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(WRIAST-2018)

24-26 October 2018

SOUVENIR & CONFERENCE BOOK

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NATIONAL AGRICULTURE DEVELOPMENT CO-OPERATIVE LTD.

Organized By:

National Agriculture Development Co-operative Ltd.
Established Under Self Reliant Co-operative Act, 1999
Under Government Control (Ministry of Cooperatives)

In Collaboration With:

University of Kashmir
Hazratbal, Srinagar, J & K, India

SKUAST-K Shalimar
Srinagar-191121 (J & K) India

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National Agriculture Development Co-operative Ltd.
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Message from Chairman NADCL

National Agriculture Development Co-operative Ltd. was established under Self-Reliant Cooperative Act-1999 and is registered Society vide Regd. No. RCS/J & K/2234-Agri, Dated: 30-05-2018 with a mission to promote, disseminate and mutual exchange of scientific information of Agricultural Science among the scientific diaspora and stakeholders. The members of the society already organized a number of training and awareness programs etc. The society was primarily established to serve as a bridge for communication between agriculture scientists, extension workers and farmers. Blending of the influences of these three, bring an effective result in the doubling of farmer's income. Needless to say, the National Agriculture Development Co-operative Ltd. desires to have your co-operation in order to develop atmosphere conducive to aware farmers about innovative agriculture practices to yield best results for the progress of the farming community.

It gives me vast satisfaction to widen a very warm welcome to all the scientists, scholars and other stakeholders, in this noble event “International Conference on Worldwide Research Initiatives for Agriculture, Science, and Technology” (WRIAST-2018) organized by National Agriculture Development Co-operative Ltd. at Ghandi Bawan, University of Kashmir, Hazratbal, Srinagar, J & K, India, on 24-26 October 2018.

I am highly thankful to the higher-ups of the University of Kashmir, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Department of Agriculture – Kashmir and Department of Sheep Husbandry – Kashmir for their overwhelming support for making this event possible.

I wish all the participants a pleasant stay at the University of Kashmir and do hope their participation in the WRIAST-2018 will be beneficial for their carrier advancement.

Peer Qammer-ud-Din Shah
Chairman
NADCL

Message from Conference Director

It gives me immense pleasure to extend a very warm welcome to all the scientists, scholars and other stakeholders, for the 3 day International Conference on Worldwide Research Initiatives for Agriculture, Science, and Technology (WRIAST-2018) organized by National Agriculture Development Co-operative Ltd. at Ghandi Bawan, University of Kashmir, Hazratbal, Srinagar, J & K, India, on 24-26 October 2018.

The conference topic is of great importance in consideration with current scientific scenarios. All over the world, significant changes have been witnessed in the science, technology, and management of natural resources and faster dissemination of technologies. However, there are certain issues in the agriculture, science, and technology which need continuous updation as per the need of increasing population and changing ecosystems. I am extremely confident that the discussion among professionals, exchange of ideas, issues and findings during the conference will definitely drive the society on a path of progress and betterment.

I wish all the participants a pleasurable stay at the University of Kashmir and do hope the discussions in the conference will be productive.

I am highly thankful to Vice Chancellor - University of Kashmir, Vice Chancellor – SKUAST-K, Director Agriculture – Kashmir and Director Sheep Husbandry – Kashmir for their inexpressible support for making this event.

Dr. R.A. Shah
Conference Director

Message from Director Agriculture Kashmir

I am very much happy to know that National Agriculture Development Cooperation Limited is organizing 3 day ***International Conference "Worldwide Research Initiatives for Agriculture, Science and Technology"*** at University of Kashmir, Hazratbal, Srinagar, Kashmir.

The agriculture sector which contributes significantly towards the development of rural economy by directly contributing to nutritional security and is important to overcome the problem of unemployment in response to rapidly increasing population; thus, having agriculture as one of the themes of the conference was important. Since the agriculture sector is backbone of more than 70% of population particularly in rural areas, and in order to improve the socio-economic status of such population; agriculture needs to become more sustainable, it must remain cost-effective for farmers. The innovative agriculture technologies making crop farming more ecofriendly, sustainable and profitable; which are important tools to overcome the challenges in agriculture sector needs to be highlighted during the conference.

The Agriculture Production Department wishes a grand success for the noble event and I on behalf of my department extend best wishes to the organizing committee who would make such kind of an event possible in the valley. I hope the conference will conclude with some innovative concepts which will be beneficial for the farming community of the country in general and for the valley in particular.

Syed Altaf Aijaz Andrabi
Director Agriculture Kashmir

Message from Organizing Chairman, WRIAST-2018

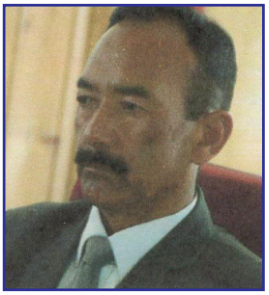
It gives me immense pleasure to learn that the National Agriculture Development Co-operative Ltd. in collaboration with University of Kashmir, Hazratbal, Srinagar, SKUAST-K, Sheep Husbandry and Agriculture Production Department, J & K Government is organizing a 3 day international conference on "Worldwide Research Initiatives for Agriculture, Science, and Technology (WRIAST-2018)" from 24-26th of Oct 2018 at Srinagar, Jammu and Kashmir.

Agriculture in India is a composite crop-livestock based production system and is age old ancestral profession of more than 60% of people of country, with a potential to galvanize the rural economy. New and need-based research initiatives and technological interventions in this field with definitely have positive and greater implications on the rural economy, natural development, food and nutritional security.

As the various development departments and policy makers are sitting together there are lots of expectations that something concrete will emerge from the conference that will go long way in shaping the agriculture in the state.

I wish the conference a greater success.

Dr. Farooq Ahmad Mattoo
Dean
SDS College of Animal Sciences,
Tohama – Haryana (India)



Message from Director, Sheep Husbandry-Kashmir

I am very much pleased to know that National Agriculture Development Cooperation Limited is organising ***International Conference on Worldwide Research Initiatives for Agriculture, Science and Technology*** in Srinagar, Kashmir. The conference will give chance to scientists, growers, manufacturers, students etc. to deliberate on wide range of subjects, technologies, experiences on a common platform.

Among various themes of the conference, the agriculture sector in general faces a number of challenges, it needs to become more sustainable and productive, nonetheless, it must remain profitable for farmers. This is particularly true for livestock sector. Modern and innovative livestock technologies making livestock farming more animal-friendly, sustainable & competitive; are important tools to overcome the challenges. The livestock sector attains significance by directly contributing to nutritional security and it is evolving in response to rapidly increasing demand for livestock products. The growing demand for livestock products is largely driven by human population growth, income growth and urbanization. The growth in livestock production is associated with science and technology as well as increase in animal numbers. Developments in breeding, nutrition and animal health will continue to contribute to increase the productivity, efficiency and genetic gains.

On behalf of my department, please accept my best wishes for an informative event. Also I am very proud of the reputation Kashmir enjoys as one of the world's most beautiful tourist destinations. I hope that, in addition to attending the conference, the participants are able to visit some famous places of Kashmir. Moreover, I on behalf of my department extend best wishes to everyone involved in organizing the conference.

17.8.018

Dr. Mohammand Sharief
Director
Sheep Husbandry Department
Kashmir

Message from the Chief Editor

It is our privilege to present you the souvenir cum conference book *"Worldwide Research Initiatives in Agriculture, Science and Technology (WRIAST-2018)"*. The book is the compilation of the abstracts and Select full length papers received for the international conference to be organised on the said theme at University of Kashmir during 24-26 October 2018. The book is the amalgamation of the research output on the emerging themes across the domains of Agriculture, Science and Technology. It was wonderful and enlightening for us to go through the creative work produced by the young inquisitive minds. A lot of research is happening worldwide in an attempt to solve the day to day problems and this conference will be an international platform for an interaction among scientists from different backgrounds, which will promote exchange of ideas, interdisciplinary collaboration and dissemination of knowledge. The influx of the abstracts and papers started right from the day conference schedule was announced and continued even after the last day of the submission which left very little scope for editorial intervention. Most of the submissions were incorporated in the book in the original form received from the authors.

We would like to express our deepest appreciations to the authors whose technical contributions are presented in this book .It is because of their excellent contributions and hard work that we have been able to prepare this book .Finally we hope that readers will find this book thoughtful and enlightening.

Adil Ahmad
Chief Editor

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Study the Effect of Time and Temperature on Pectin Yield Using Hydrochloric Acid for Extraction

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Introduction

The aim of study was to investigate the effect of time and temperature on pectin yield. The pectin was extracted from papaya (*Carica papaya Linn*.)peel using hydrochloric acid at different time, temperature and pH combinations. Extraction was done at temperatures 60°C, 70°C and 80°C for time 30 mins, 45 mins and 60 mins, and pH 2, 2.5 and 3.0 respectively.

METHOD OF EXTRACTION

Sample (5 g)

↓

Add 250 ml of water

↓

Adjusting pH by adding

↓

0.5 N HCl

↓

Heating the mixture to 60, 70 or 80°C for 30, 45 or 60 min

↓

Filtration of hot acid extract through cheesecloth

↓

Cooling (4°C)

↓

Cogulating filtrate with 96% ethanol and left for 1 hr

↓

Separation of coagulated pectin by filtration

↓

Drying at 55°C for overnight in oven

Results And Discussion

Effect of time and temperature on pectin yield using hydrochloric acid (at pH 2.0)

Acid Used	pH	Time (min)	Temperature	Yield (%)
Hydrochloric Acid	2.0	30	60	6.5
			70	8.2
			80	9.2
		45	60	13.0
			70	13.7
			80	14.5
		60	60	15.2
			70	15.7
			80	16.0

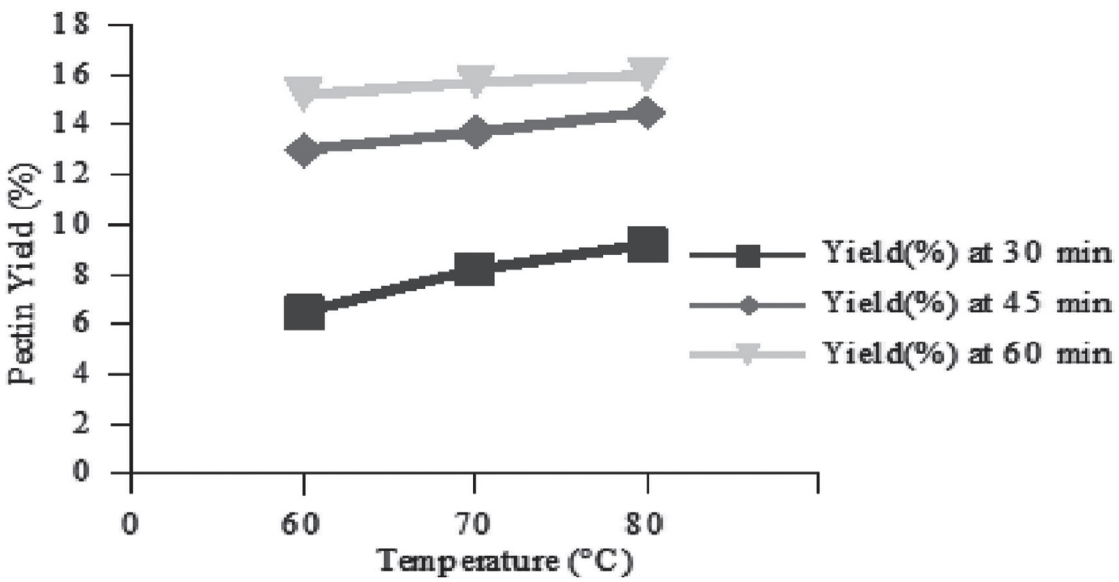


Fig. 4.1: Effect of time and temperature on yield using HCl (at pH 2.0)

Effect of time and temperature on pectin yield using hydrochloric acid (at pH 2.5)

Acid Used	pH	Time (min)	Temperature	Yield (%)
Hydrochloric Acid	2.5	30	60	4.9
			70	6.3
			80	6.8
		45	60	7.7
			70	9.7
			80	11.2
		60	60	11.6
			70	12.8
			80	13.3

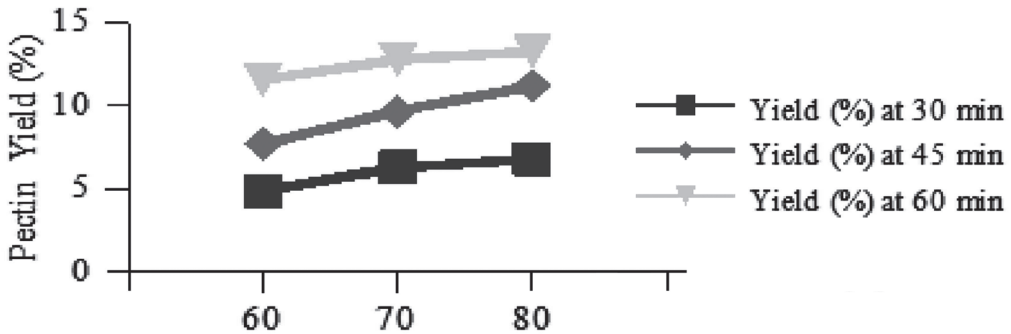


Fig. 4.2: Effect of time and temperature on yield using HCl (at pH 2.5)

Effect of time and temperature on pectin yield using hydrochloric acid (at pH 3.0)

Acid Used	pH	Time (min)	Temperature	Yield (%)
Hydrochloric Acid	3.0	30	60	2.8
			70	4.3
			80	4.7
		45	60	5.0
			70	5.7
			80	6.0
		60	60	7.6
			70	9.0
			80	9.4

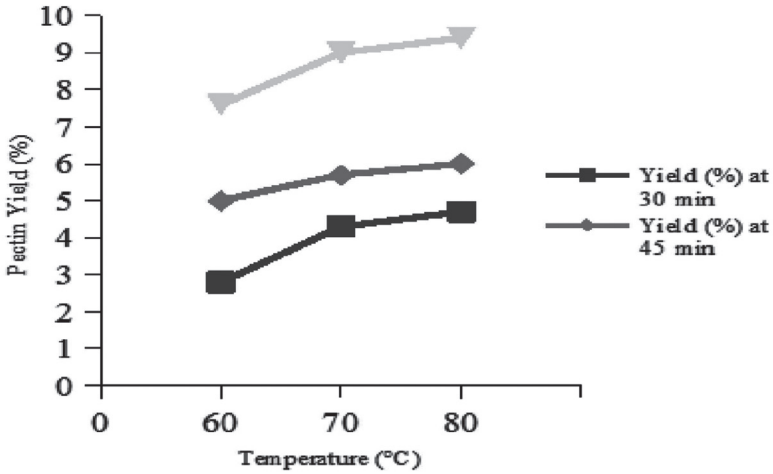


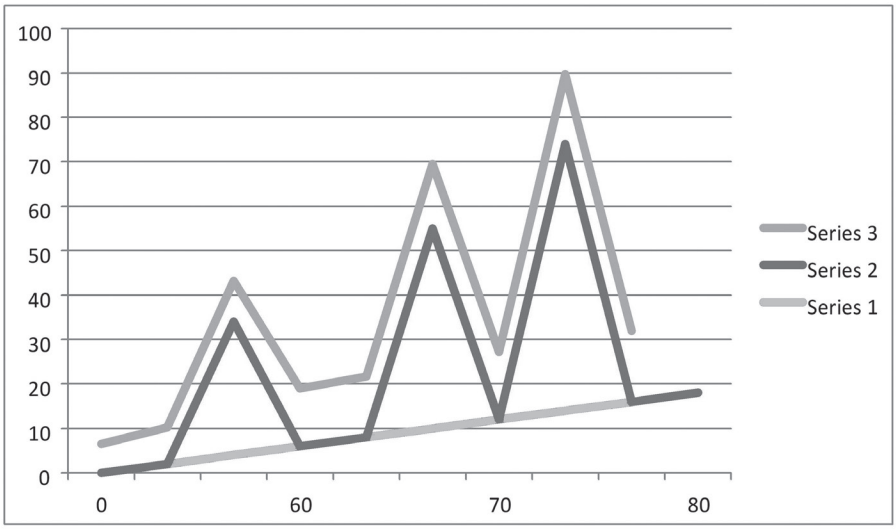
Fig. 4.3: Effect of time and temperature on yield using HCl (at pH3.0)

The results were consistent with the results obtained by **Ramli and Aswamati, 2011.** They concluded from their study that with increase in extraction time the pectin yield increased.

Conclusion

The highest percentage of pectin (16%) obtained was on extraction with hydrochloric acid at pH 2.0, temperature 80°C and with 60 min extraction time.

790-798.



References

Ramli, N. and Asmawati (2011). Effect of ammonium oxalate and acetic acid at several extraction time and pH on some physicochemical properties of pectin from cocoa husks (*Theobroma cacao*). *African Journal of Food Science* Vol. **5**(15) pp.

Man-Animal Dissension in Himalayan Wildlife

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Abstract

Due to constant Human interference in the boundary of wildlife habitat results into serious disagreement due to space crisis in their natural habitat which also favors towards wildlife crisis. Wild Bioresources of Kashmir Himalaya is constantly under threat from Anthropogenitic activities in the wildlife flora and fauna which often results into conflicts between human and wild species. Human habitat interference in the wild for extraction and exploiting of medicinal plant, fodder, food and timber results in to man-animal dissension. Wild flora and fauna of Kashmir Himalaya is under constant crisis for nearly 6-7 decades, due to bioresources extraction from wild by human settlements near it and animals are responding to the trespassers, a rise of conflict with humans is inevitable. Human-carnivore conflicts are visible dominantly within the Kashmir due to attacks by Leopards, wild brown or black bear and snakes etc. which is likely due to habitat interference and maintenance of livestock among nomads living near wildlife. The data collected from premium medical institutes of Kashmir convey that the human-animal conflict claimed nearly 51 human life and 601 injuries and killing of some 800 domestic animals during 2015 to 2017. The present study revealed that the wild flora and fauna of Kashmir Himalaya is under catastrophe it's observed that wildlife resources extraction and exploiting from the wild by humans is the main contention in Man-animal conflict.

Keywords:- Human-animal conflict, extraction, wildlife, bioresources, species, habitat.

Introduction

The Human-animal conflict has resulted in to huge confrontations on natural resources and it has become a global phenomenon with rising trends day in and day out. It has becoming a critical threat to the survival of many rare and endangered species globally. According to International Union of Conservation of Nature hosted IUCN World Park Congress, on November 2014 at Sydney, Australia is a landmark global forum on protected areas, concluded that Human-wildlife conflict (HWC) occurs when wildlife requirements overlap with those of human populations and there is huge gap in the conservation and sustainable development agenda in the world.

Human-animal conflicts are found almost all over Kashmir valley including the high mountain regions of the Himalayas up to the altitude of 2800 meters studied. The main cause is Deforestation and encroachment of habitat due to human settlements near their Habitats, ultimately resulting in destruction of these indigenous species and loss of biodiversity. Some 4o years or 4 to 5 decades back most of the wild animals where found near the bank of Dal Lake and lower brain area on the catchment area of Zaberwan hills know called as Salim Ali National park. There is representative contact of human settlements inside the protected national park which has resulted into human wildlife direct contact. When there is such land

occupancies the wildlife population density increases and animals often stray into adjacent cultivated fields or grazing areas resulting into conflicts. With increasing human population and pressure on forest areas, human wildlife interaction and resultant conflict is also increasing (Zubiri & Switzer). The Human-animal Conflict (HEC) recently becomes very common and it covers headlines in major national and regional newspapers. Minister of Environment and Forests informed parliament on that the man animal conflict were killed due to Human habitat interferences, poaching, electrocution, tourism activities and roads connectivity's acts as corridors of conflict zones. The data collected from premium medical institutes of Kashmir convey that the human-animal conflict claimed nearly 51 human life and 601 injuries and killing of some 800 domestic animals during 2015 to 2017.

Bear-human conflict is most dominant conflict in Kashmir forests areas may be due to widely distribution of black bear and has resulted into numerous human deaths and grievous injuries, even defacement of the victim. Human tolerance and education towards wildlife protection is vulnerable itself. Almost 95 per cent (Choudhur y*et al.* 2008) of Human animal conflicts occurred during day time mostly morning that though mostly in Agricultural and Horticultural sites and are dominant during fruit harvesting season and ripening of corn. The increase in bear-human conflicts is contributed to the land use change around forests, habitat loss, degradation of habitats due to heavy livestock grazing and non-timber forest products (NTFP) collection, disturbance and fragmentation of habitats due to insurgency and developmental activities such as construction of dams, hydro-electric power projects.

Materials and Methods

Kashmir or the Jhelum Valley is situated between the Pir Panjal range and the Zanskar range and has an area of 15220 sq kms and the climate of Kashmir valley is of temperate region. The Kashmir division borders Jammu Division to the south and Ladakh to the east while Line of Control forms its northern and the western border. The present work aim was to study the human animal conflict in fellowing districts of the Kashmir valley which consists of the following districts: Anantnag, Baramulla, Budgam, Bandipore, Ganderbal, Kupwara, Kulgam, Pulwama. Jammu and Kashmir state is the northern most mountainous and snow capped state of India covering an geograhhical area of 2,22,236 sq. Km. The state lies between 32o17' to 36o58' North latitude and 73o26' to 80o30' East latitude. During this work the following steps were followed: visit to the study sites including Wildlife Departments and Hospitals, data sample collection and identification. Each of the sites was divided into different area use types.

Results and Discussions

Human-Animal Conflict in the year 2017 has been the highest reported so far about 49 people were killed and some 516 injured persons mostly by Black Bear as per the figures dished out by the governments, also in the year 2016, about 291 killed 18 injured, 2014, injured 258, killed 14, 2013, injured 212, 2012, about killed 10 and 190 injured. Subsequently the year 2016-17 witnessed highest number of forest fire incidents which proves that there is huge human interferences in their Habitat, some 608 forest fire incidents were reported in Jammu and Kashmir in the year 2017, in 2016 it was 275, 2015, it was some 481, 2014, incidents where 291in 2013is was 205 and in 2013 it where about 160 forest fire incidents were recorded in the

state. In response to a question of National Conference, MLA, Mubarak Gul, the Government on Monday informed the House that in past two years 49 persons were killed by wild animals.

Table 1: Persons injured/killed due to human animal conflicts in Kashmir.

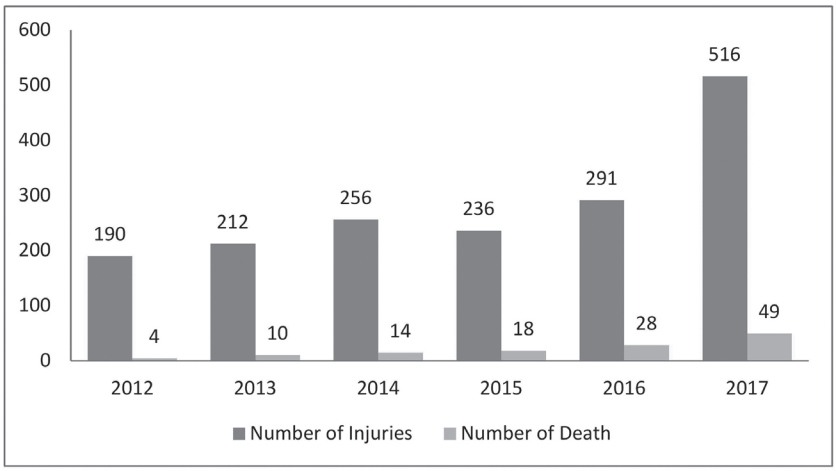
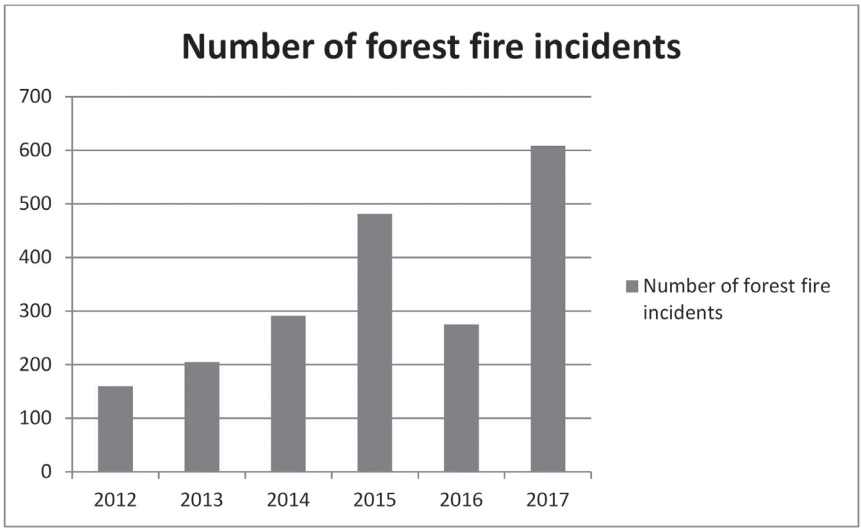


Table 2: - Number of forest fire incidents from 2012 to 2017



Recommendations

However, Jammu and Kashmir State, due to its special status, it is not dependent upon center for implementation or formation of any law governing wildlife it can itself modify and amend its own laws called Jammu and Kashmir Wildlife Protection Act, 1978, to make it more stick and upgrade it for the protection of wildlife flora and fauna to preserve the State unique wildlife resources.

Conclusions

There are the increasing trends of fatal injuries and deaths in human and domestic animals from the studied time of 2012 to 2017, especially in vicinity of forest areas. Also the incidents of forest fire are also showing increasing trend from 2012 to 2017 which proves that there is huge human intervention in the protected forest areas causing forest fires and Human animal conflicts. The present study revealed that the wild flora and fauna of Kashmir Himalaya is under catastrophe it's observed that wildlife resources extraction and exploiting from the wild by humans is the main contention in Man-animal conflict.

References

1. Websites, Nature Conservation Foundation, (2 December, 2004)
2. Namgail T, Fox JL, Bhatnagar YV. Carnivore-caused livestock mortality in transHimalaya. Envi . Manage. 2007; 39: 490-496.
3. Singh, K. S. 1995. People of India. Vol. XIV. Arunachal Pradesh: Anthropological Survey of India and Calcutta: Seagull Books
4. Patterson BD, Kasiki SM, Selempo E, Kays RW. Livestock predation by lions (Pantheraleo) and other carnivores on ranches neighboring Tsavo National Parks, Kenya. Biol. Consev. 2004; 119: 507-516.
5. Myers, N., R. A. Mittermeier, C. A. Mittermeier, G. A. B. da Fonseca, and J. Kent. 2000. "Biodiversity hotspots for conservation priorities". Nature, 403, 853-858
6. Shah GM, Jan U, Bhat BA, Ahmad F, Ahmad J. Food habits of the Leopard Panthera pardus in Dachigam National Park, Kashmir, India. J. Threat. Taxa; 2009; 1(3): 184-185.
7. Babu, V. Narendra. 2001. A report on the Investigation to determine the death of Mithuns in Sagalee, Arunachal Pradesh: Unpublished report, p. 13
8. Public Hearing on Environment and Development. The People's Commission on Environment and Development, India
9. Shah GM, Jan U, Bhat BA, Ahanger FA. Causes of decline of critically endangered hangul deer in Dachigam National Park, Kashmir (India): A review. Int. J. Biodivers. Conserv. 2011; 3(14): 735-738.
10. Dickman AJ. Key Determinants of Conflict between People and Wildlife, Particularly Large Carnivores, Around Ruaha National Park, Tanzania. PhD Thesis, University College London (UCL) and Institute of Zoology, Zoological Society of London. 2008;373pp.
11. Kaul, R. N., and K. Haridasan. 1987. "Forest Types of Arunachal Pradesh – A preliminary study". J. Econ. Tax. Bot. Vol. 9. No. 2
12. Mishra, C., A. Datta, and M. D. Madhusudan. 2004. The high altitude wildlife of Western Arunachal Pradesh: a survey report. CERC Technical Report No. 8. Mysore, India: Nature Conservation Foundation, International Snow Leopard Trust, and Wildlife Conservation Society (India Program)
13. Distefano E. Human-Wildlife Conflict Worldwide: collection of case studies.
14. Bhat BA. Ecological studies of hangul deer (Cervus elaphus hanglu Wagner) with reference to its conservation at Dachigam National Park Kashmir India. Ph.D. thesis University of Kashmir Srinagar India. (2008).
15. "State of Forest Report 2001". 20017. Dehradun: Forest Survey of India, Ministry of Environment and Forests
16. Directory of Wildlife Protected Areas of India, in ENVIS Bulletin: Wildlife and Protected Areas, Directory of Wildlife Protected Areas in India. Vol 3, No.1

Prospects of Molecular Markers in Improvement of Medicinal Plants

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Abstract

The World Health Organization has estimated that more than 80% of the world's population in developing countries depends primarily on herbal medicine which are generally considered to play a beneficial role in health care. Henceforth, it is a very high time to characterize the medicinal plants with significant characters which can be made through genetic markers. DNA-based molecular markers have acted as very useful tools in various fields like taxonomy, physiology, embryology, plant breeding, ecology, genetic engineering etc**.** The conventional method used by plant breeders for the selection through phenotypic markers is limited by having its own kind of constraints. Molecular markers can be employed for characterization, since the progress made in genetic markers has been exciting. DNA markers are more reliable because the genetic information is unique for each species and is independent of age, physiological conditions and environmental factors which also has a great utility in the drug analysis and ultimately used for the characterization of medicinally important plant species. Extensive research is being carried out on molecular markers in many research institutes all over the world.

Keywords: molecular markers, DNA markers, hybridization based markers, medicinal plants, characterization

Introduction

Medicinal plants are rich source of secondary metabolites that are commonly used in treating and preventing specific diseases which are generally considered to play a beneficial role in health care. The World Health Organization has estimated that more than 80% of the world's population in developing countries depends primarily on herbal medicine (Pourmohammad 2013). The demand for herbal medicines is increasing day-to-day because of their wide biological activity, higher safety margin than synthetic drugs. The world market for herbal medicine is estimated to have an annual growth rate between 5 and 15%. Total global herbal drug market is estimated to be US $ 2 billion and is expected to grow to US $ 5 trillion by the year 2050 (Khatak *et al.* 2013). Therefore, it is important to characterize the medicinal herbs, for the characterization of medicinal plants it is necessary to develop the sensitive and effective technology (Tharachand *et al*. 2012). Further, there is also need to increase the productivity of medicinal plants by developing new cultivars through crop breeding.

Hence Information regarding genetic diversity among population is essential for breeding programme. Genetic diversity study is a important and fundamental step in breeding programme. The conventional method used by the plant breeders for the selection is the phenotypic selection where morphological/ phenotypic agronomic traits such as plant height,

grain yields etc. are taken into account. These can be called as phenotypic markers. They are the visible manifestation of genes and therefore provide some idea about the genotype. However most of them are,

- Controlled by many genes and quantitative inheritance
- Highly influenced by environment
- Dominant- recessive interaction between the alleles make it dominant marker system
- Are field, time, effort and labor requiring
- In field they are subjected to environmental hazards also
- A trait may not express if environmental conditions are not favorable particularly in case of stress related genes.

Moreover scoring of these marker subjective the result may differ when scored by different breeders. These constraints make the use of phenotypic marker limited. Another set of markers called Biochemical markers, they include proteins, allozymes, secondary metabolites etc. These markers can be analysed at early stages, they are co-dominant marker type. But only limited number of enzymes are available for the analysis, It shows polymorphism only in the enzyme coding regions. So now a days biochemical markers are not using frequently for the genetic variability analysis (Leela *et al*. 2009).

Over the last three decades, a new class of the markers namely, molecular markers or DNA markers have been introduced which have revolutionized the entire field of molecular biology (Gupta *et al.* 2001). Molecular markers can be employed for characterization, since the progress made in genetic markers has been exciting. DNA-based molecular markers have acted as very useful tools in various fields like taxonomy, physiology, embryology, plant breeding, ecology, genetic engineering etc. Extensive research is being carried out on molecular markers in many research institutes all over the world. DNA-based molecular markers have a great utility in the drug analysis and widely used for the characterization of medicinally important plant species (Tharachand *et al.* 2012).

Molecular marker or DNA marker

A gene or DNA sequence with a known location on a chromosome and associated with a particular gene or trait. They look directly at the basic level of variation, that is DNA level giving direct insight into the genetic make up, screen the whole genome and reveal variation in both coding and non coding regions and hence offer large extent of polymorphism (Srivatsava *et al*. 2009). DNA markers are more reliable because the genetic information is unique for each species and is independent of age, physiological conditions and environmental factors (Kalpana *et al*. 2004). DNA markers are highly amenable to automation and once automated, they can be used as efficient tools by the plant breeders.

Classification of DNA markers

- **Hybridization based markers**

Restriction Fragment Length Polymorphism (RFLP):

RFLP provide the world with the first form of genetic testing based on DNA. RFLP is a variation in the DNA sequence of a genome that can be detected be breaking the DNA into pieces with restriction enzymes and analyzing the size of the resulting fragments by gel electrophoresis (Gnavi *et al*. 2010). RFLP analysis was developed first and was cheap enough to see wide application. Analysis of variation was an important tool in genome mapping, localization of genetic disease genes, genetic fingerprinting and paternity testing.

Analytical procedures:

a. Sample of DNA extracted and put on gel
b. Fragments appear as smear. Gel placed against nylon membrane and put in denaturing solution
c. Single stranded DNA's migrate from gel to nylon membrane. (Southern Blotting)
d. Nylon membrane is soaked in solution with radioactive complementary probe
e. Radioactive probes anneal at specific locations
f. Nylon membrane are exposed against an X-ray
g. Radioactive probes burn the image in the X-ray film
h. Visualization of the polymorphisms by autoradiography

Forms the banding pattern on the gel based on the molecular weight of the fragments. By scoring the bands from each genotype can analyses the genetic diversity among the individuals (Vyskot *et al*. 1991).

Advantages

- High genomic abundance
- Random distribution throughout the genome
- RFLPs are co-dominant markers, enabling heterozygotes to be distinguished from homozygotes.
- It has a discriminating power that can be at the species / population (single locus probes) or individual level (multi locus probes).
- The method is simple as no sequence-specific information is required.

Disadvantages

- Large quantities of purified, high molecular weight DNA required for the analysis
- Laborious and technically demanding
- High cost involved
- Not amenable to automation.

Hence, now a days this marker technique are not using in genetic variability studies.

Kary Mullis invented the polymerase chain reaction (PCR) technique in 1985. PCR is used to amplify specific regions of a DNA strand (the DNA target). This can be a single gene, a part of a gene, or a non coding sequence. Most PCR methods typically amplify DNA fragments of up to 10 kilo base pairs (kb), although some techniques allow for amplification of fragments up to 40 kb in size (Satya Narayan *et al.* 2009).

Procedure

The PCR usually consists of a series of 20-40 repeated temperature changes called cycles; each cycle typically consists of 2-3 discrete temperature steps.

Initialization step: This step consists of heating the reaction mixture containing DNA of our interest, primers, Taq polymerase enzyme, dNTPs to a temperature of 94-96° C.

Denaturation step: This step consists of heating the reaction to 94-98° C for 20-30 seconds. It causes melting of DNA template and primers by disrupting the hydrogen bonds between complementary bases of DNA strand.

Annealing step: The reaction temperature is lowered to 50-60° C for 20-40 seconds allowing annealing of the primers to the single stranded DNA template.

Extension step: At this step DND polymerase synthesizes a new DNA strand complementary to the DNA template strand using dNTPs.

Based on the PCR technique so many marker techniques are developed. Among theses marker types mostly used marker technique for the variability studies are,

- RAPD (or Random amplification of polymorphic DNA)
- AFLP (or Amplified fragment length polymorphism)
- SSR (or Simple sequence repeat)
- ISSR (or Inter simple sequence repeat)
- SNP (or Single nucleotide polymorphism)

Random amplification of polymorphic DNA

RAPD markers are decamer DNA fragments from PCR amplification of random segments of genomic DNA with single primer of arbitrary nucleotide sequence (Srivatsava *et al*. 2009).

Analytical procedure:

- Isolated DNA fragments are amplified by PCR using single 10-mer primers
- RAPD products are electrophoreses and bands are visualized by staining gels with ethidium bromide.
- Number of amplification products is related to the number and orientation of the genome sequences which are complementary to the primer.

Analysis of banding pattern on the gel

If the bands are present in all the individuals at a particular base pair that type of bands are called as monomorphic bands. It the bands are observed in one individual, and absent in another individual at particular base pair then that type of bands are called as polymorphic bands. Based on the presence or absence of the bands scored the data, and used for the further analysis.

Advantages

- Low quantity of template DNA required
- No sequence data for primer construction required
- Low cost involved
- Very high genomic abundance

Disadvantages

- Purified, high molecular weight DNA required
- Low reproducibility
- Dominance of alleles

Amplified Fragment Length Polymorphism

The AFLP protocol amplifies restriction fragments obtained by endonuclease digestion of target DNA using "universal" AFLP primers complementary to the restriction site and adapter sequence (Dorothea *et al.* 1996).

AFLP-PCR is a highly sensitive method for detecting polymorphisms in DNA In detail, the procedure of this technique is divided into three steps:

1. Digestion of total cellular DNA with one or more restriction enzymes and ligation of restriction half-site specific adaptors to all restriction fragments.
2. Selective amplification of some of these fragments with two PCR primers that have corresponding adaptor and restriction site specific sequences.
3. Electrophoretic separation of amplicons on a gel matrix, followed by visualisation of the band pattern.

Advantages

- The AFLP technology has the capability to detect various polymorphisms in different genomic regions simultaneously.
- AFLP has higher reproducibility compared to RAPD
- It has the capability to amplify between 50 and 100 fragments at one time.

- No prior sequence information is needed for amplification
- High genomic abundance

Disadvantage

- Dominant marker
- High quality DNA is required for the analysis

Simple sequence repeat (SSR)

SSR markers are short sequences of nucleotides (2-6 units in length) that are repeated in tandem and directly adjacent to each other.

Di- nucleotide repeat: CACACA

Tri- nucleotide repeat: ATGATGATGATG

It is believed that during DNA replication error occur in the process and extra sets of these repeated sequences are added to the strand, overtime these repeated sequences vary in length between one cultivar and another. Diversity is studied by identifying the repeats of a specific sequences.

The DNA sequences of flanking region have been exploited to design primers for amplification using PCR. Differences in the length of the PCR amplified products from different genotypes reveal the SSR polymorphism (Weber and May, 1989).

They show high mutation rate which has now been estimated to be between 10^{-2} to 10^{-6}.

These are ideal DNA markers for genetic diversity studies because of their abundance. These SSR length polymorphisms at individual loci are detected by PCR, using locus-specific flanking region primers where the sequence is known.

Analytical Procedures

- Extraction of DNA
- Amplification of DNA fragments by PCR
- Separation of polymorphism by polyacrylamide gel or agarose gel electrophoresis
- Visualization of polymorphism by autoradiography, silver staining

Advantages

- Co-dominant marker
- High genomic abundance
- Small quantity of DNA is required for the analysis
- Shows high polymorphism
- High reproducibility

Disadvantages

- Quite costly, time consuming as primers are to be synthesized from the flanking sequences of the microsatellite, which need to be isolated, cloned and sequenced.
- Some time heterozygotes may be misclassified as homozygotes when null alleles occurs due to mutation in the primer annealing sites.

Inter Simple Sequence Repeat

ISSR is a genome region between microsatellite loci.

The complementary sequences to two neighboring microsatellites are used as PCR primers, the variable region between them gets amplified (Wang *et al.* 1994).

Amplification products are obtained only if SSR's in opposite orientation and it should be PCR amplifiable distance.

Advantages

- It requires low quantity template DNA
- No sequence data are required for primer construction
- Generates many informative bands per reaction, about 10-60 fragments are generated from multiple loci (SSR contrary which produce 1-2 fragments only).

Disadvantages

- Dominant marker type

Single Nucleotide Polymorphism

SNP is a DNA sequence variation occurring when a single nucleotide — A, T, C or G— in the genome (or other shared sequence) differs between members of a species (or between paired chromosomes in an individual).

For example, two sequenced DNA fragments from different individuals, AAGCCTA to AAGCTTA, contain a difference in a single nucleotide (Alves *et al*. 2008).

Ideal Character of Molecular Markers in Diversity Study

- Having high heritability
- Highly polymorphic
- Abundant & evenly distributed
- Highly amplifiable with PCR
- More repeated sequences
- Easily quantifiable & assessable
- Amenable to automation

Conclusion

Thus we can conclude that molecular markers are more efficient tools for the assessment of genetic diversity as they are developmentally stable, detectable in all tissues, remain uninfluenced by environmental factors and provide a choice for co-dominant or dominant markers. Therefore, they could complement one another depending on technical availability. Molecular technology provides an independent approach for the characterization of medicinal plant materials. It will be more significant if a concentrated effort is made to combine the existing molecular fingerprinting data and to co-ordinate the projects of molecular characterization of medicinal plants.

References

Alves, D.M.T., Pereira, R.W., Leal-Bertioli, S.C.M., Moretzsohn, M.C., Guimaraes, P .M. and Bertioli, D.J. 2008. Development and use of single nucleotide polymorphism markers for candidate resistance genes in wild peanuts (*Arachis* spp). Genetics and Molecular Research. 7(3): 631-642.

Dorothea, M., Richard, M., Brian, G.L., Vos, P. and Richard, P.O. 1996. The use of AFLP finger printing for the detection of genetic variation in Fungi. Mycological Research. 100(9): 1107-1111.

Gnavi, G, Cinzia, M.B., Maranna Usai and Massimo, E. Maffei. 2010. Comparative characterization of *Santolina insularis* chemotypes by essential oil composition, 5s-rRNA-NTS sequencing and *Eco* RV. Phytochemistry. 71: 930-936.

Gupta, P.K., Roy, J.K. and Prasad, M. 2001. Single nucleotide polymorphisms: A new paradigm for molecular marker technology and DNA polymorphism detection with emphasis on their use in plants. Current Science. 80(4): 524-535.

Kalpana, J., Warude, P.C. and Bhushan, P. 2004. Molecular markers in herbal drug technology. Current Science. 87(2): 159- 165.

Khatak, S., Dhillon, S., Yadav, O.P., Grewal, A. and Sheokand, R.N. 2013. Agro- morphological and RAPD marker based characterization of genetic diversity in different genotypes of *Withania somnifera* L. dunal. *Int. J.of Biotech. & Research*, **3**:1-16.

Leela, T., Suhas, P.W., Seetha, K., Naresh, B., Thakur, K.S., David, A.H., Prathibha Devi and Rajeev, K.V. 2009. AFLP-based molecular characterization of an elite germplasm collection of *Jatropha Curcas* L., a biofuel plant. Plant Science. 176: 505- 513.

Pourmohammad, A. 2013. Application of molecular markers in medicinal plant studies. Acta Universitatis Sapientiae Agriculture and Environment, 5, 80-90.

Satya Narayan, J., Susheel Kumar and Narayanan K. Nair. 2009. Molecular phylogeny in Indian *Citrus* L. (Rutaceae) inferred through PCR-RFLP and trnL-trnF sequence data of chloroplast DNA. Scientia Horticulturae. 119(4): 403-416.

Srivatsava, S. and Nidhi, M. 2009. Genetic Markers – A Cutting Edge Technology in Herbal Drug Research. Journal of Chemical and Pharmaceutical Research. 1(1): 1-18.

Tharachand, C., Immanuel Selvaraj, C. and Mythili, M. N. 2012. Molecular markers in characterization of medicinal plants: An overview. Research in Plant Biology, 2(2): 01-12.

Vyskot, B., Fajkus, J., Kuglik, P., Blazena, K. and Viera, K. 1991. Genome modifications in protoplast-derived tobacco plants: Phenotypic evaluation and RFLP Analysis. Biologia Plantarum. 33(6): 455-460.

Wang, Z., Weber, J.L., Zhong, G. and Tanksley, S.D. 1994. Survey of plant short tandem DNA repeats. Theoretical and Applied Genetics. 88: 1-6.

Evaluation of Feeding Practices and Nutritional Status of Adult Horses in District Ganderbal of Kashmir Valley

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Abstract

A study was carried in three blocks of district Ganderbal, to find out the existing feeding practices and nutritional status of equines there in. 30 families were randomly selected from each study block with a total of 90 families in 3 blocks. The feed/fodder samples offered to equines were collected and analyzed for nutritive composition and macro minerals (Ca and P). The intake of DM, DE, CP, Ca and P was calculated and compared to requirements (NRC, 2007). The most common feeds and fodders offered to the equines in this district were paddy straw, oat hay, mixed hay, maize stover, as a source of roughage and rice bran, wheat bran, MOC and maize grain as a source of concentrate. Further, roughages were fed in twice a day. Concentrates were fed thrice a day. The equines were fed blend of several spicy ingredients locally popular as “masala” which comprised of onion, ginger, greenchillies, black cumin and salt.The daily feed intake in terms of dry matter for adult equines was optimum as compared to requirements (NRC, 2007).

Key words: Feeding practices,Equines, Ganderbal, Nutritional status, Masala

Introduction

Equine nutrition and the importance of implementing correct diets for equines, is becoming increasingly significant for good equine health and welfare. So having the knowledge about equine nutrition is likely to affect their feeding practices. However, most of the valuable information is taken from horse men who are raising the horses for economic purpose. Most of the horse owners may not have any basic understanding of principles of equine nutrition and decisions regarding are often based on tradition and misinformation (Crystal *et al.,* 2009). In Jammu and Kashmir, information regarding equine nutrition and feeding practices is limited due to paucity of research in this area. With this background, present study was carried out in district Ganderbal of J&K state.

Materials and Methods

For present study a cross sectional face to face survey was carried out in all the three equine rearing blocks of Ganderbal- Ganderbal, Kangan and Lar blocks in order to find out existing feeding practices and macronutrient status of equines. Data was collected from 90 randomly selected equine owners through a questionnaire on various aspects of equine feeding practices- locally available feeds and fodder, feeding strategy adopted, quantity of feeds and fodder offered per day, mineral and vitamin supplementation offered. The estimated intakes

of DM, DE, CP, Ca and P were calculated and compared to requirements (NRC, 2007). Data were analysed as per Snedecor and Cochran (1994).

Results and Discussion

The common sources of roughages for equines in district Ganderbal were maize stover, mixed hay, oat hay and paddy straw. As a source of concentrate equines in all the three study blocks of district Ganderbal were fed with maize, mustard oil cake, rice bran and wheat bran. The roughages were fed thrice a day whereas concentrate feeds were fed twice a day. The concentrate mixtures were packed in a gunny bags to facilitate intake by equines during working hours. Grazing was allowed at the periods of rest or lack of work, subject to the availability of grazing area around the halt site. In peak tourist and Amarnath pilgrim period, it was found that animals were hardly allowed to graze because of work load during that period. Equines in study blocks were provided sufficient grazing due to availability of pastures. Equines in this district were allowed to graze mainly for 3-4 hours a day. No supplemental feeds were fed. The horses were fed blend of several spicy ingredients locally popular as “masala” which comprised of onion, ginger, garlic, clove, turmeric, black cumin and salt. At least 250 gram of masala was fed to equines thrice in a month. The farmers used to prepare a blend of wheat bran and rice bran together with crushed maize to be carried along for feeding the animal during the day. None of the farmers procured any compound feeds (pellets) for equine feeding.

Nutritional status of equines in different survey areas was compared with the actual requirements as given in the feeding standards (NRC 2007) with regard to nutrient intake in terms of dry matter, crude protein, digestible energy and macro minerals (calcium and phosphorus) by the equines as is presented in table. The results were comparable with the results of Owens (1998) and corroborate well with the observations of Pal *et al*. (2013), Bhat*et al*. (2013) and Hassan *et al*. (2016d and 2016f).

Conclusions

Only a couple of studies have been conducted with regard to nutrition and feeding practices in the state. Therefore feeding practices need to be quantified in order to provide guidelines to optimize feeding to maximize performance. Further, it was concluded that ration offered to adult equines was optimum in bulk/quantity, however it was not balanced in terms of nutrients. Adult equines received optimum DM, DE and CP intakes along with imbalanced Ca and P intake when compared to the NRC (2007) requirements.

References

Crystal, J. H., Lias, R. C, R and Lisa. M. F 2009. Survey of feeding practices, supplement use, and knowledge of equine nutrition among a subpopulation of horse owners in New England.*Journal of Equine Veterinary Science.***29**(10):719-726.

Hassan, S., Ganai, A. M., Beigh, Y. A., Farooq. J., Shiekh., G. G., Masood. D and Ahmad, H.A.. 2016f. Evaluation of nutritional status and feeding practices of adult horses in district Budgam of Kashmir valley. In: Proceedings of 16th Biennial Animal Nutrition Conference on *“Innovative Approaches forAnimal Feeding and Nutritional Research”* held at NDRI, Karnal, Haryana, India, Feb. 6-8, 2016, pp. 79.

Hassan, S., Ganai, A. M., Beigh, Y. A., Farooq. J., and Ahmad, H.A., Shiekh., G. G. 2016d. Evaluation of chemical composition of available feeds/fodders for equines, nutritional status and feeding practices of adult horses in district Baramulla of Kashmir valley. In: Proceedings of X Biennial Animal Nutrition Association Conference on *“Newer perspectives in Animal Nutrition research for augmenting animal productivity”* held at Tirupati, India, Nov.9-11.

NRC 2007.*Nutrient Requirement ofHorses.*National Research Council, Washington D.C.

Pal, Y., Legha, R. A., Dedar, Gupta, R. K and Bala, P. A. 2013. Socio economicstatus of horse owners vis-à-vis horse feeding and management in Rajasthan. *Vet World.***6(**8):470-475.

Owens, E. 1998.Evaluation and monitoring of the nutritional status of Australia'sequineathletes.*Australlian Sports Commission Report.*

Snedecor, G. W and Cochran, W. C. 1994.Statistical methods 8th Ed. Oxford and IBH Publishing Co., New Delhi, India.

Table 1. Daily nutrient intakes by adult horses of district Ganderbal

Parameter	Ganderbal	Kangan	Lar	Mean
DMI (kg/d)	6.77^{a}±0.11	7.15^{b}±0.09	7.00^{ab}±0.08	6.97±0.05
DMI as % body weight	2.91^{a}±0.10	3.29^{b}±0.11	3.03^{ab}±0.10	3.08± 0.06
(%) excess/ Deficit	Optimum	Optimum	Optimum	Optimum
DE Intake (Mcal)	17.24^{b} ±0.29	16.55^{a}±0.23	17.61^{b} ±0.24	17.47±0.16
(%) excess/ Deficit	9.15	10.47	6.34	8.65
CP intake(g)	540.44^{a}±8.96	553.34^{a}±8.66	553.86^{a}±9.14	549.21±5.31
(%)Excess/Deficit	12.32	23.19	16.26	17.13
Ca intake (g)	31.14^{c} ±0.53	29.33^{b}±0.37	27.68^{ab}±1.88	29.38±0.28
(%)Excess/ Deficit	47.86	49.18	32.75	43.17
P intake(g)	29.92^{b}±0.49	25.69^{a}±0.33	29.81^{b} ±0.41	28.48±0.31
(%) Excess/Deficit	Optimum	Optimum	Optimum	Optimum

Climate Change and Livestock Production with Special Reference to J&K

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Abstract

Weather is the short-term changes seen in temperature, clouds, precipitation, humidity and wind in a region or a city. But climate of a region or city on the other hand is its weather averaged over many years. For example, a region or city may tend to be warm and humid during summer. But it may tend to be cold and snowy during winter. The climate of a city, region or the entire planet changes very slowly. These changes take place on the scale of tens, hundreds and thousands of years. Thus, climate change may be defined as any significant change in the measures of climate lasting for an extended period of time. In other words, climate change includes major changes in temperature, precipitation, or wind patterns, among other effects, that occur over several decades or longer.

One of the major aspect of climate change is global warming which refers to the recent and ongoing rise in global average temperature near Earth's surface. It is caused mostly by increasing concentrations of greenhouse gases in the atmosphere. Table -1 shows increase in GHG concentration from pre-industrial era to current era.

Evidences of climate change

Sea level rise:

Global sea level rose about 17 cm (6.7 inches) in the last century. Oceans have warmed, the amounts of snow and ice have diminished and sea level has risen. From 1901 to 2010, the global average sea level rose by 19 cm as oceans expanded due to warming and ice melted.

Global temperature rise:

Climate change is already witnessed in the high altitudes with average rise of temperature 0.01° to 0.04°C/year. The Annual mean temperatures are projected to increase an average of 2.9°C by the middle of the century with range of 2.9° to 4.3°C by the end of the century (Sharma *et al*. 2009). Most of the warming has occurred since the 1970,s with the 20 warmest years having occurred since 1981 and with all the 10 warmest years occurring in the past 12 years. From 1880 to 2012, average global temperature increased by 0.85°C.

Erratic precipitation:

There is an increased variance of precipitation everywhere. The wet areas become wetter, and dry and arid areas become more so.

Extreme events:

The frequency and number of extreme events globally and locally has been increasing. High temperatures, very cold temperatures, intense rainfall, snowstorms, hailstorms, windstorms and resulting floods, droughts, and landslides are frequent phenomenon now. India has also witnessed increasing numbers of extreme events in recent times.

Ocean acidification:

Acidity of surface ocean waters has increased by about 30 percent. This increase is the result of humans emitting more carbon dioxide into the atmosphere and hence more being absorbed into the oceans. The amount of carbon dioxide absorbed by the upper layer of the oceans is increasing by about 2 billion tons per year. In addition to these, extent of snow cover, volume of glaciers and sea ice is decreasing indicating climate change.

Some facts about climate change include:

- For each 1 degree of temperature increase, grain yields decline by about 5 per cent. Maize, wheat and other major crops have experienced significant yield reductions at the global level of 40 megatonnes per year between 1981 and 2002 due to a warmer climate.
- Given current concentrations and on-going emissions of greenhouse gases, it is likely that by the end of this century, the increase in global temperature will exceed 1.5°C compared to 1850 to 1900 for all but one scenario. The world's oceans will warm and ice melt will continue. Average sea level rise is predicted as 24 – 30cm by 2065 and 40-63cm by 2100. Most aspects of climate change will persist for many centuries even if emissions are stopped
- Global emissions of carbon dioxide (CO2) have increased by almost 50 per cent since 1990.

Causes of climate change

Main cause of the current global warming trend is human expansion of the "greenhouse effect", i.e., warming that results when the atmosphere traps heat radiating from Earth towards space.

Certain gases in the atmosphere block heat from escaping known as *Greenhouse Gases*. Greenhouse gases act like a blanket around Earth, trapping energy in the atmosphere and causing it to warm. This phenomenon is called the greenhouse effect and is natural and necessary to support life on Earth. However, the build-up of greenhouse gases can change Earth's climate and result in dangerous effects to human health and welfare and to ecosystems. Increased concentration of green house gases is mainly due to excessive carbon emissions (carbon dioxide, methane, fluorinated gases and nitrous oxide) infamous for their depletion of the upper atmosphere's protective ozone layer, reduced carbon sequestration and black carbon essentially soot and other small carbon particles from combustion which is potent enough to change the reflectivity of the earth's surface (as and when reflective sea ice melts and is replaced by heat absorbing ocean water).

The other (non-human) species that could also be accused of climate change includes all domesticated farm animals, the livestock. According to World Watch report, domesticated animals raised for food were considered as a source of greenhouse gases (GHGs), and

accounts for at least half of all human-caused GHGs (Goodland and Anhang 2009). Livestock accentuate the processes leading to climate change by adding to carbon emission mainly through methane production directly owing to rumen fermentation and indirectly through the degradation of their wastes. They also contribute to reduced carbon sequestration in various ways; by causing ecological degradation of forests, rangelands and pastures. livestock currently contributes about 18% to the global warming effect. FAO estimates that of the worldwide emissions, 7,516 million metric tonne/year of CO2 equivalents (CO2e), or 18% are contributed by buffaloes, cattle, sheep, goat, camels, horses, pigs and poultry (Steinfeld 2006). However, the World Watch analysis showed that livestock and their by-products actually account for at least 32,564 million tonne of CO2e/year, or 50% of annual worldwide GHG emissions (Goodland and Anhang 2009). Livestock contributes about 9% of total carbon dioxide (CO2) emissions, but 37% of methane (CH4), and 65% of nitrous oxide (N2O).

Livestock as a victim of climate change

Livestock sector, is not only a driver but also a sufferer of climate change. Physiology of livestock responds to climatic stimuli from their surroundings, thereby altering the functioning of their body accordingly. Overall performance of livestock – feed conversion efficiency, growth, reproduction, milk and wool production, etc. is influenced by the climate both directly and indirectly.

Direct effects of climate change on livestock includes:

1. Thermal stress on animals due to alteration in temperature range resulting in cold/heat stress inducing behavioural and metabolic changes, thereby declining their productivity.
2. Mortality of animals due to extreme climatic events, e.g.summer heat waves or snow storms

Indirect effects of climate change on livestock includes:

1. Change in quantity and quality of feed due to an increase in atmospheric CO_2 levels and temperature.
2. Temperature increases affect species reproduction, migration, mortality, and distribution resulting in biodiversity loss
3. Glacial melt leading to sea level rise resulting in salination which affects animal metabolism, fertility, and digestion
4. Accelerates growth of pathogens and parasites, induces shift in disease spreading causing outbreak of severe diseases, or even introduce novel diseases, thus increasing the potential for morbidity and death of livestock.

The above mentioned effects were a general result of climate change but a consensus has emerged that the mountain regions are more vulnerable to the adverse impacts from climate change due to its fragile environment. Mountains differ in shape, extension, altitude, vegetation cover, and climate regime. They will therefore be affected differently by climate change. It is seen that temperature changes with altitude which means impacts of a warmer climate are different for different elevations. Areas at the snow line or freezing line will be affected heavily, as they might undergo a shift from snow-covered to snow-free. It implies that every degree Celsius increase in temperature will cause the snow line to rise on average

by about 150 m. This will change precipitation from snow to rain which will lead to an above-average warming of mountains, because snowfree surfaces absorb much more radiation than snow-covered surfaces. Global warming poses threat to mountain habitats by affecting the distribution of plants and animals, resulting in loss of rare species of alpine habitats and dearth of pasturelands. As a consequence of increased global temperatures, significant range shifts of many organism toward the poles or towards higher altitude has been reported. The climate change is already witnessed in the high altitudes with average rise of temperature 0.01° to 0.04°C/year; the highest rates of warming are in winter with the lowest or even cooling in summer and increase with altitudinal rise (Haynes *et al*. 2014). The data available on temperature in Himalayas indicated that the warming trend of last 3–4 decades was more than the global average of 0.74°C over last century (Du *et al*. 2004). The seasonal temperature fluctuations are also changing in both timing and extent and the rate of change of temperature with altitude is becoming less that is higher altitude areas are warming faster than lower altitude areas. Hence, the difference in temperature between different altitudes is becoming less and gradually more increase in temperature with elevation or altitude, with areas above 4,000 m experiencing the greatest warming rates up to 0.06°C (Shrestha *et al*. 1999, Sharma *et al*. 2009).it has been reported that decadal temperature rise remains 0.2°C up to 2,000 m above mean sea level (msl) and it often exceeds 0.3°C when the altitude is above 2,000 m (Gautam *et al*. 2014).

Jammu and Kashmir nestles in fragile Himalayan Ecosystem where climate change poses a serious threat to the agriculture, horticulture, water resources, tourism, species diversity, habitats, forests, wildlife, and livelihood in the region. As per INCCA assessment the number of rainy days in the Himalayan region in 2030s may increase by 5-10 days on an average, with intensity likely to increase by 1-2 mm/day. The rate of recession of glaciers is reportedly varying which is being attributed to winter precipitation, climate warming and anthropogenic elements. Temperature, precipitation and cold wave will significantly impact the agricultures sector. The annual temperature is projected to increase from 0.9±0.6°C to 2.6±0.7°C in the 2030s. The net increase in temperature ranges from 1.7°C to 2.2°C with respect to the 1970s. Seasonal air temperatures also show a rise in all seasons. The projected precipitation is likely to increase by 5% to 13% in 2030s with respect to 1970s. The water yield in the Himalayan region, mainly covered by the river Indus, is likely to increase by 5%–20% in most of the areas, with some areas of Jammu and Kashmir showing an increase of up to 50% with respect to the 1970s. Kashmir valley is a temperate region and thus livestock as well as agriculture is adapted to cold winter conditions during winter season, thus any increase in temperature makes livestock susceptible to heat stress due to change in climate.

Effect of climate change on animals in temperate areas

Livestock in higher latitudes will be more affected by the increase of temperatures than livestock located in lower latitudes, because animals in lower latitudes are usually better adapted to high temperatures and droughts (Thornton et al., 2009). Upper comfortable limit of animals in tropics is THI – 72, while as comfortable THI of temperate livestock.is 50-60. Also, animals of temperate areas have thick skin with few functional sweat gland, heavy coat, having few means of heat dissipation other than respiratory system, making them highly susceptible to heat stress. Moreover, absence of immunity to lowland cattle diseases dispose them to parasitic and vector borne diseases

Impact of climate change on water resources

Destruction of forests and increasing cement plants in Kashmir are producing heat trapping gases leading to less or no snow in valley. Also the valley is surrounded on all sides by high mountains trapping these gases resulting in glacier melt. All the factors i.e., increase in ambient temperature, change in rainfall pattern, increased rate of evapotranspiration, mass losses from glaciers and reduction in snow cover disturbs hydrological cycle. It has been documented that total glaciated area of the nine benchmark glaciers in 1980 was 29.01 sq km which reduced to 23.81 sq km in 2013 (Murtaza, 2017). An example of glacial melt is Kolahoi Glacier which is a valley glacier in the northwestern Himalayan Range situated 26 kms north from Pahalgam and 16 kilometers south from Sonamarg, in the state of Jammu and Kashmir. Changes in the extent of Kolhoi glacier from 1962-2013 has been recorded indicating climate change impact on glaciers. (Table - 2)

Impact on transhumance practice

Jammu and Kashmir is ideally suited for rearing of sheep and goats and are kept under nomadic pastoral system. The pastoral economy of the Bakarwals mainly depends on the utilization of the extensive pastures Availability of the pastures is seasonal in character while snow covers the mountains in the north, winter pastures are available in the south. In late April, the winter pastures get exhausted, while the melting of the snow gives way to summer pastures in the north. But due to unusual warm march these years, Bakarwals are forced to migrate to higher altitudes before their scheduled time. Due to immediate melting of snow, summer pastures do not offer good grazing causing nutritional stress on livestock. In addition to scarcity of good quality pastures, due to early arrival, low temperature increases incidence of newborn mortality which is a major source of the economy for the community. An example of adverse effect of climate change on transhumance activity was in 2009, due to unseasonal snowfall, Gujjar and Bakarwals got trapped in upper reaches of Himalayas, which led to death of more than 50 humans and thousands of the animals were being perished (Tufail, 2014)

Impact of climate change on temperate forests:

a. Marked expansion (11%) in Temperate deciduous, cool mixed and conifer forests at the cost of alpine pastures which are likely to shrink.
b. The unusual trends of winter migration of birds in the wetlands of Jammu, Kashmir and Ladakh
c. Decline in socio-economic important species like Deodar, Fir and spruce and increase in Blue Pine in Kashmir Valley and Chir Pine in Jammu.
d. Decreasing tree density and forest fragmentation
e. Increased incidence of forest fires

Strategies to ameliorate changing climatic stress

Since high altitude climate and ecosystems are very fragile and sensitive to global climate change so changing climatic patterns could affect high altitude indigenous animals by creating shortage of water, fodder and increase incidence of pests and diseases. Therefore, different

strategies have to be developed to mitigate thermal stress and to augment the productivity. Mitigation for the effect of climate change on animals can be done by following ways:-

Physical modification of the environment:

Construction of temporary sheds in the grazing areas for free-range animals (Krishnan et al. 2008) to protect them from adverse climatic conditions. And at organized farms, suitable housing with necessary air circulation and cooling facilities must be provided for the animals maintained under semi-intensive system (Krishnan *et al*. 2008). Housing of milking yaks during hot days improves the milk production than the free range.

Animal breeding strategies which include:

Genetic development of strains less sensitive to heat stress and selection of more productive animals. Also, cross-breeding of heat-tolerant breeds with local breeds will help to adapt better.

Dietary manipulation

1. Increasing green fodder decreases methane production by 5.7%, increasing concentrate reduces methane by 15–32% and molasses urea supplementation mitigates methane by 8.7%.
2. Use of feed additives like Monensin and Nitrate decreasing enteric methane production by↓ 21% and 50% respectively (Hulshof et al., 2012).
3. Methane Inhibitors like bromo-chloromethane (BCM), 2-bromo-ethenesulfonate (BES), chloroform and cyclodextrin reduce methane production by 50% in cattle and small ruminant (Knight et al.2011).

Improving manure management includes:

Frequent manure removal from animal housing into covered storage using scraping systems as well as centralized digesters for biogas generation and utilization (DeAngelo *et al.* 2006). Use of manure storage covers like roofs for solid and covered tanks for liquid have seen to reduce methane emissions by 95% and also controls odour. In addition to these, composting manure reduces most pathogens, improves soil nutrient status and helps lower net GHG emissions from livestock systems. Aerobic decomposition of manure lowers CH4 and N2O creation.

An integrated approach to production of trees and animals on the same piece of land:

is important for carbon sequestration, improved feed and consequently reduced enteric methane. Trees not only provide shade reducing heat stress on animals but also help increase productivity. Trees help reduce overgrazing and curb land degradation as well (Thornton and Herrero, 2010).

Hence it can be concluded that high altitude ecosystems are very fragile and sensitive to global climate change. As the global warming continues, changing climatic patterns adversely affect high altitude indigenous animals by creating shortage of water, fodder and increase incidence of novel diseases affecting their existence as well as performance. Therefore, different strategies need to be developed to mitigate heat stress in temperate areas and to augment the productivity.

References:

DeAngelo, B. J., Chesnaye, F. C., Beach, R. H., Sommer, A. and Murray, B. C. 2006. Methane and nitrous oxide mitigation in agriculture. *The Energy Journal*, Multi-Greenhouse Gas Mitigation and Climate Policy, Special Issue **3**: 89–108.

Du, M .Y., Kawashima, S., Yonemura, S., Zhang, X .Z. and Chen, S. B. 2004. Mutual influence between human activities and climate change in the Tibetan plateau during recent years. *Global and Planetary Change* **41**: 241–49.

Gautam, H. R., Sharma, I. M. and Kumar, R. 2014. Climate change is affecting apple cultivation in Himachal Pradesh. *Current Science* **106**: 498–99.

Goodland, R. and Anhang, J. 2009. Livestock and climate change: What if the key actors in climate change are... cows, pigs, and chickens?. *Livestock and climate change: what if the key actors in climate change are... cows, pigs, and chickens?*

Haynes, M. A., Kung, K. J. S., Jodi, S., Brandt, Yongping, Y. and Waller, D .M. 2014. Accelerated climate change and its potential impact on yak herding livelihoods in the eastern Tibetan plateau. *Climatic Change* **123**: 147–60.

Hulshof, R. B. A., Berndt, A., Gerrits, W. J. J., Dijkstra, J., Van Zijderveld, S. M., Newbold, J. R. and Perdok, H. B. 2012. Dietary nitrate supplementation reduces methane emission in beef cattle fed sugarcane-based diets 1. *Journal of Animal Science*, **90**(7), 2317-2323.

Knight, M. W., Sobhani, H., Nordlander, P. and Halas, N. J. 2011. Photodetection with active optical antennas. *Science*, **332**(6030), 702-704.

Krishnan, G., Sarkar, M., Kataktalware, M. A., Saravanan, B. C., Sanjeeth, B. S. and Ramesha, K. P. 2008. Envronmental stress and its amelioration in yaks. *Livestock International* **12** (2):4–5.

Murtaza, K. O. and Romshoo, S. A. 2017. Recent glacier changes in the Kashmir Alpine Himalayas, India. *Geocarto international*, **32**(2), 188-205.

Steinfeld, H., Wassenaar, T. and Jutzi, S. 2006. Livestock production systems in developing countries: status, drivers, trends. *Rev Sci Tech*, **25**(2), 505-516.

Thornton, P. K. and Herrero, M. 2010. Potential for reduced methane and carbon dioxide emissions from livestock and pasture management in the tropics. *Proceedings of the National Academy of Sciences*, **107**(46), 19667-19672.

Tufail, M. 2014. Impact of the Climatic Change on the Seasonal Movement of the Gujjar and Bakarwals: Community Perceptions. *Journal Of Environmental Science, Toxicology And Food Technology* **8**(1): *41-46*

Table-1: Comparision of GHG pre-industiral era v/s current era

Year	Total extent (km2)
1962	13.67
2013	10.92
Loss in spatial extent	2.75

Table-2: changes in extent of Kolahoi Glacier

GHG	Pre-1750	Current	lifetime(yrs)
CO2 (ppb)	280	400.16	100-300
CH4 (ppm)	722	1842	12
N2O (ppm)	270	327	121
O2 (du)	237	337	Hours-days
CFC (ppt)	zero	236	45

Climate Change: Adaptation and Mitigation Strategies in Agriculture

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Abstract

Climate is the one of the important factor for agricultural production. The climate change effects on agriculture will differ across the world. This study reviews the adaptation and mitigation strategies in agriculture to cope up with effects of climate change. Adaptation is the process of adjustment to actual or expected climate and its effects in order to either lessen or avoid harm or exploit beneficial opportunities. Mitigation is the process of reducing emission or enhancing sinks of greenhouse gases (GHGs), so as to limit future climate change. The main strategies involve promoting agro-forestry systems, enhancing management of agricultural waste, promoting efficient fertilizer utilization, promoting good agronomic practices and technologies, alternative farming systems, promotion of indigenous knowledge, integrated crop and pest management, make better use of climate and weather data, weather forecasts and other management tools, create awareness on the negative etc.

Keywords: Climate change; agriculture; adaptation; mitigation

Introduction

The United Nations Framework Convention on Climate Change (UNFCCC), in its Article 1, defines climate change as: 'a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time period'. Climate change and agriculture are interrelated with each other. Change in climate is projected to have significant impact on condition affecting agriculture namely temperature, concentration of carbon dioxide, rainfall/ precipitation, rise in sea level, ultraviolet rays, extreme weather conditions etc. All these conditions directly or indirectly determine the production and productivity of agriculture produce. Of the total annual crop losses in world agriculture, many are due to direct weather and climatic effects such as drought, flash flood, untimely rains, frost, hail, and severe storms (Hay 2007, Springer, Berlin Heidelberg, pp. 1-19). Also, many studies revealed that increase in temperature leads to increase in the spread of insect pests to other geographical areas also, which are currently limited by temperature. Livestock and fisheries are also at risk due to heat stress, poor food quality, and change in water temperature, causing change in life- cycle timing.

In India, increase in mean annual maximum temperature was 0.76°C and mean minimum temperature was 0.22°C. Increase in annual mean temperature was 0.49°C during the period, commencing from 1901 to 2003 (Paroda, 2017). At the same time, rainfall during the monsoon season was deficit like in 1987, 2002 and 2009 which adversely affected the foodgrain production in India. Climate change directly or indirectly has impact on agriculture. Climate

change leads to early maturity of crop, thus, adversely impacting productivity. Crops like rice, wheat, sunflower, etc, the effect is on their reproduction, pollination and fertilization processes, are highly sensitive to temperature. Rattan Lal (2013) described the complex the complex relationship between climate change and food security in the flow chart (Figure 1). Agriculture provides food, nutritional and livelihood requirements to every living population. To supply sufficient food for increasing population is one of the most important challenges which were threatened by climate change.

Coping with global climate change is a must and for that there are two strategies viz., adaptation and mitigation. According to IPCC (2014, Fifth Assessment Report, IPCC, Geneva, Switzerland, 151 pp.) adaptation is the process of adjustment to actual or expected climate and its effects in order to either lessen or avoid harm or exploit beneficial opportunities. Mitigation is the process of reducing emission or enhancing sinks of greenhouse gases (GHGs), so as to limit future climate change.

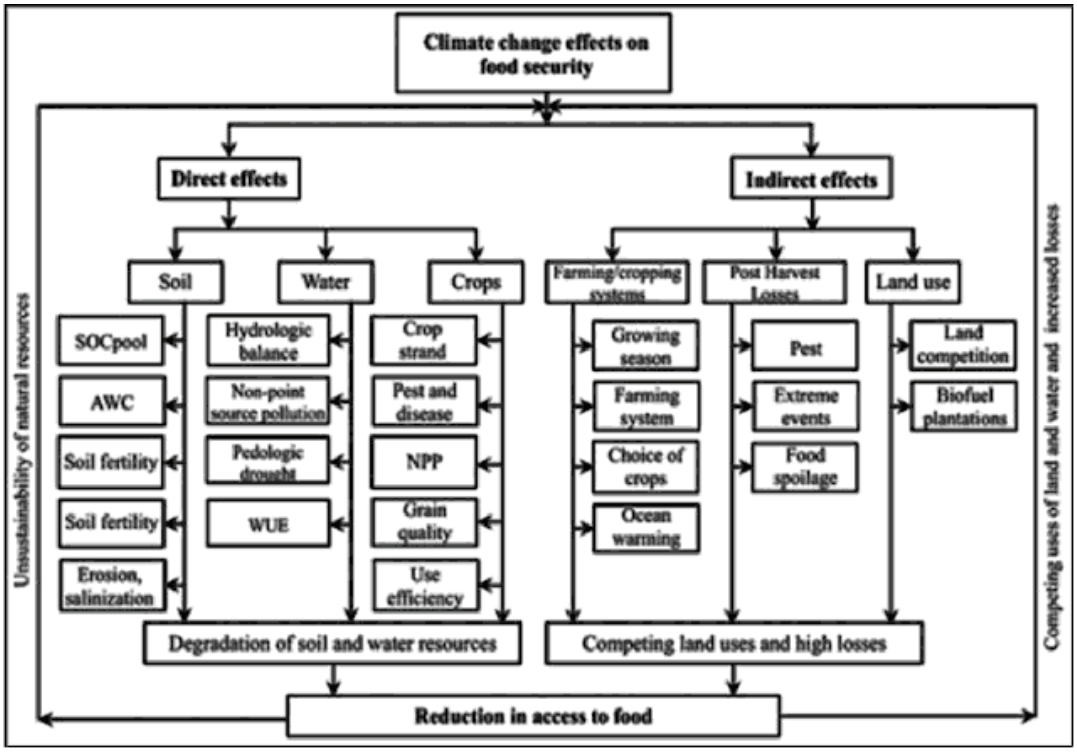

Fig.1: Direct and indirect effects of climate change on food security

(SOS: soil organic carbon, AWA: plant available water capacity, WUE: water use efficiency, NPP: net primary production)

Adaptation Strategies

According to FAO (2007), the two main types of adaptation are autonomous and planned adaptation. Autonomous adaptation is the reaction of, for example, a farmer to changing precipitation patterns through changing crops or planting dates. Planned adaptation measures, on the other hand, are conscious policy options or response strategies, often multisectoral

in nature, aimed at altering the adaptive capacity of the agricultural system, or facilitating specific adaptations. Judicious use of irrigation water, more efficient irrigation practices, and the adoption of existing and new water harvesting technologies are some of the strategies to cope with these problems. The potential strategies and actions for adaptation to climate change effects could be as follow-

1. Use of tolerant crop varieties, introduce high yielding varieties and early maturing crop varieties in cold regions.
2. Altered application of nutrient/fertilizer and insecticide/pesticide.
3. Attempt transforming C3 plants to C4 plants.
4. Exploring opportunities for maintenance/ restoration/ enhancement of soil properties.
5. Develop contingency plan for temperature and rainfall related risks. Improve irrigation system. Improve use/ store of rain water and snow water.
6. Develop improved processing and conservation technologies in livestock production. Breeding livestock for greater tolerance and productivity. Increase stock of fodder for unfavourable time period. Rotation of pastures and improve pasture and grazing management.
7. Breeding fish tolerant to high water temperature.
8. Researches on applications of short, medium and long-range weather forecasts for reducing production risks.
9. Developing knowledge based decision support system for translating weather information into operational management practices.
10. Documentation of indigenous traditional knowledge and exploring opportunities for its utilization.

Mitigation strategies

The basic strategies for mitigating climate change effects are reducing and sequestering emissions.

1. Reducing deforestation practices. Afforestation/ reforestation practices can contributes significantly to the green house gasses reduction. Conservation of wood by replacement with recycled materials.
2. Both crop and land management should be done viz; plant management, nutrient management, tillage/ residues management. Water management practices including irrigation and drainage should be following.
3. Adopt agroforestry systems (agropastoral and agrosilvopastoral systems)
4. Reduce losses in the food supply chain and in final consumption.
5. Minimizing the soil erosion risks by developing scientific land use plans and better management systems.

6. Burning has become one of the major challenges and contributes significantly to air pollution. Efficient management of crop residues to prevent stubble burning.
7. Efforts are being made for generating solar energy more and more which has potential for reducing the emission of green house gasses.

Conclusion

Impact of climate change on agricultural production is real. Hence immediate actions should be taken at international, national as well as local level. There should be research and development efforts on strategies both mitigation and adaptation, capacity building, developmental activities and change in land use management. Along with it policies and incentives should be evolved that encourage the farmers to adopt it.

References

FAO. 2007. The State of Food and Agriculture 2007. Paying farmers for environmental services. Food and Agriculture Organization of the United Nations, Rome, Italy.

Hay, J. 2007. Extreme Weather and Climate Events, and Farming Risks. In: Sivakumar M.V/K, Motha, R (Eds.) Managing Weather and Climate Risks in Agriculture. Springer, Berlin Heidelberg, pp. 1-19.

IPCC. 2014. Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, pp 151.

Paroda, R.S. 2017. Impact of Global Climate Change on Agricultural Growth in Asia. Paper presented in International Seminar on Global Climate Change: Implication for Agriculture and Water Sectors, Aurangabad, Maharashtra, India, December 14-16, 2017.

Rattan, Lal. 2012. Food Security in a Changing Climate. Ecohydrology and Hydrobiology, 13, 18-21.

Exploiting Wild Relatives for Genomics-Assisted Breeding in Walnut

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Abstract

A survey was done to characterize walnut germplasm in Jammu province at different walnut growing areas, to select promising accession and assess variability in their physiological and morphological characteristics. During survey different promising strains have been identified which show disease resistance and pest resistance like blight disease, anthracnose and good quality nuts with respect to kernel percentage, kernel colour, oil content and protein content can be exploited for breeding purpose. Some lateral bearing genotypes were found which are useful for increasing yield in walnut and mitigation of effect of climate change. These genotypes can be used as gene sources for introgression of different traits in the known cultivar through marker assisted selection (MAS) to increase the fruit yield and quality. Therefore there is an urgent need for further exploration in these areas for collection and characterization of better genomic resources for different traits to improve the yield and quality.

Key words: Walnut, Genotypes, Diversity, Qualitative, Quantitative.

Introduction

J &K is the major walnut producing state in the India and almost entire quantity (98%) of walnut exported outside is from J& K. Almost 85.05% of area of dry fruits in J& K is under walnut. J & K has monopoly in the walnut production. The area under walnut in J&K presently is 89339 ha, with production of about 266280 tons. The productivity of J&K is about 2.98 tons/ha. The country has exported 3,291.71 MT of Walnuts to the world for the worth of Rs. 117.92 crores during the year 2015-16.There is a lot of diversity in walnut. There is a lot of diversity of walnut in North Western Himalayan region. Since, the walnut is generally propagated by seed, there has been increasing diversity in nuts size, shape, thickness and color of shell, quality and color of kernel as well as other morphological attributes. The lack of systematic studies on genetic diversity among walnut species and ecotypes could seriously restrict genetic improvement by limiting exploitation in walnut culture and breeding of many excellent traits found in these landrace lines. Accordingly, it is essential to properly characterize and assess the genetic structure of walnut resources for the management and use of germplasm for practical breeding purposes. In walnut most of the varieties developed are through selection from the natural diversity. Because, the breeding of new walnut varieties is an expensive and time-consuming process due to the large size and lengthy juvenile phase almost 15 years. Genomics provides a valuable tool for improving the efficiency of breeding by allowing progeny possessing a trait of interest to be selected at the seed or seedling stage through marker-assisted selection (MAS). The benefits of MAS to a breeder in walnut are greatest because it takes a longer time to reach maturity and is expensive to grow and maintain.

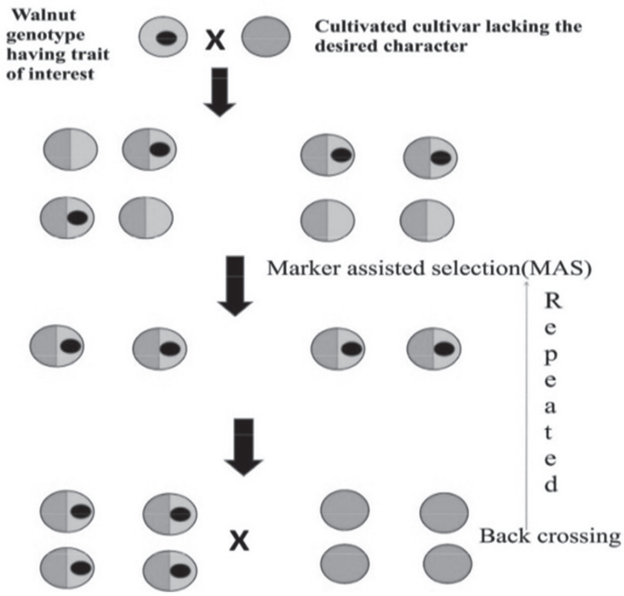
Methods

The study on "Characterization of walnut (*Juglans regia* L.) germplasm in Jammu province" was carried out during the year 2015 and 2016 at different indigenous germplasm growing areas of walnut. This study included a survey of Chenab valley region of district Kishtwar, Doda and Rajouri of Jammu and Kashmir, to select promising accession among the diverse walnut genotypes and assess variability in their physiological and morphological characteristics. The study area is situated between an altitude of 915-1638 m above sea level. The area is situated in North Western Himalayan region of Jammu and Kashmir. The area is mainly hilly and mountainous with valleys and stretches of plains. During the survey to get the first hand information local inhabitants were consulted about production of thin shelled/ Kagzi, uses and present status of different seedling origin genotypes grown in the region at various places. The location was selected with respect to the availability of diversity in walnut genotypes**.** Regular visits were made during the period of flowering, fruit setting, fruit maturity and ripening stages during the year of 2015– 2016. Finally, plants of more than hundred walnut genotypes with divergent characters were selected at fruit maturity stage on the basis of size, thickness of shell and locally famous grown walnuts. Codes were allotted to each genotype on the basis of their size, shell thickness, location and permanent tagging was done on the selected plants. Three bearing plants were selected per study site for the elaborative investigation of morpho-physiological characteristics. All three plants of each walnut genotype were the same in age, vigour and health. A short description of all walnut genotypes/ accessions was recorded in the form of passport data for different morpho-physiological characters with the help of walnut descriptor developed by International Board of Plant Genetic Resources (1994). The objectives of the study was to study the genetic diversity through morphological and biochemical characterization and to select the promising walnut genotype and gene source seedlings for various qualitative and quantitative characters

Performance characteristics

Gene source marked for various characters in seedling trees of persian walnut

Sr. No.	Character	Value	Location	Genesource
01	Nut weight	22.6 g	Galhar	Tree No.-43 (JWSG-43)
02	Kernel weight	9.89 g	Dacchan	Tree No.-59 (JWSD-59)
03	Oil percentage	62.43	Padder	Tree No.-06 (JWSP-06
04	Fat percentage	70.25	Padder	Tree No.-06 (JWSP-06)
05	Protein percentage	23.00	Dacchan	Tree No.-59 (JWSD-59)
06	Cluster bearing fruits	Upto five	Marwah	Tree No.51(JWSM-51)
07	Lateral bearing fruits	Gives 40% more yield	Marwah	Tree No. 54(JWSM-54)
08	Anthracnose resistant	0-5%	Padder	Tree No. 06 (JWSP-06)
09	Blight resistant	5-10%	Kishtwar	Tree No. 54 (JWSM-54)



Promising strain containing a trait of interest like lateral bearing are crossed with cultivated walnut. In this example, the promising genotype is heterozygous for a dominant Mendelian trait. With a marker associated with this trait, offspring can be screened for the trait and eliminated at the seedling stage. MAS ensure that the trait of interest is present in the progeny through several generations of backcrossing. Not shown here is that, with each generation, there is an increase in the proportion of cultivated ancestry while maintaining the desirable trait.

Conclusion

From the studies it can be concluded that there is a lot of diversity of walnut with respect to different qualitative and quantitative traits and the gene sources marked in present studies can be useful for improving the walnut by utilizing marker assisted breeding (MAS) a powerful tool for accelerating the speed and reducing the costs of breeding while harvesting the potential of important gene sources for improving walnut fruit crop.

References

UPOV, 1994. International union of protection of new varieties of plants. Guidelines for the conduct of tests for distinctness, uniformity and stability. Walnut (*Juglans regia* L.). UPOV-TG/125/6. *Geneva*, pp. 1-26.

Contribution of SKUAST – K Towards Krishikosh Institutional Repository

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Abstract

With the increasing growth of research publications electronically started the age of digital repositories. The world's universities, digital libraries, archives, museums and other organizations house treasures that have been hidden in basements, print formats and a variety of storage devices. These treasures encompass scientific, technological, cultural artistic materials generally unavailable to searchers and the general public. Institutional repositories are now being created to manage, preserve and maintain digital assets, intellectual output and histories of the institution. The present scenario of digital repository *Krishikosh* has been discussed in this paper. Krishikosh is the Institutional Repository of National Agricultural Education and Research System (NARES) of India. This project was envisaged under National Agricultural Innovation Project (NAIP) of Indian Council of Agricultural Research (ICAR), New Delhi. The present study highlights the aspects in terms of the annual growth of repositories, subject wise distribution, Language analysis, most prolific authors and document type distribution.

Keywords: Institutional Repository, SKUAST, Agriculture, Digital Archive.

Introduction

In the present age of digital library and online learning, digital repositories has acquired a greater significance. The trends seems to have commenced with the publications of journal des scans and Philosophical Transactions of Royal Society. Today it is a must for every sort of scholarly communication. It has facilitated the life of scholars in a variety of ways. They have been able to procure university grants, promotions and have created effective and attractive resumes. The digital repositories hold the absolute right in deciding the content and policy on selection and retention of material. Digital repositories help the researchers across the world in collection of relevant materials for themselves. In today's world no scholarly communication is possible without the digital repositories. Institutional Repository (IR) is an online repository or archive of an institution's scholarly paper's, deposited by their authors. Institutional repositories may include a variety of research output of an organization such as datasets, administrative documents, course notes, research reports, conference proceedings, and other such items which needs to be displayed through repository. According to **Bhardwaj (2014)** and **Bourfarss (2011),** an institutional repository is a means to ensure that the published work of scholars is available to the academic community even after increases in subscription fees or budgets cts

within the libraries. As indicated by **Ahmad and Al-Baridi (2012),** most of the scientists, research scholars are not willing to provide free access to their research output to their colleagues in an organization. IRs provide researchers such a platform where everyone in the institution can contribute research which is useful to promote cross-campus interdisciplinary research. An institutional repository is an online archive for collecting, preserving and disseminating digital copies of the intellectual output of an institution, particularly a research institution **Crow (2006). Prosser (2003)** listed the various benefits of institutional repositories at various levels. Digital repositories provide a central archive of the researchers work, enhance the visibility of their research findings. For the institutions, they enhance institution's prestige and visibility by putting together research output and also a show case for the institution to attract the attention of funding agencies, new talents and researchers to their institutions. For the society, they may provide peer review research without any research access. They also ensure long term preservation of institution research output.

Krishikosh Institutional Repository

Krishikosh is a digital repository of accumulated knowledge in agriculture and allied sciences, having collection of old and valuable books, old journals, thesis, research articles, popular articles, monographs, catalogues, conference proceedings, success stories, case studies, annual reports, newsletters, pamphlets, brochures, bulletins and other grey literatures spread all over the country in different ICAR Research Institutions and State Agricultural Universities (SAUs). Under the ICAR's Open Access policy, Krishikosh provides ready software platform to implement all aspects of the open access policy, similar to 'Cloud Service' for individual institution's self-managed repository with central integration. These two products of E-Grant (i) Krishikosh and (ii) IDEAL are used by all SAUs/DUs/CUs & ICAR Institutes.

Salient Features of Krishikosh Institutional Repository

1. Krishikosh is digital repository platform capable of Decentralized Management of Content but Centralized Housing and maintenance for convenience of multiple users.
2. Each institution has its own repository with full control without botheration of maintaining hardware/ software which is centrally managed at ICAR-IARI, New Delhi.
3. At present Krishikosh has more than 20 million digitized pages in 83,000 digital items (volumes) like old books, old Journals, reports, proceedings, reprint, research highlights, training manuals, historical records.
4. Includes more than 35,000 Ph.D and M.Sc. theses submitted by various ICAR Institutes / SAUs and with full Text searchable facilities.
5. Krishikosh provides ready so□ware platform, similar to 'Cloud Service' for individual institution's self-managed repository with central integration of all individual repositories.
6. Comprehensive search and browse options are available
7. Easy to register for additional facilities.
8. User feedback provision for continuous improvement.
9. Subscribed users can get collection updates

Literature Review

A number of institutional repositories has been established worldwide, around 739 repositories have been registered with Registry of Open Access Repositories as maintained by open archive initiative website. This is in contrast to the discipline or subject based repository , such as Arxiv of physics archive or the Cogprint archive, whose depositing policies are determined by the research communities. For the benefits and alternative means of scholarly communication, many academic institutions try to build their own institutional repositories. **(Pool,2015).** Institutional repositories centralize, preserve and make accessible an institutions intellectual output, at the same time they will form part of a global system of distributed **.**The main aim of institutional repositories are to bring together and preserve the intellectual output of the laboratory, department, university or other entity, the incentives and the commitments to change the process of scholarly communication have also begun serving as strong motivators. **(Drake, 2004).** According to **Chan (2004)** institutional repositories promote more timely and open access to research and scholarship, which results in increasing the potential research of archived publication. There are good number of studies conducted on various issues related to the institutional repositories. A study conducted by **Krishnamurthy and Kemparaju (2010)** and **Sarika (2010)** revealed that a majority of the 79 % Indian institutional use D Space software for their repositories. Another study conducted by **Pinfield (2001)** found that Eprint software is flexible and adaptable and could be used to run multidisciplinary institutional services. Good IR software helps in the global network and shares the intellectual contents/ resources world widely. The contents/ resources of the repositories may vary in their size in respect to the number of documents and discipline in respect to the nature of subject of the contents. In India, there are several institutional repositories created by premier research and academic institutions. **Shalini, Lihitkar & Agashe (2009)** found that majority of the Indian institutional repositories are designed and developed by premier Science and Technology institutions. They also found that the collections of these repositories are subject-specific or document specific. **Khan & Das (2008)** found that most of the IR in India is based on Science and Technology and a few repositories categorized their collection by type such as theses, article, book, conference, etc. **Gutam, Mishra, Pandey, Hariharan, & Guttikonda (2010)** found that there is a remarkable growth of open access repositories since 2004. **Ganaie (2014)** conducted the study on open access repositories in the field of Library and Information Science are gaining, momentum worldwide as almost 100 library and information science repositories are registered in OpenDOAR contributed by many countries with the United States at the top mark contributing 16 repositories followed by United Kingdom 12 and Germany 8 respectively.

Objectives

The present study aims to fulfill the following objectives:

1. To identify year wise growth of literature published in Krishikosh Institutional repository
2. To find out the subject coverage of repositories.
3. To find out the prolific authors in Krishikosh Institutional repository
4. To identify the core content types of repositories.

Methodology

The data was collected from the home page of "Krishikosh Institutional Repository". The search was restricted to the institutional search that is SKUAST-K. The results were retrieved according to the given search term. To achieve the objectives of the study, the Krishikosh repository was selected as the source for identifying and analyzing the research output from SKUAST –K . The Krishikosh institutional repository listed a total of 275 thesis were retrieved from S KUAST-k during the period of study 1985-2018.. The requisite data about these repositories were collected manually and transferred to a Microsoft Excel file for tabulation and analysis

Data Analysis and Interpretation

1. Annual growth of documents

A total of 275 publications was published in Krishikosh institutional repository during the time period of 1985 to 2018(August). It is seen from the Table 1, year wise growth of research output in Krishikosh institutional repository. It is evident from the table that the highest numbers of publications were published in the year 2006, i.e 28 (10.2%).During the period of 1985 to 1999, only 21(7.6%) documents were published in the Krishikosh Institutional Repository. Table 1 shows that from 2005, there is a slight growth in overall research output in repository.

Table 1: Year wise growth of Literature

S. No.	Year	No. of Publications	Percentage
	1985	1	0.4
	1986	0	0
	1987	2	0.7
	1988	2	0.7
	1989	2	0.7
	1990	2	0.7
	1991	2	0.7
	1992	1	0.4
	1993	1	0.4
	1994	1	0.4
	1995	0	0
	1996	2	0.7
	1997	1	0.4
	1998	2	0.7
	1999	2	0.7
	2000	5	1.8
	2001	9	3.3
	2002	5	1.8
	2003	3	1.1

S. No.	Year	No. of Publications	Percentage
	2004	8	2.9
	2005	13	4.7
	2006	28	10.2
	2007	9	3.3
	2008	12	4.4
	2009	15	5.5
	2010	19	6.9
	2011	21	7.6
	2012	24	8.7
	2013	13	4.7
	2014	22	8.0
	2015	19	6.9
	2016	17	6.2
	2017	7	2.5
	2018	5	1.8

2. Most Productive/prolific authors

Productivity of an author has a great utility in determining the authority of a subject expert in his/her expertise. There are several measures like publication count, h-index etc which can be used to determine the worth of an individual over an area of knowledge. Table 2 gives the insight of authors that holds a top position in the Krishikosh Institutional Repository from 1985 to 2018. The top contribution towards Krishikosh Institutional Repository is DARE/ ICAR department, they contributed the total of 8 publication (2.9%) of the total output. There are 8 prominent authors that contributed equally to the repository i, e 2(0.7%) as shown in table no 2.

Table 2: Most Productive Authors

Rank	Authors	Publications	Percentage	Rank
1	DARE/ICAR	8	2.9	1
2	M. A. Ahangar	2	0.7	2
3	Z. A. Dar	2	0.7	2
4	G. Ali	2	0.7	2
5	A. H. Lone	2	0.7	2
6	NDRI, Karnal	2	0.7	2
7	T. A. Shah	2	0.7	2
8	A. Sharwani	2	0.7	2
9	T.A. Sofi	2	0.7	2
10	A. Jabeen	1	1.4	3

3. Leading subject categories

Many disciplines are contributing to the Krishikosh Institutional Repository from different perspectives. The top contributing discipline includes, Agronomy, Fruit Science and Genetics and Plant Breeding. Table 3 represents the number of research publications from broader perspectives during the period of 34 years. As it is clear, Agronomy is leading with maximum number of contributions with 39(14.4%), where in Fruit Science is 35(12.7%) and Genetics and Plant Breeding 21(7.6%) respectively. The least number of publications is come from the subjects Biotechnology and Environmental Science with an equal share of 5(1.8%) each.

Table 3: Subject wise Category

S. No	Subject	Record Count	Percentage
1.	Agronomy	39	14.4
2.	Fruit Science	35	12.7
3.	Genetics and Plant Breeding	21	7.6
4.	Soil Sciences	17	6.2
5.	Vegetable Science	15	5.5
6.	Entomology	11	4.0
7.	Plant Pathology	10	3.6
8.	Floriculture and Landscaping	6	2.2
9.	Biotechnology	5	1.8
10.	Environmental Science	5	1.8

4. Type of Documents

Fig.1 indicates that type of documents in which publications was published. The highest number of publications is in the form of thesis 242(88.0%), followed by reports 14(5.1%), Journal 13(4.7%) and Books 2(2.25) respectively.

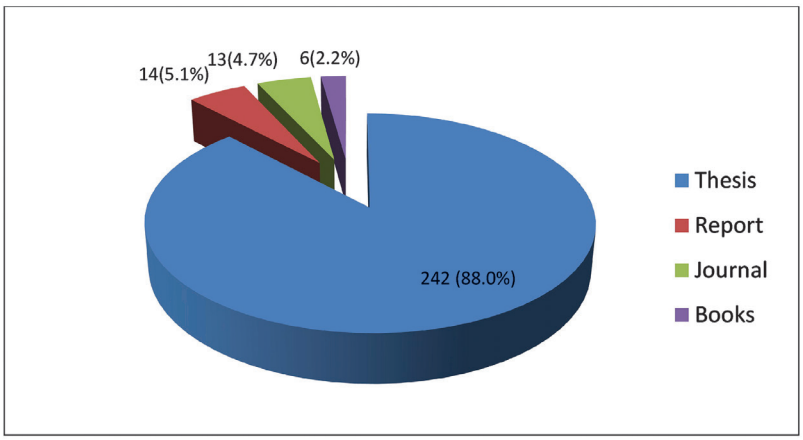

Fig 1: Type of documents

5. Language Diversity

Language is a basic thing for the communication of ideas and information. The language diversity revealed that the English is a main language for the authors. It is observed that all the publication of the repository are in English language.

Conclusion

Research and Publication works are main part of scientific activities and industrial development. Educational institutional of higher studies play an important role in this field. Sher- e- Kashmir University of Agriculture Science and Technology Kashmir(SKUAST-K) which is an old and very reputed agricultural university in Jammu and Kashmir state. The Publication output from various departments are increasing year by year. As a leading institution more and more efforts are to be taken in order to improve the quality and productivity of research and disseminate within the scholarly community. Annual academic audit or growth report ensures that the institution is on the right track in its mission for excellence. It is evident that the potential of institutional repositories to help foster change within the academy will be significant. The concept of institutional repositories develops in both convergent and divergent ways over the next few years. They are the visible manifestation of the emerging importance of knowledge management within the higher education. Digital repositories help the scholars in strcking communication with fellows across the globe. In the digital age of today, it becomes necessary for the researcher to take recourse to digital repositories for the enhancement of his knowledge and updation of the same. The main findings of the study revealed that the growth rate of literature in the early years was very low, with times goes the publishing count goes up. The majority of the publications in Krishikosh Institutional Repository are published from DARE/ ICAR department. In subject wise distribution, maximum number of publications are published in the subject field of Agronomy, Fruit Science and Genetic and Plant Breeding. The document type publication of the repository, highest number of literature was published in the form of thesis followed by reports, journals and books. At the end , all the literature published in Krishikosh Institutional Repository are in English language.

References

1. Ahmed, S.S. & Al-Baridi, S. (2012). An overview of institutional repository developments in the Arabian Gulf Region. OCLC Systems & Services: *International digital library perspectives*, 28(2): 79-89. DOI: 10.1108/10650751211236613
2. Bhardwaj, R.K.(2014).Institutional Repository Literature: A Bibliometric Analysis, *Science and Technology Libraries*, 35 , 185-202.Doi: 10.1080/0194262X.2014.9060018.
3. Boufarss, M. (2011).If we built it, will they come; A survey of attitudes towards institutional repositories among faculty at the petroleum institute, *International Journal of Library Science,* 31(1) 1-14.
4. Chan, L. (2004).Supporting and enhancing scholarship in the digital age: the role of open access institutional repository, *Canadian Journal of Information,* 29(3).Doi: 10.22230/cjc.2004v29n3a1455.
5. Crow, R.(2009).The Case of Institutional Repositories : A SPARC position paper, *ARL Bimonthly Report,* 223, 1-7. Retrieved from: https://ils.unc.edu/courses/2014_fall/inls690_109/Readings/Crow2002 CaseforInstitutionalRepositoriesSPARCPaper.pdf
6. Drake, M.A.(2004).Institutional Repositories: Hidden Treasures, *Information Today,* 12(5).Retrieved from: http://www.infotoday.com/searcher/may04/drake.shtml

7. Ganaie, S. A. (2017. Current accesss of open access digital repositories in library and information science, *International Journal of Information Dissemination and Technology*, 4(4), 278-282. Retrieved from: https://www.researchgate.net/publication/275189947_Current_Trends_of_the_Open_Access_Digital_Repositories_in_Library_and_Information_Science

8. Krishnamurthy, M. and Kemparaju, T. D. (2011). Institutional Repositories in Indian Universities and Research Institutes: A study. *Electronic Library and Information Systems*, 45(2), 185-198. Doi: 101108/00330331111129723.

9. Sarika, S. (2010). Institutional Repositories in India: a preliminary study. *Library High Tech News,* 28(10), 6-10. Doi: 10.1108/07419051111202646.

10. Pinfield, S. (2005).A Mandate to Self-archive? The role of Open Access Institutional Repositories. *Serials,* 18(1), 30-34. Retrieved from: http://eprints.nottingham.ac.uk/archive/00000152/mandate_to_archive.pdf.

11. Pool, R. (2015). Institutional Repositories: Repository Revolution.Article under the column research information. Retrieved from:http//www.researchinformation.info/features/feature.php?feature_id=527

12. Prosser, D. (2003). Institutional repositories and open access: The future of scholarly communication. *Information Services & Use,* 23 (2-3). Available: http://iospress.metapress.com/media/3duf6utqrk4vyp1kvrt0/contributions/b/0/t/9/b0t9y69afjhylw9y.pdf

13. Shalini, R. L., Lahitkar, R. S. and Agashe, A. T. (2009). Submission of paper on a study of major institutional repositories in India. *ETD conference*, 1-21, http://eprint.rclis.org/bitstream/10760/14234/1/ETD_2009_IRshaliniIndia.pdf.

14. Khan, B. and Das A. K. (2008). An assessment of present situation of Institutional Digital Repositories in India. *6Th conventional PLANNER*, 176-181. Retrieved from: http://ir.inlibnet.ac.in/dxml/bitstream/handle/1994/1121/9.pdf.

15. Gutam, S., Mishra, A K., Pandey, P S., Hariharan, C. and Guttikonda, A. (2010) Status of open access repositories in India. http://works.bepress.com/ sridhar_gutam/8/

Efficacy of botanical insecticides against pod borer (*Maruca vitrata*) on Cowpea (*Vigna unguiculata*)

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Abstract

The field experiment was conducted during kharif 2016-17 to evaluation of botanical insecticides against pod borer on cowpea. Two rounds of insecticides were sprayed at fifteen days interval. The most effective treatment evaluated against pod borer was Chlorpyriphos 20 EC@ 300g a.i. ha^{-1} during first spray (1.97, 1.74 and 1.53 larvae /m^2 at 3, 5, and 7 days after spray, respectively) and second spray (1.51, 1.54 and 1.93 larvae /m^2 at 3, 5 and 7days after spray, respectively) followed by Neem oil @ 2 % first spray (4.30, 4.08 and 3.52 larvae /m^2) second spray (3.00, 2.85 and 3.28 larvae /m^2) and NSKE @ 5 % during first spray (4.62, 4.18 and 3.81 larvae /m^2) second spray (3.12, 3.09 and 3.37 larvae /m^2) respectively. The maximum larval population was found in untreated plot. The highest green pod yield of cowpea was recorded in Chlorpyriphos 20 EC@300g a.i. ha^{-1} (53.12 qha^{-1} followed by Neem oil @ 2% (43.53 qha^{-1}) and NSKE @ 5% (42.11 qha^{-1}) while lowest yield recorded in untreated control plot (32.16 qha^{-1}).

Keywords: Evaluation, cowpea, pod borer, botanical insecticides.

Introduction

Cowpea (*Vigna unguiculata*) is important legume crops belong to family Leguminaceae. Cowpea is known as vegetable meat due to high amount of protein in the grain with better biological value on dry weight basis. The grain contains 26.61 % protein, 3.99 % lipid, 56.24 % carbohydrates, 8.60 % moisture, 3.84 % ash, 1.38% crude fiber, 1.51 % gross energy, and 54.85% nitrogen free extract (Owolabi *et.al*. 2012). The pod borer complex posing serious threat to cowpea cultivation includes *Maruca vitrata* (Fabricius), *Lampides boeticus* (L.), *Helicoverpa armigera* (Hubner), *Etiella zinckenella* Treitsche, *Adisura atkinsoni* Moore and *Exelastis atomosa* (Walsingham). Application of highly toxic chemical insecticides at short intervals against insect pests has resulted in many deleterious effects such as residual toxicity, insecticide resistance, pest resurgence, destruction of natural enemies and environmental pollution. In this context, the relevance of the use of botanicals, newer chemicals for managing pod borer complex assumes greater significance. Azadirachtin containing formulations are effective in reducing the larval population of pod borers and contribute to a higher yield (Singh and Yadav, 2006). The major constraint in the cultivation of cowpea is insect pest attack which has been observed to have caused up to 70 % grain yield loss (Adipala *et al.,* 2005).

Among the insecticides, the botanical insecticides are naturally occurring, often slow-acting crop protectant and minimal residual effects. Therefore the plant pesticides have been recommended ever more as a suitable alternative of plant protection with minimum negative risks (Isman, 2006). So that the present study were undertaken to the evaluation and efficacy of botanical insecticides against spotted pod borer on Cowpea (*Vigna unguiculata*).

Materials and methods

The field experiment was conducted at the farm of college of agriculture and research station, Boirdadar, Raigarh during *Kharif* 2016-17. The experiment was laid out in randomized block design (RBD) with eight treatments (Table -1) and three replications. The plot size was 5x4 meter (m) and the seeds of cowpea were sown at 45x30 centimeter (cm) spacing during the last week of July. Cowpea variety Gomti is used for experiment. All agronomic practices except plant protection were followed as and when required. The spraying of botanical and conventional insecticides was applied at the initial incidence of pod borer and two sprays were given. All the spraying was done by using knapsack sprayer at 15 days intervals. The one m^2 area randomly selected plants were marked to count the number of pod borer larvae before spray, 3, 5 and 7 days after each spray. The green pod yield was recorded from per plot and converted into quintal per hectare. The calculated data of pod borer larvae were transformed into square root values $\sqrt{x+0.5}$ as per the standard requisites (Gomez and Gomez, 1984).

Per cent reduction in larval population over control was calculated by using following modified given formula given by Henderson and Tilton, 1955.

Per cent reduction over control =

$$\left(1-\frac{\begin{matrix}\textit{Larval population}\\ \textit{in contorl before treatment}\end{matrix}\times\begin{matrix}\textit{Larval population}\\ \textit{in treated plot after treatment}\end{matrix}}{\begin{matrix}\textit{Larval population}\\ \textit{in contorl after treatment}\end{matrix}\times\begin{matrix}\textit{Larval population}\\ \textit{in treated plot before treatment}\end{matrix}}\right)\times 100$$

Table -1 : Treatment Details

Treatment	Treatment Details
T_1	Neem Oil @ 2%
T_2	NSKE @ 5%
T_3	Karanj Oil @ 2%
T_4	Karanj Seed Powder @ 30kg/ha
T_5	Chilli + Garlic Solution @ 9kg/ha
T_6	Chilli Solution @ 10kg/ha
T_7	Chlorpyriphos 20EC @ 2ml/lit.
T_8	Untreated Control –Plain water spray

Results and Discussions

The result presented in Table-2 revealed that the larval population of pod borer in cowpea was significantly reduced in treated plants as compared to untreated plants after each of first and second application. There was no significant difference was observed in pre-treatment count of larvae of pod borer the data ranged from before first spray and second spray.

After first spray, among the different botanical and conventional insecticides the minimum number of larval population of pod borer in cowpea was found in Chloropyriphos 20 EC @ 2 ml litre^{-1} water *i.e.* 1.97, 1.74 and 1.53 larvae /m^2 at 3,5 and 7 days after spray (DAS),

respectively followed by botanical insecticide Neem oil @ 2% *i.e.* 4.30, 4.08 and 3.52 larvae /m^2 and NSKE @ 5% *i.e.* 4.62, 4.18 and 3.81 larvae /m^2 at 3, 5 and 7 DAS, respectively. The maximum larval population of 8.11, 9.39 and 9.53 larvae /m^2 at 3, 5 and 7 DAS was recorded in control untreated plots. The overall per cent reduction over control treatment was highest in Chloropyriphos 20 EC @ 2 ml litre^{-1} water *i.e.* 80.84% (1.75 larvae /m^2) followed by Neem Oil @ 2 % *i.e.* 54.0 % (3.97 larvae /m^2) and NSKE @ 5% *i.e.* 53.54 % (4.20 larvae /m^2).

Table-2: Efficacy of botanical insecticides against larval population of pod borer in Cowpea during Kharif 2016

Treatment	Pre-treatment (larvae /m^2)	Larval population at different DAS during first spray (larvae/m^2)					Pre-treatment (larvae/ m^2)	Larval population at different DAS during first spray (larvae /m^2)				
		3DA5	**5DAS**	**7DAS**	Mean	PROC		**3DA5**	**5DAS**	**7DAS**	Mean	PROC
T_1	16.61 (4.12)	4.30 (2.19)	4.08 (2.14)	3.52 (2.00)	3.97 (2.11)	54.00	13.14 (3.69)	3.00 (1.87)	2.85 (1.83)	3.28 (1.94)	3.04 (1.88)	59.38
T_2	17.40 (3.23)	4.62 (2.26)	4.18 (2.16)	3.81 (2.08)	4.20 (2.17)	53.55	13.21 (3.70)	3.12 (1.90)	3.09 (1.90)	3.37 (1.97)	3.19 (1.92)	57.60
T_3	20.76 (4.59)	5.67 (2.49)	5.16 (2.38)	5.14 (2.37)	5.32 (2.41)	50.68	12.43 (3.59)	3.53 (2.01)	3.47 (1.99)	3.97 (2.11)	3.66 (2.04)	48.30
T_4	17.87 (4.04)	5.25 (2.40)	5.02 (2.35)	4.90 (2.32)	5.06 (2.36)	45.51	13.88 (3.79)	3.47 (1.99)	3.36 (1.96)	3.83 (2.08)	3.55 (2.01)	55.09
T_5	18.79 (4.38)	4.94 (2.33)	4.70 (2.28)	4.24 (2.18)	4.63 (2.26)	52.58	13.23 (3.71)	3.27 (1.94)	3.22 (1.93)	3.45 (1.99)	3.31 (1.95)	56.07
T_6	20.70 (4.60)	5.97 (2.54)	5.56 (2.46)	5.73 (2.50)	5.75 (2.50)	46.54	13.95 (3.80)	3.64 (2.04)	3.63 (2.03)	4.17 (2.16)	3.81 (2.08)	52.05
T_7	17.58 (4.24)	1.97 (1.57)	1.74 (1.50)	1.53 (1.43)	1.75 (1.50)	80.84	14.26 (3.84)	1.51 (1.42)	1.54 (1.43)	1.93 (1.56)	1.66 (1.47)	79.56
T_8	17.34 (4.22)	8.11 (2.94)	9.39 (3.13)	9.53 (3.16)	9.01 (3.08)	-	13.66 (3.76)	6.15 (2.58)	8.01 (2.91)	9.18 (3.11)	7.78 (2.86)	-
Sem	**-**	**0.04**	**0.08**	**0.05**	**0.06**		**-**	**0.04**	**0.05**	**0.06**	**0.05**	
CD at 5%	**NS**	**0.11**	**0.25**	**0.14**	**0.17**		**NS**	**0.13**	**0.16**	**0.17**	**0.15**	

Note: Figure in parenthesis is square root transformed value, DAT: Days after Spraying, PROC: Percent Reduction over Control

In second spray, the minimum larval population was found in Chloropyriphos 20 EC@ 2 ml litre^{-1} water *i.e.* 1.51, 1.54 and 1.93 larvae /m^2 at 3, 5 and 7 DAS followed by Neem Oil @ 2 % (3.00, 2.85 and 3.28 at 3, 5 and 7 DAS, respectively) and NSKE @ 5% (3.12, 3.09 and 3.37 at 3, 5 and 7 DAS, respectively). The overall per cent reduction over control treatment was highest in Chloropyriphos 20 EC @ 2 ml litre^{-1} water *i.e.* 79.56% (1.66 larvae /m^2) followed by Neem Oil @ 2 % *i.e.* 59.38% (3.04 larvae /m^2) and NSKE @ 5% *i.e.* 57.6.% (3.19 larvae / m^2).The chloropyriphos 20 EC @ 2 ml litre^{-1} water was effective to minimize larval population of in cowpea. In the present study the botanical insecticide perform well to reduce the larval population of pod borer in cowpea The effectiveness of NSKE against M. distalis infesting green gram (Irulandi and Balasubramaniam, 2000), *H. armigera* infesting green pod of Indian bean (Dalwadi *et al.,* 2008) has been reported, all these reports are similar with the present

results. The neem based extract reduce pod borer and protect the cowpea plants. It might have been absorbed by the flowers/pods through osmotic pressure causing the insect to stop feeding (Oparaeke *et al.,*2005) .

Table 3: Botanicals insecticidal impact on total green pod yield of cowpea

Treatment	Green pod Yield (q/ha)	Increased yield over control (q/ha)
T1	43.53	11.37
T2	42.11	9.95
T3	40.08	7.92
T4	41.44	9.28
T5	41.86	9.70
T6	38.59	6.43
T7	53.12	20.96
T8	32.16	-
Sem	1.37	
CD at 5%	4.15	

The data presented in Table 3 indicated that with the application of treatment the green pod yield of cowpea was significantly increased in all the treatments as compare to untreated control. The highest green pod yield was recorded in Chloropyriphos treatment (53.12 q ha^{-1}) followed by Neem oil @ 2 % (43.53 q ha^{-1}) and NSKE @ 5% (42.11 q ha^{-1}). The lowest yield was recorded in untreated plot (32.16 q ha^{-1}) followed by chilli solution 10 kg ha^{-1}(38.59 q ha^{-1}). These findings are closely with the result of Dalwadi *et. al*. 2008 in Indian bean.

Reference

Adipala, E., Kawuki, R.S., Agona, A. and Nampala, P. 2005. A comparison of effectiveness of plant-based and synthetic insecticides in the field management of pod and storage pests of cowpea. *Journal of Crop Protection* (24): 473 – 478.

Dalwadi, M.M., Korat, D. M. and Tank, B.D. 2008. Bio-efficacy of some botanical insecticides against major insect pesta of Indian bean, *Lablab purpureus* L. *Karnataka J. Agric. Sci.,* 21(2):295-296.

Gomez, A. K. and Gomez, A.A.1984. Statistical procedures for agricultural research, 2nd Ed. John Wiley & Sons, New York, 471pp.

Hednderson, C. F. and Tilton, E. W. 1955.Test with acaricides the brown wheat mite. *J. Economic Entomology*. 48(2):157-161.

Irulandi, S. and Balasubramanian, G. 2000. Report on the effect of botanicals against *Megaleurothrips distalis* (Karny) and *Lampides boeticus* Linn. On green gram. *Insect Environ*., 5: 175-176.

Isman, M. B. 2006. The role of botanical insecticides, deterrents and repellents in modern agriculture and an increasingly regulated world. *Annual Review of Entomology*, 51:45-66.

Oparaeke, A.M., Dike, M. C. and Amatobi, C. I. 2005. Botanical pesticide mixtures for insect pest management on Cowpea *Vigna unguiculata* (L.) Walp plants – 2. The pod borer, *Maruca vitrata* FAB. (Lepidoptera: *Pyralidae*) and pod sucking bug, *Clavigralla tomentosicollis* STAL (Heteroptera: *Coreidae*). *Agricultura Tropica Et Subtropica*. 38(2):33-38.

Owolabi A.O, Ndidi U.S, James B.D, Amune, F.A. 2012. Proximate, Antinutrient and Mineral composition of five varieties (improved and local) of cowpea, *Vigna unguiculata ,* commonly consumed in Samaru community, Zaria-Nigeria. *Asian Journal of Food Science and Technology,* 4(2):70-72.

Singh, S.S. and Yadav, S.K.2006. Efficacy and economics of some modern insecticides, bioinsecticides and neem based formulations against pod borer, *Helicoverpa armigera* in pigeonpea. *Indian Journal of Entomology* 68(2) 139-143.

Subhasree, S. and Mathew, M. 2014. Eco-friendly management strategies against pod borer complex of cowpea, *vigna unguiculata* var. *Sesquipedalis* (L) Verdcourt. *Indian Journal of Fundamental and Applied Life Sciences* 4 (4) 1-5.

Efficiency of Nitrogen in Relation to Tillage in Rice-Wheat Cropping System

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Abstract

Studies pertaining to the efficiency of nitrogen in relation to tillage in rice -wheat cropping system, was conducted at the research station , SKUAST-K, J&K.. The aim of the study was to examine the influence of zero tillage (ZT) and conventional tillage(CT) methods in collaboration with three different dosage of nitrogen treatments comprised 0,120 and 200 kg N ha^{-1} with general recommended dose of Phosphorus and potassium in both tillage methods on yield and yield components, benefit cost ratio of rice (oryza sativa.L) and wheat (Triticum aestivum L.) grown after rice. The grain yield ha^{-1} were significantly affected by various nitrogen levels in both tillage methods. Nitrogen application beyond the level of 120 kg N ha-1 did not increase the grain yield ha^{-1} to a significant extent. Conservation tillage(ZT) and nitrogen may improve soil fertility, yield and income on sustainable basis.. Mean maximum grain yield (5515,4805 kg·ha−1) and benefit cost ratio (6.4,5.0) could be achieved at 120 kg·N·ha−1. The tillage systems produced more yield in zero tillage system on higher nitrogen application and maximum BCR is also obtained as compared to control and conventional tillage . Though tillage × N interactions were not significant for most of the parameters under study, the overall effect of ZT with 120 kg·N·ha^{-1} appeared to be most favorable compared to CT as per the BCR is concerned. The results suggest that ZT with 120 kg·N·ha^{-1} was optimum and sustainable strategy to achieve higher yield and income.

Key Words: Yield, Nitrogen, Wheat, Cropping system, BCR, tillage.

Introduction

A significant role is played by rice crop in livelihood of people of Jammu and Kashmir State. Although area under rice is very small of about 0.27 m ha, it plays an important role in the state economy. Rice productivity in the state is high (2.2 t/ha) compared to the national average productivity of about 1.9 t/ha(RKMP). The total annual rice production in the state is about more than 0.59 mt. Rice is grown only once in a year because of extreme climatic conditions. Wheat is the second most important cereal crop in India after rice covering an area of about 28 m ha (Prasad et al,2013) and is also important crop in J&K state more important in Jammu as compared to Kashmir due to customer choice and favourable climate. With increase in population worldwide and also in Jammu and Kashmir resources are limiting like irrigation and nutrients which put pressure on farmer to use adequate input in order to get maximum productivity without degrading quality of soil . So there is an urgent need to increase productivity i.e., to produce more food with less water, optimum fertilizer and less degradation of soil structure.

A current trend in rice-wheat cropping system (R-WCS) is the excessive use of tillage implements to obtain a good tilth. Management practices such as tillage, fertilizers, and pesticides result in degradation of natural re-sources and low grain yield (Chhokar,2007). Research results showed that conventional tillage (CT) practices declined soil structure and stability over years due to depletion of SOM. Zero tillage(ZT) is an alternative to address the problems associated with conventional agriculture. Unlike CT, ZT may facilitate wheat planting at optimum time and reduce cost of production. Zero tillage improve water and nutrient-use efficiencies, and increase crop productivity and carbon sequestration, ameliorate soil properties and mitigate green house gases emission (Timsina e.t at,2001). Under ZT, mineralization is more evenly distributed over the growing season, while under CT there is a flush of mineralization following cultivation and hence soil N is more prone to leaching losses rather than its availability to crop

Nitrogen is one of the main inputs for cereals production systems and is the most limiting nutrient in crop production and its efficient use to increase food production is more than any other nutrient; however, much use of N may cause environmental concerns such as nitrate leaching, eutrophication, and greenhouse gases emissions and reduce crop yield (Malhi et.al2001). Therefore, proper use of N is critical to optimize crop yield and minimize environmental damage. thus the present study was conducted to evaluate the comparative yield potential of Rice-wheat cropping system at different levels of nitrogen under CT and ZT system with regulating the water balance at critical stages of wheat and flooding method in case of rice.

Materials and methods

Field experiments were conducted from 2014-2015 at SKUAST-K (1650 m elevation) on the total area of 2.5 kanal. The study area is characterized by medium rainfall, hot and dry summer. The experiment was laid out based on randomized complete block design with split plot arrangement replicated four times. Two tillage systems viz. ZT and CT were carried out to main plots, while three N (0, 120, and 200 kg N ha^{-1}) were applied to subplots. Each subplot was 50 m^{-2} (10 m × 5 m) in size. The three subplots treated with different concentrations of N were isolated from each other by making bunds around them so that N could not be transported between these subplots. After rice harvest, the land was prepared for wheat. Zero tillage sowing was accomplished with ZT drill in the standing stubbles of preceding rice crop while CT comprised of disk plow (once), cultivator (twice) and rotavator (twice). Wheat was planted in first week of November in 30-cm wide rows at 100 $kg \cdot ha^{-1}$ seed rate and harvested in third week of May each year. N was applied at 120 $kg \cdot ha^{-1}$ in the form of urea. Half of the N was applied at sowing, while remaining half was applied at tillering stage. In both crops soil samples were collected randomly from three different points of each plot the samples were composited. Grain yield (kg ha–1) were recorded using standard procedures. The data were analyzed statistically by ANOVA techniques, LSD test at 5% probability level was applied to compare the differences among the treatment means (Steel and Torrie, 1984). Benefit cost ratio was calculated from gross income divided by total cost of production.

Results and Discussion

The results revealed that, similar or even higher grain yield was obtained by ZT if provided with optimum N rate compared to CT. In case of higher N application (200 $kg \cdot N \cdot ha^{-1}$) there

will be more chances of N losses via leaching and denitrification from CT compared to ZT (Atreya et.al 2006), which may lead to significant differences in grain yield of the two tillage systems. The results further indicate that at 0 (control) application of nitrogen fertilizer the yield is higher under conventional tillage than zero tillage. so it indicates that ZT need higher N requirement compared to CT to achieve higher grain yield due to lower mineralization and limited roots feeding area (Dowson et al,2008).

Table 1: Grain yield (kg ha^{-1}) under different N- fertilizer doses in rice-wheat cropping system

N dosage (kg ha^{-1})	Zero tillage (ZT)			Conventional tillage (CT)		
	Rice	Wheat	Mean	Rice	Wheat	Mean
0(control)	4709	1552	**3130.5**	5210	1701	**3455.5**
120	5515	4805	**5160**	4811	4112	**4461.5**
200	5210	4550	**4880**	4509	4513	**4511**
Mean	**5144.66**	**3635.66**		**4843.33**	**3442**	

Mean at 5% level level of significance

Additionally, the wide C:N ratio of the residues of rice can have a negative effect on N supply and hence higher N would be needed to optimize yield under ZT compared to CT system in case of wheat. this results are similar with Ayub (1994) who reported that grain yield increased significantly with the application of nitrogen fertilizer. The results suggest that ZT at 120 kg·N·ha^{-1} were more productive, economical, and safe environmentally on sustainable basis compared to the other treatments. In contrast, CT have environmental consequences besides fatigues in soil fertility and productivity and unnecessary economic costs if continued for longer term.

Table 2 : Benefit cost ratio under different N-fertilizer doses in rice wheat cropping system

Treatment	Rice	Wheat
0 kg N with ZT	2.0	2.8
0 kg N with CT	2.4	3.0
120 N with ZT	6.4	5.0
120 N with CT	5.0	4.8
200 N with ZT	4.6	3.8
200 N with CT	4.2	3.5

There was significant effect of tillage and N interaction on BCR. The most consistent effect was that of N fertilizer, which increased BCR significantly each year as well as over years as comparison to control. The BCR increased with increase in N rate and highest BCR was achieved at 120 kg·N·ha^{-1} in rice (6.4, 5.0), wheat (5.0,4.8), compared to control having lowest BCR in the range of 2.0 ,3. The highest BCR at 120 kg N plots could be due to more nutrients uptake by crop and less nitrogen loses at this level resulting in higher yield as against other treatments. Moreover, N significantly increased BCR as a result of higher produce obtained compared to control. The BCR value obtained from ZT at 120 kg·N·ha^{-1} was quite satisfactory

when compared CT system. Because the latter systems (CT) despite higher cost of cultivation could not produce higher yield than ZT, as a result BCR value remained statistically at par with ZT. The reason for favorable BCR in ZT at 120 $kg \cdot N \cdot ha^{-1}$ compared CT is ascribed to lower cost of cultivation, and better utilization of resources. The unfavorable output/input ratio under CT might be due to its higher N losses through leaching, denitrification and its more favorable environment for weeds growth particularly Phalaris minor and Rumex dentatus which were dominant in CT Usman et.al 2010 and Bhattacharyya et. al 2009).

Summary and Conclusions

In an irrigated condition when crop residues were left on the field, the final biomass and grain yield of wheat under ZT were similar to those obtained under CT; these results support the adoption of ZT for wheat under such conditions. A preceding rice crop residues with wide C:N ratio did not improve the productivity of the subsequent wheat crop but rather demanded more N particularly under ZT as shown under control with no addition of nitrogen. Because grain yield, benefit cost ratio (BCR) responded differently to N among the two tillage systems, it can be assume that N was a limiting factor in the productivity of ZT rice-wheat cropping system. Nitrogen at 120 $kg \cdot N \cdot ha^{-1}$ produced higher yield and yield attributing characters in addition to higher BCR compared to lower and higher levels of N. The results would indicate that ZT may be more productive, economical, and safe environmentally, while sequestering more C and N at higher level of N than CT system. Thus wheat can be grown successfully after rice on soils of J&K with ZT at 200 $kg \cdot N \cdot ha-1$. The farmers of J&K, who face problem of yield decline under CT despite application of higher doses of N to rice-wheat crop, require demonstration of the benefits of optimum N level under ZT that may guarantee sustainable and profitable rice and wheat production.

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References

Anonymous. Rice Knowledge Management Portal (RKMP) Directorate of Rice Research, Rajendranagar, Hyderabad 500030. Email: naiprkmp@gmail.com, pdrice@drricar.org, shaiknmeera@gmail.com Ph: 91-40-24591218, 295 Fax: 91-40-24591217

Atreya, K, Sharma, S., Bajracharya R. M and. Rajbhandari. N. P 2006.Applications of Reduced Tillage in Hills of Central Nepal, Soil and Tillage Research. **88**(1-2) :16-29.

Bhattacharyya. R. ,Prakash, V,. Kundu, S,. Srivastva. A. K and. Gupta, H. S .2009.Soil Aggregation and Organic Matter in a Sandy Clay Loam Soil of the Indian Himalayas under Different Tillage and Crop Regimes. Agriculture, Eco- systems & Environment. **132**. (1-2): 126- 134.

Chhokar. R. S,. Sharma R. K,. Ja G. R t,. Pundir . A. K and. Gathala. M. K. 2007 . Effect of Tillage and Herbicides on Weeds and Productivity of Wheat under Rice-Wheat Growing System. Crop Protection. **26(**11) 1689-1696.

Krishna Prasad, K. Devkota, Manschadi. A. John P.A. 2013. Mineral nitrogen dynamics in irrigated rice–wheat system under different irrigation and establishment methods and residue levels in arid drylands of Central Asia. European Journal of Agronomy. **47**: 65– 76_

Malhi, S. S., Grant, C. A.. Johnston, A. M and Gill , K. S.2001.Nitrogen Fertilization and Management for No-Till Cereal Production in the Canadian Great Plains: A Review.

Timsina, J. and Connor. D. J.2001.Productivity and Management of Rice-Wheat Cropping Systems: Issues and Challenges. Field Crops Research. **69**(2): 93- 132.

Usman K.,. Khalil, S. K, Khan, A. Z, Khalil, I. H, Khan, M. A. and Amanullah.2010.Tillage and Herbicides Impact on Weed Control and Wheat Yield under Rice-Wheat Crop- ping System in Northwestern Pakistan. Soil and Tillage Research. **110**(No). 101-107.

Gauging and divulging the video-lectures hosted by Consortium for Educational Communication in the subject field of Agro-Chemical and Pest Control (B.sc)

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Abstract

The present study is an effort to expose and gauge the video-contents hosted by Consortium for Educational Communication in the subject field of Agro-Chemical and Pest Control (B.Sc.). An emphasis was given to analyse the distribution of video-contents in course papers covered in it and to calculate the average views. Similarly, particular stress was also given to identifying the top 3 video-lectures in each course paper of CEC- Agro-Chemical and Pest Control (B.Sc.), having the highest viewership. The study revealed that e-learning can be a reliable educational supplement to the users or students especially when there are quality learning resources (video-lectures) available for use. The CEC portal hosts the quality video-lectures on diverse subjects and a good number of the same are available in CEC- Agro-Chemical and Pest Control (B.Sc.) discipline. The students concerned with this subject domain can utilize these video-lectures to understand the different topics covered in their curricula.

Keywords: Agro-Chemical and Pest Control (B.Sc.), *Consortium for Educational Communication,* Educational videos, *E-learning*

Introduction

The electronic mode of learning is the trending sensation among the learners in the present era of digital revolution. Education of masses has shifted to new heights by incorporating the new communication technologies for delivering the learning contents and training. E-learning means the integration and exploration of a wide range of information and communication technologies (ICT) into teaching and learning to improve the students or learners learning outcomes. The e-learning environments are interactive and interest generating, offering the online accessibility of contents from home or in the distanced places (Buckley Park College, 2018). The varied advantages of e-learning are proof evident that it can supplement the educational needs of masses in general and that of students enrolled in the different course in particular. Advantages viz; content diversity, time and space flexibility, cost efficiency and different subject experts; blended learning and much more make the e-learning a daily requirement of students or learners. No doubt the internet has made the e-learning easily available and costs less for learners, but due to huge information explosion and the retrieval of

the same on the Web has created some hurdles for learners. They are not able to find the most specific and relevant qualitative e-learning resources. Search engines are allowing the filtering mechanisms to retrieve the most relevant results of search queries. But the ordinary students and learners can feel troublesome due to lack of searching, browsing and internet knowledge for retrieving the required e-learning resources. In this manner, there is a vital need to expose the e-learning resource platforms, which host the quality e-contents in various subject fields.

The students of Agro sciences are the future scientist for uplifting the Agriculture and farming sectors of a nation. Their educational needs especially the learning & understanding of different topics is crucial for building the standard foundation of their knowledge base. E-learning resources (video-contents) can supplement their education. They need to make aware of the availability of high-quality video-contents covering the different topics, similar to their course curriculum. In this milieu, the study made an effort to expose and gauge the e-learning contents (video-lectures) hosted by Consortium for Educational Communication in the field of Agro-Chemical and Pest Control (B.Sc.).Besides, an ascent was also given to check the course paper wise distribution of video-contents along with calculation of average views and particular stress was also given to identifying the top viewed video-lectures in each course paper. The Students pursuing the B.Sc. in Agro-Chemical and Pest Control (B.Sc.) can make an extensive use of these exposed CEC hosted video-lecture to understand the different topics in an easy manner.

Problem

The learners studying the different courses are facing many difficulties in understanding the instructional contents taught in classrooms by their teachers. Reasons are multiple like; some students are slow learners, some are shy to ask questions, some are absent-minded and some remain absent etc. Besides, the reason can also be the lack of teaching efficiency of teachers, their teaching behaviour towards students and much more. This problem could be solved by finding & accessing the quality free online e-contents (video-lectures) covering different topics of curricula taught in the educational institutes. Usually, the learners are not aware of where to find the quality video-lectures which they were in need of. In this milieu, there is a vital need to expose these quality e-contents to the learners so that they can get benefited by utilizing those resources. The study made an endeavour to expose the video-contents hosted by Consortium for Educational Communication (CEC) in the discipline of Agro-Chemical and Pest Control (B.Sc.).The students concerned with this discipline can utilize the exposed free video-contents for supplementing their formal learning and understand the various topics more easily.

Literature Review

The modern ICT based communication and transfer of knowledge has revolutionized the learning practices of masses across the globe. The leading key players in educational excellence like MIT, CIT, Stanford and many other institutions have realized the worth of e-learning and are now leading the world by offering the quality e-learning resources mostly Open to use for all at any place of the world (e.g. MIT-Open Course Ware etc.).The MOOCs are the outcome of understanding the power of e-learning or online learning, today a vast number of courses are offered to the learners by different institutes to full fill the educational needs of people in a democratic manner.

Concept of e-learning

The learning that takes place in the electronic environment by utilizing the digital technologies for covering or accessing the classroom curriculum outside the traditional classrooms is often termed as e-learning (Ganesan, Ignatius & Neppolian, 2018; Guri-Rosenblit, 2005; e-learning.gov, 2018). Similarly, it can be said that the use ICT to deliver knowledge, information & training for educating the learners or users can be called as e-learning (Sun, Tsai, Finger, Chen & Yeh, 2008; Ruiz, Mintzer & Leipzig, 2006). E-learning can be defined as the courses that are particularly delivered via the World Wide Web to somewhere other than the classroom. Moreover, e-learning or online learning is the education that is provided to learners by using the multimedia technologies, web technologies and internet (Li, Lau, & Dharmendran, 2009; Koohang & Harman, 2005; Liao & Lu, 2008; Alonso et al., 2005; Lee & Lee, 2006). In the same vein, e-learning can be defined as the use of ICT technologies to enhance the learners education by employing a wide combination tools, contents and other infrastructure like; computer-networks to improve the learning value chain, mediate synchronous and asynchronous teaching-learning activities (Aldrich, 2003; Ellis, Ginns, & Piggott, 2009; Jereb & Šmitek, 2006).In simple terms, it can be said that e-learning means educating the masses virtually in an electronic mode with the help of modern digital assets viz: computers, multimedia tools and the internet (Bermejo, 2005). The relevance of e-learning in the present era is quite natural as the advancement of digital technologies has touched the sky and is rapidly increasing in every corner of the world. All technologies are developed to ease the way of living of masses; education can also be simplified by adopting the e-learning concept among the students especially by supplementing their formal education.

Significance of e-learning

The e-learning involves the use of the internet, computer and other communication technologies to simplified access to quality education (Magdalene & Sridharan, 2018). It can't replace the formal education rather it has supplemented the same by enabling the students or learners to access the variety of learning contents in various formats like audios, videos, and texts etc. The nature of e-learning is entertaining, flexible, self-paced, colourful and motivational, helps the learners to enhance their learning endeavours and master the different topics of their interest (Noe, 2009, octal academy, 2015, Aslan, 2006, Pura & Aslan, 2015 as cited by Çevik & Duman, 2018). The e-learning is significantly helpful for all the learners especially to those who are living in far-flung areas and are not able to get access to quality formal education. It can act as a backbone for their educational development, as there are numerous courses and a wide range of subject materials available for learners in electronic mode. They only need to possess a digital device (laptop, computer or smartphone etc.) with internet connectivity to access the vast chunk of resources available for their use.

Benefits of using educational videos

The e-learning yields best results for learners when it is mostly available in video-lectures because they directly appeal the all human senses especially the visual senses to understand the subject matter more easily. It is believed that students retain more information, understand concepts more quickly & are more enthusiastic or curious about their learning when they receive their educational instructional contents in video format (NTTI, 2018). The video lectures

are also helpful for both the students as well as for teachers. The teachers can use them for delivering their topics to students in classrooms where class size is large, students are not able to attend regular classes for certain valid reasons, where students are in search of flexibility of time & space, and where the students are non-local language speakers of instruction (Preston et al., 2010). Similarly, it was founded that the recorded video-lectures used by more active students during exams can increase their chances to pass their examinations (Gorissen et al., 2012). It was also founded that two-thirds of the lecturers surveyed are of the view that the success of the study will increase by using web-lectures or online video lectures (Filius & Lam, 2009). Similarly, on the other hand, it was also founded that 76% of learners surveyed felt that web-based video-lectures have a significant positive impact on their education or learning. Besides, 90% of students of Manchester University believe that by watching and utilizing the recorded video lectures will make their learning easier and can improve their exam performance (Preston et al., 2010; Reece, 2013). The use of videos in teaching-learning can increase the learning outcomes and learning satisfaction among the users (Yousef et al., 2014; Martyn, 2009).

In nutshell, the benefits of using the video contents are huge and are significantly accepted and appreciated by both the teachers as well as students across the globe. The very need to focus upon is the availability of quality video-lectures with a diversity of subject coverage and relevance to the topics of interest and topics in the curriculum. Although different agencies are now hosting quality video-contents on different topics under diverse subject areas, one such a mega initiative is Consortium for Educational Communication. It emerged in 1993 and is an initiative of UGC-India, it acts as a nodal agency to coordinate & control the educational programmes at the national level. At present, there are 21 media centres which are working under the guidance of CEC to produce the quality educational resources on different subjects taught in almost all educational institutes in India (Consortium for Educational Communication, 2018).

Scope

The study is confined to the exposition and estimation of video contents hosted by Consortium for Educational Communication (CEC) in the field of Agro-Chemical and Pest Control (B.Sc.).

Objectives

The main objectives of the present study include:

- To gauge the e-contents hosted by Consortium for Educational Communication (CEC) in the field of Agro-Chemical and Pest Control (B.Sc.).
- To analyze the course paper wise video-lecture distribution and calculate the average views in each course paper.
- To identify the top 3 video lectures with the highest views in each course paper of Agro-Chemical and Pest Control (B.Sc.) discipline.

Methodology

The study adopted an online method to harvest the data for achieving the objectives of the present study. The data was systematically collected by accessing the official portal of CEC,

via a link (http://cec.nic.in/E-Content/Pages/default.aspx) and subject stream Natural and Applied Sciences was selected in the search box and the discipline of Agro-Chemical and Pest Control (B.Sc.) was chosen from the displayed subject list under the same stream. All the relevant data was successfully harvested between the time periods of 10-September 2018 to 17-September 2018 and was tabulated in MS-excel for analysis and interpretation. The total course papers included were identified and the distribution of video-lectures among all course papers was checked and the average video-lectures per course paper were also calculated. Besides, the aggregate analysis of video-lecture views per course paper in Agro-Chemical and Pest Control (B.Sc.) discipline was scrutinized. Similarly, the top three video-lecturers with highest views in each course paper were also founded.

Results and Discussion

The video-lectures hosted by CEC in the field of Agro-Chemical and Pest Control (B.sc) are distributed in eight papers and all these video-contents are produced in media centre-EMRC, JODHPUR with presentation/ subject expert as Vindhya.K. The course papers included in CEC- Agro-Chemical and Pest Control (B.sc) discipline includes: (1) Pesticide and Social Science (2) Pest Control (3) Entomology (4) Pest and Diseases of Crop Plants (5) Pesticide Residues And Toxicology pesticide Residues And Toxicology (6) Techniques for Agrochemicals (7) Biotechnology Aspects In Plant Protection & (8) Agro-Based Marketing Management.

The distribution of video-contents among the course papers is as follows: Pest Control & Pest and Diseases of Crop Plants course papers contain 20% of video lectures each, followed by Pesticide and Soil Sciences with 16% of video lectures, Pesticide Residues And Toxicology pesticide Residues And Toxicology contains 12% of video lectures, and Techniques for Agrochemicals, Biotechnology Aspects In Plant Protection & Agro-Based Marketing Management all these contain 8% each.Fig-1 offers a lucid view.

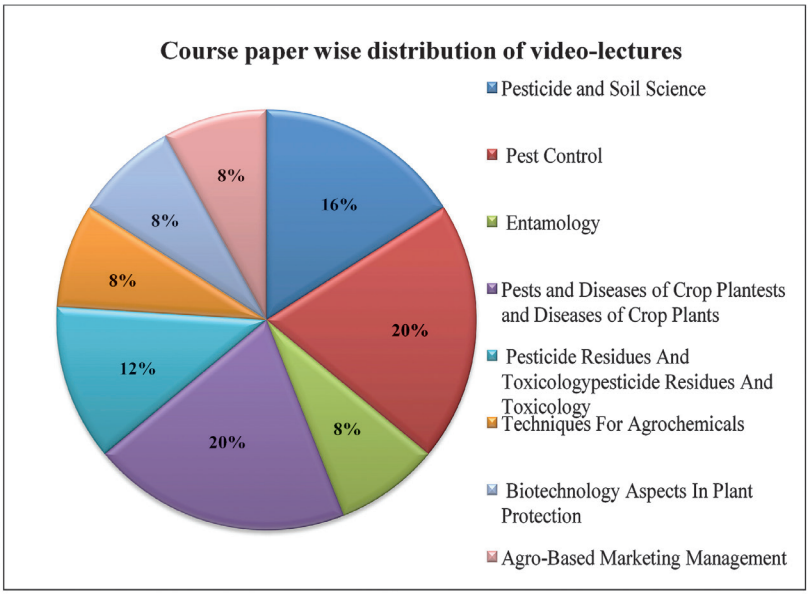

Fig.1: Average video-contents per course paper in CEC-Agro-Chemical and Pest Control (B.Sc.)

There was a total of eight-course papers and a total of fifty video lectures in all the course papers in Agro-Chemical and Pest Control (B.sc) subject. An average was calculated it was founded that the average video-lectures per course paper is 6.25. See table-1 for clear understanding.

Table-1: Average video-contents per course paper in CEC-Agro-Chemical and Pest Control(B.Sc.)

Total course papers included	Total No. of video lectures	Average video-content per course paper
8	50	6.25

Table-1 Aggregate analysis of video lecture views in all the course papers of CEC-Agro-Chemical and Pest Control (B.Sc.)

The video lecture views of all the course papers of CEC-Agro-Chemical and Pest Control (B.sc) were analysed. It revealed that in the course paper, Pest Control has highest average views of video lectures (11.2), followed by Pests and Diseases of Crop Planters and Diseases of Crop Plants with average views of 11 per video lecture, & Pesticide and Soil Science course paper with 9.75 average views. Similarly, Pesticide Residues and Toxicology pesticide Residues and Toxicology course paper have average views of 9.33 per video lecture, followed by Techniques for Agrochemicals with 5.25 average views, Biotechnology Aspects In Plant Protection, Agro-Based Marketing Management & Entomology each having an average view of 5 per video lecture. The study also calculated the average views per course paper and it was found out that there is an average view of 8.74 per course paper.Table-2 depicts the whole analysis of the same.

Table-2: Aggregate analysis of video lecture views in all the course papers of CEC-Agro-Chemical and Pest Control (B.Sc.)

Course papers name	No. of lectures	No. of views	Average views	Average views per course paper
Pest Control	10	112	11.2	**437/50=(8.74)**
Pests and Diseases of Crop Plantests and Diseases of Crop Plants	10	110	11	
Pesticide and Soil Science	8	78	9.75	
Pesticide Residues and Toxicology pesticide Residues and Toxicology	6	56	9.33	
Techniques For Agrochemicals	4	21	5.25	
Biotechnology Aspects In Plant Protection	4	20	5	
Agro-Based Marketing Management	4	20	5	
Entamology	4	20	5	
Total	50	437	8.74	

Table-2 Top three video lectures with highest views in Pesticide and Soil Science

The study was curious to find the top three video-lectures with highest views in each course paper of CEC-Agro-Chemical and Pest Control (B.sc) discipline. This objective was successfully achieved and top 3 video lectures in course paper Pesticide and Soil Science were identified as; Macro and micronutrients of soil video lecture ranked at position one with 16 views, followed by Soil chemistry and fertility at 2nd rank with 14 views, and Controlled release formulation of pesticides and fertilizers video lecture at 3rd rank with 12 views. Table-3 gives a clear picture.

Table-3 : Top three video-lectures with highest views in Pesticide and Soil Science

Rank	Lecture Title	Views	Subject Expert
1	Macro and micro nutrients of soil	16	Vindhya.K
2	Soil chemistry and fertility	14	Vindhya.K
3	Controlled release formulation of pesticides and fertilizers	12	Vindhya.K

Table-3 Top three video lectures with highest views in Pest Control

The top three video lectures based on highest views in the course paper of Pest Control includes; Rank1) Integrated Pest management having 20 views, followed by video lecture (Rank2) Plant protection appliance with 18 views, and (Rank3) Recent advances in pest control with 16 views. See table -4.

Table-4 : Top three video lectures with highest views in Pest Control

Rank	Lecture Title	Views	Subject Expert
1	Integrated Pest management	20	Vindhya.K
2	Plant protection appliance	18	Vindhya.K
3	Recent advances in pest control	16	Vindhya.K

Table-4 Top three video lectures with highest views in Entomology

In course paper Entomology of CEC-Agro-Chemical and Pest Control (B.sc) the top three video-lectures with highest views were also identified these video-lectures are as follows; Applied entomology with 8 views positioned at rank one, followed by Insects of Industrial Importance at 2nd place with 6 views and at 3rd position is General Life Cycle Patterns Of Insects with 4 views. For clear understanding see table-5.

Table- 5: Top three video lectures with highest views in Entomology

Rank	Lecture Title	Views	Subject Expert
1	Applied entomology	8	Vindhya.K
2	Insects of Industrial Importance	6	Vindhya.K
3	General Life Cycle Paterns of Insects	4	Vindhya.K

Table-5 Top three video lectures with highest views in Pests and Diseases of Crop Plantests and Diseases of Crop Plants

The course paper titled Pests and Diseases of Crop Plantests and Diseases of Crop Plants is also one of the course papers of CEC-Agro-Chemical and Pest Control (B.sc) subject field. Top three video lectures having the highest views were also identified in it they are; Bionomics and management of the medically important pests at rank one with 20 views, followed by Bionomics and management of the stored grain crops with 18 views at 2nd position & Bionomics and control of the crop plants with 16 views at third rank. See table-6 for brief understanding.

Table- 6: Top three video lectures with highest views in Pests and Diseases of Crop Plantests and Diseases of Crop Plants

Rank	Lecture Title	Views	Subject Expert
1	Bionomics and management of the medically important pests	20	Vindhya.K
2	Bionomics and management of the stored grain crops	18	Vindhya.K
3	Bionomics and control of the crop plants	16	Vindhya.K

Table-6 Top three video lectures with highest views in Pesticide Residues and Toxicology pesticide Residues and Toxicology

The top three video lectures having the highest view score in the course paper of Pesticide Residues and Toxicology pesticide Residues and Toxicology were too identified. These identified video lectures includes; Rank1) Analysis of pesticide residues and toxicological testing methods (12 views), followed by Pesticide hazards, Pesticides residues in the soil & Pesticides residues in the atmosphere ranked at 2nd place with 10 views each, and at 3rd position is Penetration and distribution of Pesticide residues with 8 views. For a lucid view, see table-7.

Table- 7: Top three video-lectures with highest views in Pesticide Residues and Toxicology pesticide Residues and Toxicology

Rank	Lecture Title	Views	Subject Expert
1	Analysis of pesticide residues and toxicological testing methods	12	Vindhya.K
2	Pesticide hazards	10	Vindhya.K
2	Pesticides residues in the soil	10	Vindhya.K
2	Pesticides residues in the atmosphere	10	Vindhya.K
3	Penetration and distribution of Pesticide residues	8	Vindhya.K

Table-7 Top three video lectures with highest views in Techniques for Agrochemicals

The top three video lectures in the course paper of Techniques for Agrochemicals of CEC-Agro-Chemical and Pest Control (B.sc) are as follows; Analysis of agrochemicals video lecture

tops the list with 8 views, followed by Analytical techniques involved in pesticide analysis at 2nd position with 6 views, and Non-instrumental techniques for agrochemicals at 3rd place with 4 views.Table-8 gives a nice view.

Table-8 : Top three video-lectures with highest views in Techniques For Agrochemicals

Rank	Lecture Title	Views	subject expert
1	Analysis of agrochemicals	8	Vindhya.K
2	Analytical techniques involved in pesticide analysis	6	Vindhya.K
3	Non-instrumental techniques for agrochemicals	4	Vindhya.K

Table-8 Top three video lectures with highest views in Biotechnology Aspects in Plant Protection

In the course paper of Biotechnology Aspects in Plant Protection top three video lectures having highest views includes; Biotechnology approaches in pest management (8-views) on first place, Biocontrol in agro-ecosystem (6-views) placed at the 2nd rank and Agroecosystem analysis with 4 views at 3rd rank. See table-9 for a clear picture.

Table-9 : Top three video lectures with highest views in Biotechnology Aspects in Plant Protection

Rank	Lecture Title	Views	Subject Expert
1	Biotechnology approaches in pest management	8	Vindhya.K
2	Bio control in agro-ecosystem	6	Vindhya.K
3	Agro ecosystem analysis	4	Vindhya.K

Table-9 Top three video lectures with highest views in Agro-Based Marketing Management

The Agro-Based Marketing Management is also one of the course papers of CEC-Agro-Chemical and Pest Control (B.sc) subject field. Top three video lectures with highest views in the same are; Agro-based marketing strategies ranked at first position with 8 views, followed by Indian agro based marketing environment at 2nd rank with 6 views. Similarly, on 3rd rank is Agro based market process and planning concept with 4 views. Bird's eye view is offered by table-10.

Table-10: Top three video lectures with highest views in Agro-Based Marketing Management

Rank	Lecture Title	Views	Subject Expert
1	Agro-based marketing strategies	8	Vindhya.K
2	Indian agro based marketing environment	6	Vindhya.K
3	Agro based market process and planning concept	4	Vindhya.K

Table-10 Limitations of the study and directions for future research

The study is only limited to exposing and gauging the e-contents or video lectures of the subject field of Agro-Chemical and Pest Control (B.sc) hosted on Consortium for Educational Communication. Besides the data was only harvested between the time periods of 10-September 2018 to 17-September 2018, thus the results may or may not remain the same for all. The study suggests that future researches need to be conducted to explore and expose the other video content hosting platforms and other subject areas on which video lectures are available for the learners.

Conclusion

The video lectures can be considered as a backbone of e-learning at any stage of learners learning especially at higher education level. Students who enjoy e-learning as a supplement for their educational advancement and preparing for their course exams can utilize the quality video contents of CEC. As the study was only concerned with the subject field of Agro-Chemical and Pest Control (B.sc), it was found that there are eight-course papers covered in it and a good number video lecture presented by an experienced subject expert (Vindhya.K) are distributed in each course paper. The students perusing their degree in Agro-Chemical and Pest Control (B.sc) or which are interested in learning the topics covered under this subject field can make use of these video lectures free of cost at any place via the internet. Besides they can understand the course paper wise usage trend of video lectures by observing the top three video lectures list with highest views in each course paper of Agro-Chemical and Pest Control (B.sc) discipline identified by the present study.

References

Aldrich, C. (2003). *Simulations and the future of learning: An innovative (and perhaps revolutionary) approach to e-learning*. John Wiley & Sons.Retrieved from: https://books.google.co.in/books?hl=en&lr=&id=3kldMjjtKVwC&oi=fnd&pg= PR1&dq=Aldrich,+C.+(2003).+Simulations+and+the+future+of+learning:+An+innovative+(and+perhaps+revolutionary)+approach+to+e-learning.+John+Wiley+%26+Sons.+Retrieved+from:+https://books.google.co.in/books%3Fhl%3Den%26lr%3D%26id%3D3kldMjjtKVwC%26oi%3Dfnd%26pg%3DPR1%26dq%3DAldrich,%2BC.+%2B(2005)&ots=qNquV06Xtx&sig=TIn4LDUO6viJJzDwVrU6PQWeieo

Alonso, F., López, G., Manrique, D., & Viñes, J. M. (2005). An instructional model for webNbased eN learning education with a blended learning process approach. British Journal of educational technology, 36(2), 217-235.Retrieved from: https://pdfs.semanticscholar.org/500c/16c54686ae29f2b997458459de59b51a32d2.pdf

Bermejo, S. (2005). Cooperative electronic learning in virtual laboratories through forums. IEEE Transactions on Education, 48(1), 140-149.Retrieved from: http://www.qou.edu/home/sciResearch/pdf/eLearningResearchs/cooperativeElectronic.pdf

Buckley Park College (2018). E-LEARNING. *Buckley Park College*. Retrieved from: www.buckleyparkco.vic.edu.au/page/210/E-LEARNING

Çevik, H., & Duman, T. (2018). Analyzing the Effects of E-Learning on Science Education. *International Journal of Instruction*, *11*(1), 345-362.Retrieved from: https://files.eric.ed.gov/fulltext/EJ1165196.pdf

Consortium for Educational Communication (2018). About CEC. *Consortium for Educational Communication.* Retrieved from: http://cec.nic.in/Pages/About-CEC.aspx

E-learning.gov (2018). What is eLearning?. *E-learning.gov*. Retrieved from: http://www.elearningnc.gov/about_elearning/what_is_elearning/

Ellis, R. A., Ginns, P., & Piggott, L. (2009). E-learning in higher education: some key aspects and their relationship to approaches to study. *Higher Education Research & Development*, *28*(3), 303-318.Retrieved from: https://www.tandfonline.com/doi/full/10.1080/07294360902839909

Filius, R., & Lam, I. (2009). Rapportage Evaluatie Weblectures Universiteit Utrecht. Retrieved from: https://dspace.library.uu.nl/bitstream/handle/1874/41709/Evaluatie+weblectures+UU+eindrapportage.pdf?sequence=1

Ganesan, L., Ignatius, D., & Neppolian, B. (2018). Potential for Entrepreneurship in E-Learning System of Higher Education in India: A Bird View Study. Retrieved from: http://14.139.186.108/jspui/bitstream/123456789/31378/1/Dalia.pdf

Gorissen, P., Van Bruggen, J., & Jochems, W. (2012). Students and recorded lectures: survey on current use and demands for higher education. Retrieved from: https://dspace.ou.nl/bitstream/1820/4418/1/17299-71803-1-PB.pdf

Guri-Rosenblit, S. (2005). 'Distance education'and 'e-learning': Not the same thing. *Higher education*, *49*(4), 467-493. Retrieved from: https://idp.springer.com/authorize/casa?redirect_uri=https://link.springer.com/content/pdf/10.1007/s10734-004-0040-0.pdf&casa_token=aqIGPCwQjVMAAAAA:Is1TqEdwgiG3cWNsEmjJfcTaNw7JjM7emBe2e_TWC0od_3hVHElBTuNI6soNq0-B8SJMwSRBPpf56rMlQg

Jereb, E., & Šmitek, B. (2006). Applying multimedia instruction in e-learning. *Innovations in Education and Teaching International*, *43*(1), 15-27.Retrieved from: https://srhe.tandfonline.com/doi/abs/10.1080/14703290500467335

Koohang, A., & Harman, K. (2007). Advancing sustainability of open educational resources. *Issues in Informing Science & Information Technology*, *4*.Retrieved from: http://proceedings.informingscience.org/InSITE2007/IISITv4p535-544Kooh275.pdf

Lee, T., & Lee, J. (2006). Quality assurance of web based e-learning for statistical education. In *Compstat 2006-Proceedings in Computational Statistics* (pp. 429-438). Physica-Verlag HD. Retrieved from: https://link.springer.com/chapter/10.1007/978-3-7908-1709-6_34

Li, F. W., Lau, R. W., & Dharmendran, P. (2009, August). A three-tier profiling framework for adaptive e-learning. In *International Conference on Web-Based Learning* (pp. 235-244). Springer, Berlin, Heidelberg. Retrieved from: https://link.springer.com/10.1007%2F978-3-642-03426-8_30

Liao, H. L., & Lu, H. P. (2008, August). Richness versus parsimony antecedents of technology adoption model for e-learning websites. In *International Conference on Web-Based Learning* (pp. 8-17). Springer, Berlin, Heidelberg. Retrieved from: https://link.springer.com/chapter/10.1007/978-3-540-85033-5_2 https://link.springer.com/chapter/10.1007/978-3-540-85033-5_2

Magdalene, R., & Sridharan, D. (2018). POWERING E-LEARNING THROUGH TECHNOLOGY: AN OVERVIEW OF RECENT TRENDS IN EDUCATIONAL TECHNOLOGIES. *The Online Journal of Distance Education and e-Learning*, *6*(1), 60. Retrieved from: https://tojdel.net/journals/tojdel/articles/v06i01/v06i01-05.pdf

Martyn, M. A. (2009). Engaging lecture capture: lights, camera… interaction. *Educause Quarterly Magazine*, *32*(4).Retrieved from: https://www.cotronline.ca/pluginfile.php/346271/mod_book/chapter/63872/nCAST-instructors2013.docx

NTTI (2018). Why Use Video in the Classroom?. *NTTI*. Retrieved from: https://www.thirteen.org/edonline/ntti/resources/video1.html

Preston, G., Phillips, R., Gosper, M., McNeill, M., Woo, K., & Green, D. (2010). Web-based lecture technologies: Highlighting the changing nature of teaching and learning. *Australasian journal of educational technology*, *26*(6), 717-728. Retrieved from: http://researchrepository.murdoch.edu.au/id/eprint/3386/1/web-based_lecture_technologies.pdf

Reece, R. J. (2013). Lecture capture at the University of Manchester. *Manchester*. Retrieved from: http://www.tlso.manchester.ac.uk/media/services/tlso/content/files/Lecture capture supporting document.pdf

Ruiz, J. G., Mintzer, M. J., & Leipzig, R. M. (2006). The impact of e-learning in medical education. *Academic medicine*, *81*(3), 207-212.Retrieved from: http://workspace.unpan.org/sites/Internet/Documents/UNPAN93464.pdf

Sun, P. C., Tsai, R. J., Finger, G., Chen, Y. Y., & Yeh, D. (2008). What drives a successful e-Learning? An empirical investigation of the critical factors influencing learner satisfaction. *Computers & education*, *50*(4), 1183-1202. Retrieved from: http://www.academia.edu/download/39652266/successful_e_learning.pdf

Yousef, A. M. F., Chatti, M. A., & Schroeder, U. (2014). Video-based learning: a critical analysis of the research published in 2003-2013 and future visions. Retrieved from: https://pdfs.semanticscholar.org/1b1c/057c36ec34581959b9e4910fc147611c776f.pdf

Frontline Demonstrations: An effective tool for transfer of Wheat (HD-2967) production technology in Hanumangarh District of Rajasthan

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Abstract

The frontline demonstrations were conducted by Krishi Vigyan Kendra from Rabi 2015-16 in area of 4.0 hectare on 10 locations (farmers). Total 10 demonstrations were selected. The data collected from the reports of frontline demonstrations conducted by the Krishi Vigyan Kendra on the production technology of wheat crop were used. Production and economic data for frontline demonstrations and local practice were collected and analyzed. The results of the study showed that the highest grain yield of wheat under demonstration plots was 3940 kg/ha when compared to local check 3475 kg/ha. The percentage increase in the yield over local check was 13.38 % during the course of study. Technology gap and technology index values were 1860 kg per hectare and 32.06 %, respectively. It is concluded that wide gap existed in potential and demonstration yield in high yield wheat varieties due to technology and extension gap in Hanumangarh district of Rajasthan.

Keyword: FLDs; Technology Gap; Technology Index; Wheat; & Production technology.

Introduction

W*heat* {*Triticum aestivam* L.} is the world's most widely cultivated food crop. It is eaten in various forms by more than one thousand million human beings in the world (Iftikhar *et. al.*, 2002). Besides staple food for human beings, wheat straw also serves as good source of feed for animals (Sarwar *et. al*., 2006). In India, wheat production was recorded as 95.91 million tonnes (mt) from an area of 30 m ha in 2013-14 (GoI, 2014). It supplies 21 per cent of the per capita food energy and 18 per cent of dietary protein in the country (Balasubramanian *et. al.,* 2012).

Wheat is grown in all the states in India except Southern and North Eastern states. Uttar Pradesh, Haryana, Punjab, Rajasthan are the major wheat producing states and accounts for almost 80% of total production in India. Only 13% area is rain-fed. Major Rainfed wheat areas are in Madhya Pradesh, Gujarat, Maharashtra, West Bengal and Karnataka. Central and Peninsular Zone accounts for total 1/3rd of wheat area in India. All India basis only 1/3 irrigated wheat receives desired irrigations and remaining is limited irrigation only. Breeding programmes are generally aimed for rainfed and irrigated environments and there is need to develop varieties which are responsive to limited irrigation conditions.

Frontline demonstration may play a very important role in proper transfer of technologies and changing scientific temperament of the famers. Frontline demonstration is the new concept of field demonstration evolved by the ICAR with the inception of the technology mission on oilseed crops during mid-eighties. The main objective of frontline demonstrations is to

demonstrate newly released crop production and protection technologies and its management practices in the farmers filed under different agro-climatic regions and farming situations. Frontline demonstrations are conducted in a block of two or four hectare land in order to have better impact of the demonstrated technologies on the farmers and field level extension functionaries. The agricultural technology is not generally accepted by the farmers completely in all respects.

As such there always appears to be a gap between the recommended technology by the scientist and it's modified from at the farmer's level. The technology gap is thus the major problem in the efforts of increasing agricultural production in the country. A need of the day is to reduce the technological gap between the agricultural technology recommended by the scientist and its acceptance by the farmers on their field. In view of the above factors, frontline demonstrations were undertaken in a systematic manner on farmer's field to show the worth of a new variety and convince the farmers to adopt improved cultivation practices of wheat for increasing productivity of wheat. Keeping in view the present investigation attempts to study the yield gap between frontline demonstration trails and farmers yield, extend of technology adoption and benefit cost ratio.

Research Methodology

The study was carried out by Krishi Vigyan Kendra, Nohar, Hanumangarh-II (Rajasthan) during rabi 2015-16 at farmer's field. The data on output of high yield variety of wheat crop and inputs used per hectare have been collected from the frontline demonstration trails conducted. All the participating farmers were trained on various aspects of wheat production technologies. Recommended agronomic practices and genuine seeds of wheat were used for frontline demonstrations in 0.4 hectare area per demonstration. A one fifth area was also devoted to grow local standard check. The frontline demonstrations were conducted by Krishi Vigyan Kendra from Rabi 2015-16 in area of 8.0 hectare on 20 locations (farmers). Thus, a total of 20 full package frontline demonstrations were selected. The data collected from the reports of frontline demonstrations conducted by the Krishi Vigyan Kendra on the production technology of wheat crop were used. These were compared with prevailing production technologies of wheat crop (which were taken in check plots). The performances of improved varieties with improved technologies evaluated closely by the organizing seasonal training, method of demonstrations, field days and by taking crop-cut experiments. Regular diagnostic visit by the scientists helped in proper execution of demonstration as well as collection of farmer's opinion about the demonstration field. Production and economic data for frontline demonstrations and local practice were collected and analyzed.

In the present study, technology index was operationally defined as the technical feasibility obtained due to implementation of frontline demonstration in wheat. To estimate the technology gap, extension gap and technology index following formulae used by Samuel *et al.* (2000) have been used:

Extension Gap (kg/ha) = Demonstration yield - Farmer practices yield (Local check)

Technology Gap (kg/ha) = Potential yield - Demonstration yield

Technology Index = Potential yield - Demonstration yield / Potential yield X 100

Results and Discussion

Performance of Frontline demonstration:

Perusal of data indicated that the yield of wheat increased progressively over the years of study in demonstration plots as well as in control plots (Table-1).

Table 1: Productivity of wheat crop under demonstration and farmer practice:

Year	Name of variety	Average yield (Kg/ha)		% increase in over the yield
		Demonstration plot	Farmer practice	
2015-16	HD-2967	*3,940*	*3,475*	13.38

The results of average grain yield of wheat under demonstration plots was recorded 3940 kg/ha when compared to local check 3475 kg/ha. The percentage increase in the yield over local check was 13.38%. More and less similar yield enhancement in different crops in frontline demonstration has amply been documented by Patel *et al.* (2013) and Ghintala *et al.* (2018). From these results it is evident that the performance of improved variety was found better than the local check under same environment conditions. Farmers were motivated by results of agro technologies applied in the frontline demonstrations trails and it is expected that they would adopt these technologies in the coming years. Yield of the frontline demonstration trails and potential yield of the crop was compared to estimate the yield gaps which were further categorized into technology index.

Extension Gap:

The Extension gap shows (Table-2) the gap in the demonstration yield over farmer practices yield and it was 465 kg/ha. These findings are similar to the findings of Patel *et al.* (2013) and Ghintala *et al.* (2018).

Technology Gap:

The technology gap shows the gap in the demonstration yield over potential yield and it was 1860 kg/ha (Table-2). The frontline demonstrations were laid down under the supervision of scientists at the farmer's field. There exists a gap between the potential yield and demonstration yield. This may be due the weather conditions. Hence, location specific recommendations are necessary to bridge the gap.

Technology Index:

Technology Index shows the feasibility of the variety at the farmer's field. The lower the value of the technology index more is the feasibility. Results of the study depicted in Table-2 revealed that the technology index value was 32.06%. The results of the present study are in consonance with the findings of Singh *et al.* (2007), Patel *et al.* (2013) and Ghintala *et al.* (2018).

Table 2: Yield, technology gap, technology index and extension gap of wheat grown under demonstration and local check:

Variables	Yield (Kg/ha)	% Increase over local check	Extension Gap (Kg/ha)	Technology Gap (Kg/ha)	Technology Index (%)
Local check	3,475	-	-	-	-
Demonstration **(HD-2967)**	3,940	13.38	465	1,860	32.06

Economic of frontline demonstration:

The economics of wheat production under frontline demonstrations were estimated and the results of the study have been presented in Table-3.

Table 3: Economic analysis of demonstration plot and farmer practice:

Variables	Average yield (Rs./ha.)			
	Gross Cost	Gross Return	Net Return	B:C Ratio
Farmer plot	18,250	48,650	30,400	2.67
Demonstration plot	18,750	55,160	36,410	2.94

The results of economic analysis of wheat production revealed that frontline demonstrations recorded higher gross return of wheat under demonstration plots was Rs. 55,160 per ha and net return Rs. 36,410 per ha with highest benefit cost ratio (2.94) as compared to local checks. These results are in accordance with the finding of Hirenmath *et al.* (2007), Hirenmath and Nagaraju (2009) and Ghintala *et al.* (2018). Further, additional cost of Rs. 500 per ha in demonstration has increased additional net returns Rs. 6,010 per ha with incremental benefit cost ratio 12.02 suggesting it's higher profitability and economic viability of the demonstration. More and less similar results were also reported by Dhaka *et al.* (2010) and Ghintala *et al.* (2018).

Conclusions

The results of the study showed that the highest grain yield of wheat under demonstration plots was 3,940 kg/ha when compared to local check 3,475 kg/ha. The percentage increase in the yield over local check was 13.38 % during the course of study. Technology gap and technology index values were 1860 kg per hectare and 32.06 %, respectively.

The finding of the study revealed that wide gap existed in potential and demonstration yield in high yield wheat varieties due to technology and extension gap in Hanumangarh district of Rajasthan. By conducting frontline demonstration was an effective tool for increasing the productivity of wheat crop. Improved technologies in frontline demonstrations enhanced yield and increase percent over the farmers practice in local check plots. This will substantially increase the income as well as the livelihood of the farming community. This created greater curiosity and motivation among other farmers who do not adopt improved practices of wheat cultivation. The demonstrations also built the relationship and confidence between farmers and scientist of Krishi Vigyan Kendra.

The study emphasizes the needs to educate the farmers in adoption of improved technology to narrow the extension gaps through various technology transfer centers. Therefore it is suggested that these factors may be taken for considered to increase the scientific temperament of the farmers.

References

Anonymous, (2015-16). Annual Progress Report, *Krishi Vigyan Kendra, Nohar*, Hanumangarh-II.

Anonymous (2014). "Agricultural statistics at a glance". Ministry of Agriculture, Department of Agriculture and cooperation, *Directorate of Economics and Statistics*, Government of India, pp. 68-69.

Balasubramanian, V.; Adhya, T. K. and Ladha, J. K. (2012.) "Enhancing eco-efficiency in the intensive cereal-based systems of the Indo-Gangetic Plains". *Issues in Tropical Agriculture Eco efficiency From Vision to Reality*. CIAT Publication, Cali, CO.

Dhaka, B. L.; Meena, B. S. and Suwalka, R. L. (2010)."Popularization of Improved Maize production technology through frontline demonstrations in south-eastern Rajasthan".*Journal of Agri. Sci.,* 1(1):39-42.

Ghintala, A.; Singh, B.; Verma, M.K. and Lal, M. (2018). Performance of Front Line Demonstration on the Yield of Wheat in Hanumangarh District of Rajasthan, India. *Int. J. Curr. Microbiol. App. Sci.* 7(09): 3477-3482.

Hiremath, S. M. and Nagaraju, M. V. (2009). "Evaluation of frontline demonstration trails on onion in Haveri district of Karnataka". *Karnataka j. of agric. Sci.,* 22(5): 1092-1093.

Hiremath, S. M.; Nagaraju, M. V. and Shashidhar, K. K. (2007). "Impact of frontline demonstration on onion productivity in farmers field". *Nation. Sem. Appropriate Extn. Strat. Manag. Rural Resources, Univ. agric. Sci. Dharward.* December 18-20:100.

Iftikhar, M. H.; Shamshad, H. S.; Hussain, S. and Iqbal, K. (2002). "Growth, yield and quality response of three wheat (Triticum aestivum L.) varieties to different levels of N, P and K". *International journal of Agricultural biology*. 4: 362-364.

Patel, M. M.; Jhajharia, A. K.; Khadda, B. S. and Patil, L. M. (2013). "Frontline demonstration: An effective communication approach for dissemination of sustainable cotton production technology". *Ind. J. Extn.Edu.& R.D.,* 21: 60-62.

Samuel, S. K.; Miha, S.; Roy, D. K.; Mandal, A. K. and Saha, D. (2000). "Evaluation of Frontline demonstration on groundnut". *Journal of Indian Society Coastal Agril .Res.,*18:180-183.

Sarwar, N.; Maqsood, M.; Mubeen, K.; Shehzad, M.; Bhullar, M. S.; Qamar, R., and Akbar, N. (2006). "Effect of different levels of irrigation on yield and yield components of wheat cultivars". *Pakistan Journal of Agricultural Science*. 47: 371-734.

Sharma, R. N. and Sharma, K. C. (2004). "Evaluation of frontline demonstration trails on oilseeds in Baran district of Rajasthan". *Madhya Pradesh Journal of Extn.Edu.,7*: 94-95.

Singh, D. K.; Gautam, U. S. and Singh R. K. (2007). "Study on yield gap and level of demonstrated crop production technology in Sagar district". *Ind. Res. J. Extn. Edu.,*7(2&3):94-95.

Impact of *Glyphodes pyloalis* Walker (Pyralidae: Lepidoptera) infested leaves on the economic and nutritional parameters of silkworm hybrid (NB_4D_2 X SH_6) *B. mori* L. During autumn season

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Abstract:

The study was conducted on silkworm larvae fed with infested and healthy mulberry leaves. Observations were made on some economic and nutritional characters like leaf fed, larval duration, larval weight, cocoon yield, single cocoon weight, single shell weight, shell ratio, filament length, fecundity and viability. In all these observations, it was found that there was more negative impact on the traits when the silkworm larvae were fed with infested leaves as compared to healthy leaves.

Keywords: Silkworm larvae, infested mulberry leaves, economic traits.

Introduction

A major factor determining productivity, and hence profitability in sericulture, is the maximization of mulberry leaf. The productivity of mulberry silk cocoons and superior quality of silk is dependent on quality feed (mulberry leaf). Several factors such as agronomic practices, biotic and a-biotic components influence the quality of mulberry leaf. In spite of adopting all these, sometimes the nutritive values are also degraded due to insect pest damage as mulberry foliage is vulnerable to several insect pests. Though mulberry is subjected to frequent leaf picking and pruning operations, many pests still find enough place and time to establish on it and cause considerable economic loss to the sericulturists. Insect pests are known to interfere considerably with all the phases of sericulture practices and account for 20-25 per cent crop loss worldwide so for (Sengupta *et al*., 1990).

In sericulture, it is established that several factors contribute in the growth and development for the production of quality eggs (seed). Quality Silkworm seed refers to richness of laying, egg viability (egg fertility), hatching uniformity and more importantly good rearing performance of the progeny (Ullal and Narashimhana1981). And it depends upon management practice that is rearing temperature, relative humidity, nutrition and genotype of the breed (Miller 2005; Malik and Reddy 2007). Fecundity and fertility are the two main factors of seed cocoon production.

Under Kashmir climatic conditions mulberry foliage is also vulnerable to several insect pests but among them *Glyphodes pyloalis* Walker causes considerable damage to mulberry leaves especially in autumn season July to October. In recent years *Glyphodes pyloalis* Walker assumed greater significance owing to its damage to mulberry plants both qualitatively and quantitatively. Feeding of such infested leaves to the silkworms affects their growth and development which in turn brings down the quality of silk produced. The reduction in leaf quality

by this insect pest leads to inferior performance of silkworm rearing during autumn season by adversely affecting the growth and development of silkworms. Therefore the present study was undertaken to study the impact of feeding the pest infested mulberry leaves on the economic parameters of silkworm hybrid (NB_4D_2 X SH_6) *B. mori* L.

Materials and Methods

Disease free laying of commercial silkworm hybrid (NB_4D_2 X SH_6) *B. mori* L. obtained from Temperate Sericulture Research Institute Mirgund were reared on healthy leaves of mulberry from 1st to 4th instar during autumn season 2005 and 2006 (sep. Oct.) at TSRI Mirgund SKUAST K.

Freshly resumed fifth instar larvae were grouped into two batches, with seven replications of 100 worms under each treatment and reared (cellular) as per package of practices as recommended by Dar and Sing (1998).The experiment was initiated on the 1st day of the 5th instar by feeding pest infested mulberry leaves to the silkworms of batch 1st (experiment) while those of batch 2nd (control) were fed with healthy mulberry leaves. In the beginning of the 5th stage the wt. Of the worms were recorded for the calculation of average wt .gained.

After completion of egg laying the total number of eggs and number of fertilised eggs per female were counted.

Results and Discussion

The observations recorded on the economic parameters of silkworm by feeding pest infested and healthy mulberry leaves has been presented in tables 1. The quality of mulberry leaf has a great influence on the amount of food ingested by the silkworms. The importance of quality of mulberry on the growth, development, health and silk production in silkworms was studied by Yokoyama (1963). In the presented study, the economic parameters, such as larval duration was prolonged by feeding the infested mulberry leaves to the silkworms. The larval duration was prolonged to the tone of ten days and nine hours (10:9) while it was (8:9) in healthy leaves, the quantity of leaf fed per replication was also increased due to prolonged larval duration in pest infested leaves which was recorded (5120gm) while it was (4000gm) in healthy leaves. These findings coincide with the findings of Aftab *et., al*, (1999) who also reported prolongation in the larval duration of silkworms fed with spiralling whitefly (*Aleurodicus disperses* Russel) affected mulberry leaves. The weight of mature larvae was recorded in worms fed with pest infested leaves (28.10gm) and (39.00gm) in healthy leaves. Which is in corroboration with the findings of Pradeep Kumar *et al*, (1992) who also reported decrease in the larval weight of silkworm race, PCN fed with mealy bugs infested leaves from K-2 variety. Naik,(1997); Doureswamy and Chandramohan, (1999) and Narayanaswamy *et al*., (1999). Also reported decrease in the larval weight can be attributed to reduce appetite of silkworms due to their feeding on pest infested mulberry leaves which are nutritionally inferior. Similar results were observed when silkworms were fed with leaves from mulberry plants attacked by giant African snails by Ravi Kumar and Shree (1988).

The yield /10,000 larvae by weight was reduced to the (11.84 kg) in pest infested leaves and it was (16.17 kg) in healthy leaves. Single cocoon weight was reduced to (1.59 gm) in infested leaves and it was (1.66 gm) in healthy leaves. Cocoon shell wt. was reduced to (0.24

cg) when fed with the infested leaves, and it was (0.31 cg) when fed with the healthy leaves. The silkworms fed with infested mulberry leaves recorded (15.99) shell ratio percentage and (19.12%) in healthy leaves. The length of silk filament was reduced to (540 m) in the cocoons procured from the larvae fed with *Glyphodes* pest infested mulberry leaves, while it was (873 m) in healthy leaves. And the egg parameters also shows negative affects by feeding pest infested leaves, it was recorded 296 eggs and 80 % fertility per female moth, while it was 378 eggs and 87.33 % fertility in healthy leaves.

The pest infested leaves being nutritionally unfit for silkworms as confirmed by the present study, therefore the study reveals that feeding of the *Glyphodes* Walker infested leaves have undesired (negative) effects on silkworms in respect of their economic characters as well and this is in line with the findings of Shree and Mahdeev (2005), Umesh Kumar *et al*. (1989), Pradeep kumar *et al.* (1992) and Suma (2001).

S. No	Parameters (Mean ± S D)	Infested leaves (Mean ± S D)	Healthy leaves	Remarks
1.	Leaf fed / rep (gm)	5120 ± 57.15	4000 ± 67.15	highly significant
2.	Initial larval wt. (gm)	7.50 ± 0.23	7.30 ± 0.29	Non significant
3.	Larval duration (D. / H.)	10: 9 ± 5 hr	8: 9 ± 7 hr	highly significant
4.	Wt. of 10 mature larvae (g)	28.10 ± 0.90	39.00 ± 0.76	highly significant
5.	Cocoon yield/10000 larvae (kg)	11.84 ± 0.72	16.17 ± 0.67	highly significant
6.	Single cocoon weight (gm)	1.59 ± 0.05	1.66 ± 0.09	Non significant
7.	Cocoon shell weight (cg)	0.24 ± 0.05	0.31 ± 0.01	highly significant
8.	Shell ratio (%)	15.99 ± 0.42	19.12 ± 1.40	highly significant
9.	Filament length (m)	540 ± 15.84	873 ± 14.0	highly significant
10.	No of eggs/female	296 ± 14.10	378 ±12.70	highly significant
11.	Hatching %age.	80.00 ± 0.91	87.33 ± 0.75	highly significant

Conclusion:

From the present investigation, it can be concluded that feeding of the *Glyphodes* Walker infested leaves have undesired (negative) effects on silkworms in respect of their economic characters and as such the feeding of silkworm larvae with infested leaves should be avoided as much as possible to get good yield with the best economic traits.

Refrences:

1. Aftab Ahmad C. A., Narayanasamy K. C. Ramagowda, T. Chandrakala, M. V. and Maribashaty, V. G. 1999. Impact of feeding spiralling whitefly, affected mulberry leaf on nutritional parameters and cocoon conversion efficiency in silkworm, *B. mori* L. During fifth instar. *Mysore journal of agricultural* sciences **33**: 355-60.
2. Dar, H. U., Sing, T. P. 1998. Improved rearing techniques for *Bombyx mori* L. In Jammu and Kashmir. *Oriental Sciences* **3** (2) : 30-46.
3. Douraswamy, S., Chandramohan N. 1999. Investigation on the economic characters of silkworm *B. mori* L. as influenced by the spiralling whitefly damage on mulberry. "Abstract of National Seminar on Tropical Sericulture" 28-30 Dec. University of Agricultural Sciences, Bangalore – 560065 PP. 82.
4. Malik. F. A. And Reddy, Y. S.2007. Role of mulberry nutrition on manifestation of post cocoon characters of selected races of silkworm. Sericolgia- 97: 63-67.
5. Miller. W. E. 2005. Extrinsic effects on fecundity- maternal weight relations in capital breeding Lepidoptera. *J.* Lepidopterans Soc., 59: 143-160.
6. Naik, S. L., 1997. Bio - ecology of thrips infesting mulberry, M. Sc Sericulture, University of Agricultural Sciences, Bangalore, 77.
7. Narayanaswamy, K. C., Ramegowda, T., Rajhuraman, R., Manjunash, M. S., 1999. A study on the biochemical changes in the leaves mulberry attacked by spiralling whitefly, Aleurodicus disperses Russel Entomon **24 (3):** 215-220.
8. Pradeepkumar, Kishore, R., Noamani M. K. R. And Sengupta, K. 1992. Effect of feeding tukra affected mulberry leaves on silkworm rearing performance. *Indian Journal of sericulture.* **31**(1):27-29.
9. Ravikumar K, and Shree, M. P. 1988. Impact of feeding leaves from snail infested mulberry plants on the growth and development of silkworms and cocoon characters. *Himachal journal of Environmental zoology* **12** : 1-10.
10. Sengupta,K., Kumar, P., Baig, M. And Govindaih, 1990. Handbook on pest and disease control of mulberry and silkworm. Economic and Social Commission of Asia and Pacific, Bangkok Thailand. P. 35.
11. Shree and M. P. And Mahadev, A. 2005. Biochemical studies in the pest infested mulberry varieties and their impact on sericulture. 3rd National Seminar on ***Indian Entomology.*** 173-86.
12. Suma, R. 2001. Enzymatic studies in the thrips infested mulberry leaves. M. Sc. Dissertation, Bangalore University, Bangalore 560056.
13. Ullal, S. R. And Narashimhana M. N., 1981. *Handbook of practical sericulture*. C. S. B. Bangalore pp. 61-80.
14. Umesh Kumar, N. N., Shree, M. P. And Ravi Kumar, R. 1989. Effect of "TUKRA" on the biochemical contents of mulberry leaf. Geobios. 16 (6): 283-84.
15. Yokoyama T. 1963. *Sericulture. Ann. Rev. Ent*. 287-298 pp.

Designer Eggs: A Step Towars Better Human Health

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Introduction

The time when eggs first appeared on the Earth is not known, but one thing is clear - they have always been an important part of human diet. Chicken eggs are considered to be nature's perfect food. The egg is a nutrient dense food and an excellent, inexpensive, convenient and low calorie source of high quality protein and several important nutrients such as riboflavin, selenium, choline and vitamin B12. Studies have shown that apart from culinary uses, bird eggs, including hen eggs, have become one of the best raw materials for biomedical and nutraceutical applications due to their considerable content of bioactive components.

The poultry industry has made tremendous growth and has brought about a revolution in animal husbandry and food supply over the last 20 years. Today world produces around 70 MT of eggs out of which India produces about 3.9 MT of eggs per year. This great improvement in the efficiency of the egg industry has been due to the advances in breeding, management, disease control, and nutrition. With the advancement of poultry industry, there is a rising interest in poultry biotechnology for altering the egg composition by genetic and nutritional manipulations for human health. Designer eggs are the result of such interventions and aimed at fulfilling the demands of consumers for food products of superior health quality.

Designer eggs

"Designer eggs" are those in which the content has been modified from the standard egg. Designer eggs don't just have the alterations in nutrient content. Several other distinguishing factors may include appearance, being pathogen free and a number of alternative production methods (feed, housing and even fertility). Designer eggs may be categorized as

1) Nutritionally enhanced
2) Value added and
3) Added processing

Designer egg approach was started in 1934 by Cruickshank, who modified the fatty acid composition in egg yolk by making feed interventions. After that, Sim and Sunwoo (2002) developed designer egg rich in omega-3 fatty acids and antioxidants by feeding hen with flax seed and patented as Professor Sim's Designer Egg, in which saturated fatty acid in yolk was replaced with 3-poly unsaturated fatty acid (PUFA) i.e. the yolk triglyceride is replaced by linolenic acid and yolk phospholipids are replaced by longer chain omega-3 fatty acids, such as eicosapentaenoic (EPA), dososapentaenoic and docosahexaenoic (DHA) acids.

Need for Designer Eggs

Consumer demand for food products of superior health quality has generated interest in modifying the lipid composition and enriching poultry meat and eggs with beneficial nutrients. Meeting consumer demands is a constant challenge for the animal food industry.

Cholesterol phobia

During the last 20 years the egg industry has been under intense attack by anti-cholesterol advocates. The egg has been blamed, blasted and defamed as one of the major culprits in coronary heart disease (CHD). Traditionally, eggs have not been regarded as a functional food because of their perceived link with adverse effects on blood cholesterol. The egg consumption has reduced because people think eating eggs will raise their cholesterol levels. No doubt egg is a cholesterol rich food and a large egg contains about 210 mg of cholesterol. But does eating eggs increase the blood cholesterol and risk of heart disease. The "cholesterol phobia" has scared the people in developed countries until 1990 and still continues to do so in developing countries including India due to ignorance.

Recent research indicates that the levels of cholesterol in the diet is not the major determinant of the cholesterol level in the blood and there are other (for example, the level of saturated fat) more important determinants of this parameter as well as the development of coronary heart disease. Interestingly, people in Japan — consumers of some of the largest quantities of eggs in the world (averaging 328 eggs consumed per person per year — have low levels of cholesterol and heart disease compared with other developed countries, especially the United States. It is because the Japanese eat a diet low in saturated fat. The British Journal of Medicine carried a study in 2017 and concluded, "Higher consumption of eggs (up to one egg per day) is not associated with increased risk of coronary heart disease or stroke. Also the international journal of Cardiology showed that, in healthy adults, eating eggs everyday did not produce negative effect on cardiac risk, nor did it increase cholesterol levels. Eggs promote favorable shifts in high density lipoprotein (HDL) lipid composition and function. They are relatively low in saturated fat (1.6 grams in the yolk) which is the major determinant of plasma LDL level.

Although, the nutritional superiority of the egg has been proved beyond doubt, the egg consumption in India is very low due to vegetarianism as well as cholesterol scare. The nutritionists and cardiologists have established that there is only an insignificant correlation between dietary and serum cholesterol levels but still the consumers are scared of consuming cholesterol rich foods, hence the justification of population wide restriction on egg consumption needs to be reconsidered.

Production of Designer Eggs

The designer eggs can be produced in the following ways:

1. **Omega -3 (ω-3) Fatty Acids enrichment**: Recently, eggs have gained attention as an alternative to fish and oilseeds as a source of Omega -3 fatty acids. Generally people tend to avoid egg yolk but yolk only contains omega 3 fatty acids. The total fat content in the egg yolk cannot be altered; but its fatty acid composition can be altered, by changing the type of oil used in the hen's diet. Omega-3 is an essential fatty acid

with a treasure trove of health benefits. Omega-3 is a building block for foetal vision development and brain function. In adults, omega-3 lowers risk of heart disease and cancer of the breast, colon and prostate. Its anti-inflammatory properties help decrease episodes of asthma and pain associated with rheumatoid arthritis. One normal eggs contain only 50- 100mg of omega 3 fatty acids and which can be increased to 500mg or more with dietary modifications in the hen's diet.

Attention given to modifying the fatty acid composition of eggs has mainly focused on the elevation of conjugated linoleic acid and n-3 polyunsaturated fatty acids (PUFA), including a-linolenic (ALA, C18:3 n-3), eicosapentaenoic (EPA, C20:5 n-3), docospentaenoic (DPA, C22:5 n-3) and docosahexaenoic (DHA, C22:6 n-3) acids. One way to produce n-3 PUFA-enriched eggs is through enrichment of the diet with ALA derived from flaxseed, canola, hempseed, etc., and the other one is supplementation with fish oil or fish meal, which is the major dietary source of DHA (Yannakopoulos, 2007).

2. Herbal enriched super eggs:

Phytobiotics or plant derived products containing several plant secondary metabolites can be used in poultry feed to improve the performance of hen and to produce herbal enriched super eggs. Chicken feed will be supplemented with herbs like garlic/onion leaves, spirulina, basil leaves, turmeric powder, citrus pulp, flaxseed, red pepper, fenugreek seeds etc. These super eggs will be having a lower LDL cholesterol, immunomodulator property, antioxidant, anticarcinogenic properties, higher omega-3 fatty acids etc. For example normal egg have vitamin E content of 90-100 µg /g yolk whereas herbal supplemented egg have 220 – 240 µg / g yolk which added to its increased antioxidant property. All these indicating that the overall health promotion in hens as well as possible health promotion in humans is possible by popularizing herbal enriched eggs.

3. Lowering Cholesterol Content:

Even though the dietary cholesterol is insignificantly correlated with the serum cholesterol levels, the consumers are scared of high cholesterol foods, like eggs. A large egg contains about 200 mg of cholesterol. Although the nutritionists and cardiologists have established that there is only an insignificant correlation between dietary and serum cholesterol levels; the consumers are still scared of consuming cholesterol rich foods, hence there is an urgent need to reduce the egg yolk cholesterol levels as well as to incorporate several other health promoting components in the egg.

A more recent pioneering finding suggests that daily egg consumption does not show adverse effects on cholesterol in the blood for the majority of people (Fernandez, 2008), but promotes favorable shifts in high density lipoprotein (HDL) lipid composition and function, beyond increasing plasma HDL cholesterol in metabolic syndrome (Andersen et al., 2013). Research towards lowering egg cholesterol has centered mostly on dietary and pharmacological interventions. Chromium, copper, nicotinic acid, statins, garlic, basil (tulasi), plant sterols, N-3 PUFA supplementation to chicken feed will reduce the yolk cholesterol levels significantly and many more herbs in chicken diets will reduce

the yolk and body cholesterol levels by 10-25%. Designer eggs are also developed by replacing yolk cholesterol with conjugated linoleic acid (CLA). CLA is studied for its various health related properties such as antiadipogenic, anti-carcinogenic, anti-atherogenic and anti-inflammatory (Magdalena et al. 2008).

4. Antioxidants rich designer eggs

Egg is a rich source of natural antioxidants like vitamin-E, selenium, carotenoid pigments, flavonoid compounds, lecithin and phosvitin. These compounds will protect the fat-soluble vitamins and other yolk lipids from oxidative rancidity. However, these levels are not sufficient to protect the designer eggs rich in N-3 PUFA. Hence it is essential to increase the anti-oxidant levels in the designer eggs. The designer egg not only contain high levels of the above anti-oxidants; but also contain synthetic antioxidants like Ethoxyquin and anti-oxidants of herbal origin such as Lycopene, Curcumin, Sulforaphene, Carnosine, Quercetin, depending upon the herbs used in hens diet (Narahari, 2004) Supplementation of these antioxidants in hen's diet will increase their levels in the egg. For designer egg production, vitamin E and organic selenium can be added as anti-oxidants at levels of 200-400mg/kg and 0.1-0.3ppm, respectively (Dominic *et al.* 2014).

5. Mineral enriched designer eggs

Designer eggs can be a good source of micro minerals and can help in reducing their deficiency in the world. The eggs are fortified with minerals such as selenium, iodine etc. Iodine enriched eggs are known to reduce plasma cholesterol in humans and have anti-inflammatory and anti-allergic properties (Papp *et al*. 2007). Among all micro-elements, selenium is one of the most essential micro-nutrient because it plays very vital function in our body (Hassanien, 2011). They were first developed in the Scottish Agriculture College in 1998 by of supplementation of Se enriched yeast into hen diets. Today Russia is the most advanced country for the production of selenium enriched eggs. Nowadays, nano-selenium is being used for production of designer eggs due to high absorption rate, high security, high antioxidant capacity, high egg-laying capacity, good growth performance, lowest toxicity.

6. Immunomodulating designer eggs

During the past 20 years, the use of chickens instead of mammals for antibody production has increased. A major advantage of using birds is that the antibodies can be harvested from the egg yolk instead of serum, thus making blood sampling obsolete. In addition, the antibody productivity of an egg-laying hen is much greater than that of a similar sized mammal (Hau & Hendriksen, 2005). Hens are recognized as a convenient and inexpensive source of antibodies. It has been reported that the amount of immunoglobulin that can be yielded from one egg of an immunized hen is as much as that can be obtained from 300 ml of rabbit blood. Chicken egg yolk antibodies (IgY) have been applied successfully for scientific, diagnostic, prophylactic and therapeutic purposes. Because of the phylogenetic distance between birds and mammals, mammalian proteins are often more immunogenic in birds than in other mammals and antibody synthesis readily stimulated in hens (Bizhanov *et al.* 2004). Egg IgY serve as an alternative therapy for mastitis caused by S. aureus. (Zhen *et al.* 2009).

Designer eggs with hyperimmune egg yolk (HEY) against four human rotavirus strains result in modest improvement of diarrhea associated with earlier clearance of rotavirus from stools (Sarker *et al.* 2001). *Helicobacter pylori* are one of important cause of gastritis and gastric ulcer. It has been classified as a category 1 carcinogen by WHO (Prinz et al. 2003). Antibiotic resistance has made the treatment diffiucult. Various researchers found that administration of anti-urease specific IgY was effective passive immunization against *H. pylori* infection and its related gastrointestinal disorders . Malekshahi *et al.* (2011) in their study developed recombinant IgY from by using hens immunized with recombinant UreC and found that UreC-induced IgY is specifically successful in inhibition of *H. pylori* infection. Genetic immunization of ducks with a plasmid expressing *H. pylori* UreB produced UreB induced IgY polyclonal and monospecific antibodies against recombinant *H.pylori* urease (Kazimierczuk *et al.* 2005). Consumer acceptance of these designer eggs are similar to that of normal eggs. Designer eggs which produce human erythropoetin fusion protein (HpEo) in their whites and yolks have also been developed (Penno *et al.* 2010)

7. Pharmaceutical designer eggs

Transgenic chickens which produce drug Kanuma in eggs designed to treat lysosomal acid lipase deficiency in humans has been approved the US FDA in 2015. Designer eggs which produce interferon beta to fight cancer have been produced by Japan and are currently under research trials.

Chicken eggs are used to produce antivenom. The antivenom from immunized chicken egg yolk is biologically active and more convenient alternative to equine anti-snake venom. The antibodies are present in the egg for upto 100 days after the immunization. The antivenom purified from immunized chicken egg yolk is biologically active (Devi et al., 2002 a,b). Paul *et al*. (2007) reported this system as a more convenient alternative to current conventional production of equine anti-snake venom. Antibodies raised in chicken could effectively neutralize the pharmacological effects induced by venoms and chickens therefore present an alternative and cheaper source of specific antibody generation, he also indicated that the antivenom generated in chicken could be used for therapeutic purposes in case of snakebite envenomation (Meenatchisundaram *et al.* 2008 a,b).

8. Designer eggs with pigment fortification of yolk

Fortification of eggs with carotenoid is the new concept in the field of the designer eggs. Canthaxanthin is a carotenoid usually used for the production of pigment enriched yolk (Grashorn and Steinberg, 2002). Other carotenoid which may be used for fortification in egg consist of lycopene. These carotenoid pigments are naturally obtained from different sources such as marigold, chilly or corn (Ebrahim *et al*. 2008). The beneficial effects of pigment enrichment in the yolk include:

(a) It assists in preventing macular degeneration

(b) It is responsible for attractive color of yolk

(c) It acts as antioxidant and anticarcinogenic agent

(d) Lutein is responsible for safeguard to the retina

Conclusion

Designer eggs are the result of modern development trends in egg production and processing and this line is being constantly expanded. Egg is the best vehicle to incorporate various health promoting components in it and the designer eggs are not only nutritious but also promote the overall health status of consumers. Designer egg approach is one of the major strategies to reduce micronutrient deficiency in developing countries. The future of poultry industry is not just about producing more eggs but about producing more eggs of the right kind. Thus we can expect that in future poultry farmers may be the producers of "designer eggs.

References:

Abdulah, R., H. Koyama, K. Miyazaki, M. Nara and M. Murakami, 2006. Selenium supplementation and blood rheological improvement in Japanese adults. *Biol. Trace Elem. Res*., 112: 87-96.

Andersen Catherine J, Christopher N. Blesso, Jiyoung Lee, Jacqueline Barona, Dharika Shah, Michael J. Thomas, and Maria Luz Fernandez Egg Consumption Modulates HDL Lipid Composition and Increases the Cholesterol-Accepting Capacity of Serum in Metabolic Syndrome.US National library of Medicine

Bennett D C, Cheng K M. 2010. Selenium enrichment of table eggs. *Poult Sci.;*89(10):2166–2172.

Bizhanov G, Jonauskiena I and Hau F (2004) A novel method based on lithium sulfate precipitation for purification of chicken egg yolk Immunoglobulin Y, applied to immunospecific antibodies against Sendi virus. *Scand. J. Lab. Anim. Sci.* 31,121-130.

Cruickshank E,M. 1934. Studies in fat metabolism in fowl. I. Composition of egg fat and depot fat of the fowl as affected by the ingestion of large amount of different fats.. *Biochem J*.;28:965– 977.

Devi CM, Vasantha Bai M and Krishnan KL (2002b) Development of viper-venom antibodies from chicken egg yolk and assay for their antigen binding capacity. *Toxicon.* 40, 857–861.

Devi CM, Vasantha Bai M, Vijayan Lal A, Umashankar PR and Krishnan LK (2002a) An improved method for isolation of anti-viper venom antibodies from chicken egg yolk. *J. Biochem. Biophys. Methods.* 51, 129–138.

Dominic,G., Murali, P and Nampoothiri, V, M. 2014. Dietary Manipulations for Improvement of Egg Quality for Human Consumption. RNFU (14). ISSN: 2250 –3668.

Ebrahim Nezhad, H.A Shahryar, M.R Dastouri, A.A Golshani, A. Tahvildarzadeh and K.A. Najafyan. 2008. "the Effect of Combination of Citric Acid and Microbial Phytase on the Egg Quality Characteristics in Laying Hens",. *Asian J. Anim. Vet. Adv*., 3.293-297.

Fernandez M.L., Webb D. The ldl to hdl cholesterol ratio as a valuable tool to evaluate coronary heart disease risk. *J. Am. Coll. Nutr*. 2008;27:1–5

Grashorn, M.A. and W. Steinberg, 2002. Deposition rate of canthaxanthin in egg yolks. *Arch. Geflugelk*., 66: 258-262.

Hassanien, H.H.M., 2011. Effect of force molting programs on egg production and quality of laying hens. *Asian J. Poult. Sci*., 5: 13-20.

Hau J and Hendriksen C (2005) Refinement of polyclonal antibody production by combining oral immunization of chickens with harvest of antibodies from the egg yolk. ILAR. 46, 294 – 299

Kazimierczuk K, Cova L, Ndeboko B, Szczyrk U, Targosz A, Brzozowski T, Sirko A. 2005. Genetic immunization of ducks for production of antibodies specific to Helicobacter pylori UreB in egg yolks. *Acta Biochimica Polonica*. 52(1):261–266.

Magdalena Franczyk-Z˙ aro'w, Renata B. Kostogrys, Beata Szymczyk, Jacek Jawien, Mariusz Gajda,Tadeusz Cichocki, Leszek Wojnar, Stefan Chlopicki and Pawel M. Pisulewski (2008. Functional effects of eggs, naturally enriched with conjugated linoleic acid,on the blood lipid profile, development of atherosclerosis and composition of atherosclerotic plaque in apolipoprotein E and low-density lipoprotein receptor double-knockout mice (apoE/LDLR2/2). *British Journal of Nutrition* 99: 49–58

Malekshahi Z, V., Gargari S, L., Rasooli I and Ebrahimizadeh W.2011. Treatment of Helicobacter pylori infection in mice with oral administration of egg yolk-driven anti-UreC immunoglobulin. *Microb Pathog*.;51(5):366–372.

Meenatchisundaram S, Parameswari G, Michael A and Ramalingam S (2008b) Neutralization of the pharmacological effects of cobra and krait venom by chicken egg yolk antibodies. *Toxicon.* 52, 221– 227.

Meenatchisundaram S, Parameswari G, Michael A and Ramalingam S (2008a) Studies on pharmacological effects of Russell's viper and Sawscaled viper venom and its neutralization by chicken egg yolk antibodies. *Intl. Immunopharm*. 8, 1067– 1073.

Narahari,D., A. Kirubakaran and R. Kumararaj,2004. " Influence of Herbal Enriched Functional Eggs Consumption on Serum Lipid in Humans". Proceedings of the 22nd World Poultry Congress, June08-13,2004 Istanbul.

Papp, L.V., J. Lu, A. Holmgren and K.K. Khanna, 2007. From selenium to selenoproteins: Synthesis, identity and their role in human health. *Antioxidant Redox Signaling*, 9: 775-806.

Paul K, Manjula J, Deepa EP, Selvanayagam ZE, Ganesh KA and Subba Rao PV (2007) Anti-Echis carinatus venom antibodies from chicken egg yolk: Isolation, purification and neutralization efficacy. *Toxicon.* 50, 893-900.

Penno CA, Kawabe Y, Ito A, Kamihira M. 2010. Production of recombinant human erythropoietin/Fc fusion protein by genetically manipulated chickens. *Transgenic Res.;*19: 187–195.

Prinz C, Hafsi N, Voland P. 2003. Helicobacter pylori virulence factors and the host immune response: implications for therapeutic vaccination. *Trends Microbiol.* 11:134–138.

Ruggiero P, Peppoloni S, Berti D, Rappuoli R, Giudice GD. 2002. New strategies for the prevention and treatment of Helicobacter pylori infection. *Expert Opin Investig Drugs*.;11:1127–1138.

Sarker , S A, Casswall ,T H, Juneja L R, Hoq E, Hossain I, et al. (2001)Randomized, placebo-controlled, clinical trial of hyperimmunized chicken eggyolk immunoglobulin in children with rotavirus diarrhea. *J Pediatr Gastroenterol Nutr* 32: 19–25

Sim S, J and Sunwoo H, H. 2002. Designer eggs: Nutritional and functional significance. In : Watson RR (ed) Egg and health promotion, 1 edn.Wiley-Blackwell, pp19–35.

Venardos, K.M., A. Perkins, J. Headrick and D.M. Kaye, 2007. Myocardial ischemia-reperfusion injury, antioxidant enzyme systems and selenium: A review. *Curr. Med. Chem*., 14: 1539-1549.

Yannakopoulos A,L. 2007 A.L. Egg enrichment in omega-3 fatty acids. Springer, Berlin, Heidelberg pp. 159-170

Zhang, J., R.G. Munger, N.A.West, D.R. Cutler, H.J. Wengreen and C.D. Corcoran, 2006. Antioxidnat intake and risk of osteoporotic hip fracture in Utah: and effect modified by smoking status. *Am. J. Epidemiol*., 163: 9-17.

Zhen YH, Jin LJ, Li XY, Zhi Li JG, Zhang BJ, Fang R and Xu YP (2009) Efficacy of specific egg yolk immunoglobulin (IgY) to bovine mastitis caused by Staphylococcus aureus. *Vet. Microbiol*. 133(4), 317-322.

Effect of Organic, Inorganic And Integrated Nutrient Management on Productivity and Economic Viability in Rice Based Cropping Systems in Madhya Pradesh

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Abstract

A field investigation was conducted during 2012-13 to 2013-14 at Breeder Seed Production Unit (Groundnut), Jawaharlal Nehru Krishi Vishwa Vidhyalaya, Jabalpur, Madhya Pradesh to study the effect of nutrient management and cropping system on productivity under different rice based cropping systems in Madhya Pradesh. The 4 different cropping systems Green manuring -rice-wheat, Rice-chickpea-sesame, Rice-berseem (green fodder+seed) and Rice-vegetable pea-sorghum (green fodder) and three nutrient managements viz.,Organic, Inorganic and Integrated nutrient management with 3 replications in strip plot design. The soil of the experimental field was sandy clay loam in texture, neutral in reaction (7.3), normal EC (0.52), low in OC (0.72%), medium in available N (264 kg/ha) and P(13 kg/ha) and high in K(285 kg/ha).The highest rice equivalent yield (68.13 and 74.99 q/ha) was recorded from 100% inorganic nutrient management with growing of rice-berseem (fodder+seed) cropping system. The highest net monetary return 95251,111155 Rs/ha and B:C ratio of 2.70 and 2.60 was obtained from this 100% inorganic nutrient management and rice-berseem (green fodder+seed) cropping system superior over other treatments. Therefore, this cropping system is best suitable for this particular area.

Methodology

A field experiment was conducted during 2012-13 to 2013-14 at the research farm of Jawaharlal Nehru Krishi Vishwa Vidhyalaya , Jabalpur on a sandy clay loam soil. The soil of the experimental site had a pH 7.4,EC 0.51dS/m and organic carbon 0.7%.The available soil nitrogen ,phosphorus and potash were 264,12.6 and 282 kg/ha, respectively.The factors studied included 3 nutrient managenment practices viz., 100% organic manure(NM_1), 100% inorganic manures (NM_2) and integrated nutrient (NM_3) and 4 cropping systems viz.,CS_1 rice-durum wheat-green manuring, CS_2 rice-chickpea-sesame, CS_3 rice-berseem (green fodder+seed), CS_4 rice-vegetable pea-sorghum(green fodder) in strip plot design with 3 replication. The crop varieties grown were 'Pusa sugandha 5' of rice, MPO 1106 in durum wheat, JG 24 for chickpea, JB 1 for berseem, Arkel for vegetable pea during winter season and TKG 55 in sesame and MP Chari in sorghum during summer season. These crops were raised with recommended agronomic practices. In organic manure treatment farm yard manure was applied on the nitrogen equivalent basis for each crop. The nutrient composition of FYM was 0.5,0.25,0.5% N,P_2O_5 and K_2O respectively. Mechanical measures were adopted for the weed management, and for insect pest management, neem oil (Azadiractin 0.03%) was applied as and when required under organic nutrient management. In chemical fertilizer treatment, nutrient were applied through chemical fertilizers viz., urea, single super phosphate and muriate of

potash while plant protection was done through recommended pesticides, when required. The recommended dose of fertilizers for rice, wheat, chickpea, sesame, vegetable pea, sorghum and berseem. 120:26.4 : 33.3, 120:26.4:33.3, 20:60:30, 30:60:30, 20:26.4:16.6,100:22:25 and 20:26.4:16.6 kg N:P:K/ha. In integrated nutrient management (NM_3) treatment 50% of nitrogen was supplied through farm yard manure and rest 50% through chemical fertilizers . In rice-wheat green manuring cropping system, sunhemp was grown before rice and 35 days old crop was incorporated in soil as green manure. Phosphorus Solubilizing Bacteria was used for inoculation in all the crops.

Result

Among different nutrient management practices and cropping systems the rice equivalent yield was maximum (74.99 q ha^{-1}) with rice-berseem (green fodder+seed) cropping system (CS_3) which reduced (68.68 q ha^{-1}) with rice-vegetable pea-sorghum (green fodder) (CS_4), green manuring-rice-wheat (CS_1) (63.90 q ha^{-1}) and (51.80 q ha^{-1}) with rice-chickpea-sesame CS_2 in descending order. It was observed that application of 100% inorganic (NM_2) topped with REY of (68.13 q ha^{-1}), which was at par with integrated NM_3 (66.20 q ha^{-1}) .The 100% organic (NM_1) produced significant lowest yield (60.23 q ha^{-1}) than all other nutrient management. . The rice-berseem (green fodder + seed) cropping system (CS_3) proved superior with regard to REY (74.99 q ha^{-1}) mainly due to high market value of berseem seed yield . As compared to the 100% inorganic (NM_2) treatment again proved to be top yielder in terms of REY (68.13 q ha^{-1}) compared to integrated NM_3 (66.20 q ha^{-1}).The application of 100% organic nutrients (NM_1) was the lowest yielder (60.23 q ha^{-1}) with regard to rice equivalent yield Gangwar *et al*., (2006) and Upadhyay *et al*., (2011). The cost of cultivation was maximum (99137 Rs/ha) under rice-vegetable pea-sorghum cropping system (CS_4) for growing of all crop components than the growing of crops associated with other crop-sequences followed by green manuring-rice-wheat (CS_1) with 74657 Rs/ha and rice-chickpea-sesame (CS_2) needed the expenditure of Rs 71203 ha^{-1} . The cost of cultivation was the lowest under rice-berseem (green fodder+seed) cropping system (CS_3), respectively Among the 3 nutrient management practices 100 % organic nutrient management (NM_1) required maximum investment of (97910 Rs/ha) followed by 79214 Rs/ha under integrated (NM_3), which was quite lesser (59203 Rs/ha) with 100% inorganic nutrient management (NM_2). The gross monetary return was maximum (Rs 181261 ha^{-1}) with rice-berseem (green fodder+seed) cropping system (CS_3) because of more production of green fodder and high value of seed .The next cropping system were green manuring-rice-wheat (CS_1) with Rs 162788 ha^{-1} , rice-vegetable pea-sorghum (green fodder) (CS_4) with Rs 146878 ha^{-1} and rice-chickpea-sesame (CS_2) (Rs 122648 ha^{-1}) with regard to GMR in descending order. Though scented rice cv.Pusa Sugandha 5 gave significantly more grain yield with CS_2 than other crop-sequences, the less yield of chickpea was obtained during *rabi* season and no yield was obtained during summer season from sesame during second year. This attributed to the lowest gross monetary return. In rice-vegetable pea-sorghum (green fodder) (CS_4) the rice yield was similar as in other treatments whereas the yield of vegetable pea decreased in second year due to frost injury and fodder sorghum yield was also reduced due to unfavorable weather conditions. Therefore, as the market value of these crops reduced it decreased its gross monetary return. The 100% organic (NM_1) recorded maximum gross monetary return (159827 Rs/ha) followed by (154455 Rs/ha) 100% inorganic (NM_2) and integrated NM_3 (145899 Rs/ha).

Conclussion

The rice-berseem (green fodder+seed) (CS_3) and green manuring-rice-wheat (CS_1) cropping systems followed the similar trend of gross monetary return and net monetary return, but position of rice-chickpea-sesame CS_2 and rice-vegetable pea-sorghum (green fodder) (CS_4) cropping system reversed in net monetary return than that of gross monetary return. Though rice-chickpea-sesame (CS_2) led to record lesser gross monetary return of (122648 Rs/ha) than rice-vegetable pea-sorghum (green fodder) (CS_4) cropping system with 146878 Rs/ha, it had higher net monetary return than rice-vegetable pea-sorghum (green fodder) (CS_4) because of lesser cost of cultivation. The 100% inorganic NM_2 fetched maximum net monetary return of 95251 Rs/ha followed by integrated NM_3 with 66685 Rs/ha and 100% organic NM_1.The net monetary return was maximum 111155 Rs/ha with NM_2, while it was lowest 61916 Rs/ha under rice-vegetable pea-sorghum (green fodder) cropping system (CS_4) as also reported by Arya *et al.,* (2005). Among the treatment combinations rice-berseem (green fodder+seed) cropping system (CS_3) with 100% inorganic nutrient management (NM_2) fetched the highest benefit cost ratio of (3.25) while it was minimum (1.30) under rice-vegetable pea-sorghum (green fodder) (CS_4) with 100% organic (NM_1). As similar results were obtained from Bharde *et al.,* (2006).

Table 1. Effect of different nutrient management and cropping system on rice equivalent yield (q ha^{-1}) and economics

Treatments	Rice equivalent yield (q ha^{-1})	Cost of cultivation (Rs/ha/year)	Gross monetary return (Rs/ha/year)	Net monetary return (Rs/ha/year)	Benefit cost ratio
NM_1	60.23	97910	159827	61916	1.70
NM_2	68.13	59203	154455	95251	2.70
NM_3	66.20	79214	145899	66685	1.90
SEm ±	1.86	----------	----------	----------	----------
CD (P=0.05)	5.17	----------	----------	----------	----------
CS1	63.90	74657	162788	88131	2.40
CS2	51.80	71203	122648	51445	1.80
CS3	74.99	70106	181261	111155	2.60
CS4	68.68	99137	146878	47740	1.50
SEm±	9.67	---------	----------	----------	----------
CD (P=0.05)	23.68	----------	----------	----------	----------

References

Arya, R.L., Kumar, L., Singh, K.K. and Kushwaha, B.L. 2005 . Effect of fertilizers and tillage management in rice –chickpea cropping system under varying irrigation schedules. *Indian Journal of Agronomy* **50**(4): 256-259.

Bharde, N. M., Shivay, Y. S., Singh, S. and Kumar, D. 2006 . Productivity and economics of rice-wheat cropping system as influenced by neem oil-treated urea and biogas slurry. *Indian Journal of Agricultural Sciences* **76** (9): 550-553.

Gangwar, B., Katyal, V. and Anand, K.V. 2006 .Stability and efficiency of different cropping systems in Western Himalayas region. *Indian Journal of Agricultural Sciences* **76**(2):135-139.

Upadhyayay, V.B.,Jain, Vikas., Vishwakarma, S.K., Kumhar, A.K. 2011. Production potential, soil health, water productivity and economics of rice based cropping systems under different nutrient sources. *Indian Journal of Agronomy* **56**(4):311-316 .

Climate Smart Agriculture : Food Security of Future to the Climate Change

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Abstract

Adverse climatic variabilities draw attention of people towards a sustainable approach to mitigate against climate change to fulfil the increasing demand of this exploding population. But due to increasing population, food security requires a sustainable strategy and to combat these effects of climate, climate-smart agriculture (CSA) came into existence in present climatic scenario for sustainable food security and enhances food security and development. CSA is an integrative and interacting approach to address these interlinked challenges of food security and climate change, i.e., sustainably increasing agricultural productivity, adapting and building agricultural resilience and reducing emissions of greenhouse gas (GHGs) from agriculture activities (including crops, livestock and fisheries). CSA combines to the actions both on-farm and off-farm, and incorporates technologies, policies, organizations, institutions and investment on an equal platform

Introduction

Food is a basic need and human right. Climate change, food security, pollution and population pressure are most severe challenges facing by world community now a days. The world's population is expected to increase 9 billion by 2050. For them,at least 60% increase in agricultural production required. But climate change having greater challenges to meet this need. Due to increasing population many of the resources required sustainable food security already stretched because the food security challenges are at larger scale. At the same time climate change is also negatively effecting agricultural production at both global and local levels. As agriculture accounts for near about 80 percent of water use globally, is also a major user of fossil fuels and accounts for 17-30 percent of global greenhouse gases emission.

In last 45 years, about 1.2 billion hectares (ha) (almost 11 per cent of the Earth's vegetated surface) has been degraded by human activity. Globally, cereal production reduces by 1% to 7%due to climatic variability and climate change by 2060. Near about 22% of the cultivated area will be experience negative impacts from climate change by 2050 under the world's most important food crops and agricultural crops, with the extent of 56% of theland area in sub-Saharan African countries. The harmful impacts of climate change and variability may be less by 2050 but they will become severe in the endof this century. According to IPCC, global averagesurface temperatures have increasedby 0.74°C in last century, with thebiggest increase of 0.55°C occurring over only in the last 30 years or in some decades. Climate

change will influence crop adaptation, distribution and production and enhance the risks associated with agricultural activity. The variable climatic conditions having negative impacts on crop yield and productivity but in some areas, mostly in temperate areas, positive impacts have been also seen on crop yield.Climate risks to all the allied sectors of agriculture i.e. cropping,livestock and fisheries are expected to increase in future, particularly in developing countries where adaptive capacity is low. According to the Intergovernmental Panel on Climate Change (IPCC) the agriculture sector accounts for almost 13% of global anthropogenic greenhouse gas emissions (GHGs). The negative Impacts on agriculture threaten both food security and agricultural sustainability in rural livelihoods and developing countries. So that to combat from harmful impacts of climate change and to sustain food security a new concept of Climate Smart Agriculture (CSA) came into light.So that as research established a link between climate change and agriculture. This formed a new concept of “climate-smart agriculture”. This climate adaptive andProtectiveagricultural system can be facilitate climate change adaptation strategies and provide mitigation advantages and to improve world’s food security problem for poorer and livelihoods of rural families. CSA hasmanaging the reverse pattern and position of agriculture that is vital in mitigating and adapting to climate change. Agriculture that sustainably increases productivity, adapt to changing climatic conditions, lessen greenhouse gases (GHGs), and achieving the food security and development targets, known as CSA.

The concept of “climate-smart agriculture” was come into view in 2010. The development of this term and idea has been developed by international organizations and institutions, especially the World Bank and the United Nations Food and Agriculture Organization (FAO). The Consultative Group on International Agricultural Research (CGIAR), France has provided leadership, extension services, knowledge and technology to the world’s research community as the idea of climate-smart agriculture has matured. However, climate-smart agriculture requires actions beyond the farm scale. World develop a conceptual model of climate-smart agriculture as agriculture that can be ensure to bring us closer towards safe working with agricultural and food systems across spatial and temporal scales. Agriculture is said to be “climate smart” when it contributes to enhancing, adaptation, mitigation and food security in a sustainable manner. Recently, this concept pre-dominates the current issues in agricultural development because of its strength to bind all the agendas of agricultural sustainability, food security and climate change under single floor. This concept will bring prioritizing key areas of attention, suchas (1) improved adaptive managementand mitigation strategies; (2) gathering of qualitative and quantitative integrated data, information, system knowledge, environment and analytical tools for improved models for decision-making; (3) governance of social-ecological systems; (4) development of meaningful and relevant integrated indicators of social-ecological sustainable systems and (5) development of legitimate and empowered science policy dialogues on local to international scales to facilitate decision making.

What is Climate Smart Agriculture

To ensure a food-secure future, farming must become climate resilient. Around the world, governments and communities are adopting innovations that are improving the lives of millions while reducing agriculture’s climate footprint. These successful examples show the many ways

climate-smart agriculture can take shape, and should serve as inspiration for future policies and investments. Climate Smart Agriculture (CSA) is defined as "agriculture that sustainably increases productivity and resilience (adaptation), reduces greenhouse gases (mitigation), and enhances food security and development" (FAO, 2010). CSA turns the climate change threats that have to be tackled into new business opportunities for the sector in different regions and therefore provides a triple win action and strategies for adaptation, mitigation and economic growth. According to World Bank, climatesmart agriculture includes "integrated planning of land, agriculture, fisheries, and water at multiple scales(local,watershed, regional)."

Climate-smart agriculture (CSA) is an integrative and interacting approach to address these interlinked challenges of food security and climate change, that having three objectives: (1) sustainably increasing agricultural productivity, to support increases in farm incomes, food security and socioeconomic development; (2) adapting and building agricultural resilience and food security systems to climate change at multiple levels; and (3) reducing emissions of greenhouse gas (GHGs) from agriculture activities (including crops, livestock and fisheries). CSA invites to consider these three objectives together at different scales - from farm to landscape–at different levels - from local to global and over short and long time horizons, taking into account national and local specificities and priorities. Climate smart agriculture aims for three main benefits: (I) Increased food security (II) Resilience to the impacts of climate change (adaptation) (III) Reduced greenhouse gas emissions (mitigation).

History of climate-smart agriculture

For understanding the repulsion between maximizing global agricultural productivity, increasing resilience of agricultural systems in the face of climate change and mitigating greenhouse gas (GHG) emissions from agriculture, in 2009, a new term climatesmartagricultural development was first time used. After some years, at the First Global Conference on Agriculture,FoodSecurity and Climate Change at TheHague, Netherlands the conceptofclimate-smart agriculture (CSA) was presented and defined as agriculture that "sustainably increases productivity, enhances resilience, reduces/removes greenhouse gas emissions, and enhances achievement of national food security and development goals". The term CSA was coined by FAO in 2010 in Hague Conference onFood Security, Agriculture and Climate Change by using the background document prepared for this conference. The CSA concept was developed with strong focusing targets on food security and sustainable development, for present and the future generations, including adaptation and mitigation to climate change. After in the Second Global Conference on Agriculture, Food Security and Climate Change held inHanoi, Vietnam in 2012, published Climate-Smart AgricultureSource book for further advancing the concept with theintention of benefiting primarily smallholder farmers and vulnerable people in developing countries. The CSA concept presently has wide ownership and popular among regional and international agencies, governments, civil society, private sector and farming communities. Climate-Smart Agriculture (ACSA) provides a platform for shared learning and collaboration among all interested parties through emerging global and regional (Africa) Alliances.

Africa is a leading example of CSA, and the Africa Climate-Smart Agriculture Alliance will help ensure thatthe agriculture sector can continue to be an engine for enhancing of economic growth and social development for all people, even in the face of climate change," said

NkosanaDlamini-Zuma, Chair of the AUCommission. The International Fund for Agricultural Development (IFAD) and the World Bank announced that 100 % of their agricultural investment portfolios in climate-smart agriculture by 2018 that is near about $11 billion. The Consultative Group on International Agricultural Research (CGIAR) over the next 10 years for climate-smart agriculture research will allocate $10.2 billion. Other organizations involving in climate smart projects and research are the Global Research Alliance for Agriculture (GRA) on Agricultural Greenhouse Gases, the Global Forum on Agricultural Research (GFAR), the International FertilizerDevelopment Centre (IFDC) and several European organizations.

More than 30 organizations, 20 Governments and several companies announced they will join the newly launched Global Alliance for Climate-Smart Agriculture. These countries joining represent millions offarmers, at least 1/4th of the world cereal production, 43 million undernourished and malnourished people and 16 % of total greenhouse gas emissions from agriculture. Several big food retailers like McDonald's, Walmart and Kellogg Company announced that they will increase their food chain supply through climate smart approaches. The commitment of thesemajor companies will widely expand the use of sustainable agricultural practicesand mitigating carbonemissions fromagricultural practices.

A North-American Climate Smart Agriculture Alliance will also be established to help farmers, farming societies, ranchers, rural people and foresters adapt to climate change, improve resilient capacity and ease the associated risks of the production process. "I am glad to see action that will increase agricultural productivity, build resilience for farmers and reduce carbon emissions," said United Nations Secretary-General Ban Ki-moon. These efforts will improve food and nutrition security for billions of people."

Main elements of climate-smart agriculture

Climate-smart agriculture combined to the actions both on-farm and beyond the farm, and incorporates technologies, policies, organizations, institutions and investment. Different elements which are integrated in climate-smart agricultural approaches and policies include:

1. Farm and livestock
2. Ecosystem and landscape management
3. Services for farmers and land managers.

Actions are needed to implement climate-smart agriculture

Governments, organizations, institutions and partners seeking to facilitate the implementation of CSA can undertake a range of actions to provide the base for effective CSA towards agricultural systems, landscapes and food chain systems. CSA approaches include four major types of rebuilt actions:

(1) Assessment of agricultural growth strategies for food security

(2) Policy framework and scale of support

(3) Building climate risk and adaptation practices, technologies and processes

(4) Financial support towards risk

(5) Timely agro-advisory information.

Constraints

Several climate-smart agricultural practices can be integrated into a single farming system and will provide a range of benefits that can improve livelihoods and incomes of farmers and agricultural community. However, there are practices that cannot be integrated because they impact upon other elements of the farmer and farming system. There are several drawbacks like the timing of a practice may lead to labour constraints, marginal lands with low production potential, high investment or maintenance costs may exceed the capacity of asset poor farmers and competition for crop residues mayrestrict the availability of feed for livestock, biofuel and biogas production. So that to identifying these constraints isimportant to developing economically viable and environmentally sustainable management practices that have adaptation and mitigation benefits towards climate change for farming community.

Phytochemistry and Pharmacological properties of *Phyllanthus amarus* Schum. : A Review

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Abstract

Medicinal plants are important for human health by prevention of several human diseases. One of such medicinal plant species which used widely is *Phyllanthus amarus*. This herb is used as traditional medicine in many countries for more than 3,000 years. It is popular in indigenious system of medicine like ayurveda, siddha, unani homoepathy and is used for its hepatoprotective, antitumour, antidiabetic, antihypertensive, analgesic, anti-inflammatory and antimicrobial properties. The plant is also used in dropsy, jaundice, diarrhoea, dysentery, intermittent fevers, cold and has a good anti-viral activity against hepatitis B virus. *Phyllanthus amarus* has also served as lead for several experimental investigations that explored its phytochemical constituents and pharmacological uses. The Present review compiles traditional uses, phytochemical and pharmacological properties of *Phyllanthus amarus.*

Keywords: *Phyllanthus amarus* Schum., traditional uses, phytochemical and pharmacological properties.

Introduction

Phyllanthus amarus is also known as "Bhui amla" and is belonging to the family Euphorbiaceae. It is a very large genus and has about approximately 550 to 750 species which are found in tropical and subtropical countries of the world. It is an annual herb grows to a height 6 inches-15 inches. Stem is angular with numerous distichous, elliptic oblong leaves. Flowers are yellowish, whitish or greenish, auxillary, males flowers in groups of 1-3 whereas females are solitary. Fruits are depressed-globose like smooth capsules present underneath the branches and seeds are trigonous, pale brown with longitudinal parallel ribs on the back. The plant has been found in Philippine, Cuba, Nigeria and among others. In India, *Phyllanthus amarus* is widely distributed as a weed in cultivated and waste lands.

Taxonomy:

Kingdom	:	Plantae
Division	:	Angiospermae
Class	:	Dicotyledoneae
Order	:	Tubiflorae
Family	:	Euphorbiaceae
Genus	:	*Phyllanthus*
Species	:	*amarus*

Fig. 1: *Phyllanthus amarus*

Traditional Uses

Phyllanthus amarus herb has a number of traditional uses in several health related problems such as diarrhoea, dysentery, dropsy, jaundice, intermittent fevers, urinogenital disorders, scabies and wounds. Further, these are used in the treatment of kidney problems, urinary bladder disturbances, pain, gonorrhea, diabetes and chronic dysentery. Topically, it is used for several skin problems sach as skin ulcers, sores, swelling and itchiness, wounds, scabies and tubercular ulcers, ringworm, scabby and crusty lesions. It has a urolithic property, dissolving renal calculi. Also, used in cough, asthma and other bronchial infections. It is used in the treatment of gallstones, other kidney related problems, appendix inflammation and prostate problems. Because of its efficacy in the field of gastro-intestinal disorders it is used in the treatment of disorders like dyspepsia, colic, constipation and dysentery. The herb has found to be effective in several female problems such as in leucorrhoea, menorrhagia and mammary abscess and can act as galactagogue. The young shoots of plant are administered in the form of an infusion for the treatment of chronic dysentery. Fresh leaf paste has wound healing capacity and used to cure white spots on skin & jaundice. The stem juice is also used as wound healers. The whole plant extract is used in urinary problems & swelling of liver. The root extract is used to cure stomach pain. The flower paste of *Phyllanthus amarus* is applied externally as antidote against snake bite.

Phytochemical Studies

Phyllanthus amarus have numerous phytochemical constituents such as alkaloids, flavonoids, tannins, lignins, polyphenolic compounds and tetracyclic triterpenoids. Several phytoconstituents isolated from this plant.

Pharmacological Activity

Anticancer activity

The aqueous extract of *Phyllanthus amarus* demonstrates potent anticancer activity against 20- metylcholanthrene (20-MC) induced sarcoma development. The aqueous extract inhibits DNA topoisomerase II of mutant cell cultures and inhibited cell cycle regulatory enzyme cdc 25 tyrosine phosphatase of Saccharomyces cerevisiae. The anticarcinogenic and anti-tumour activity of *Phyllanthus amarus* proposed to be inhibition of metabolic activation of carcinogen as well as the inhibition of cell cycle regulators responsible for cancerous growth and DNA repair.

Antioxidative Activity

The DPPH assay is used to determine the antioxidant potential, which is based on the reduction of stable radical DPPH to yellow coloured diphenyl picryl hydrazine. Thus, the ability of the test samples to quench this radical is a measure of its antioxidative ability. *Phyllanthus amarus* have powerful antioxidant property. In another study, it has been found that boiled water extract of the fresh and dried *Phyllanthus amarus* plant had comparatively greater antioxidant activity than microwave assisted extraction method employed for the extraction.

Actions on Kidney Stones & Uric Acid

In a clinical study it is reported that a significant increase in diuresis and sodium and creatine excretion after 1-3 months treatment with *Phyllanthus amarus* tea. Calcium oxalate crystals are the building blocks of most kidney stones can be prevented by the administration of *P. amarus* proved in an in-vitro clinical study. *P. amarus* also increased bile acid secretion (demonstrated choleretic activity) and significantly lowered blood cholesterol levels in rats.

Antinociceptive Activity

The hydroalcoholic extract of four *Phyllanthus* species namely *Phyllanthus amarus, Phyllanthus orbiculatus, Phyllanthus fraternus* and *Phyllanthus stipulatus* were given intraperitoneally and evaluated in acetic acid-induced writhing and formalin and capsaicin-induced licking effects. In the formalin test, it was observed that the hydroalcoholic extract of four species produced graded inhibition against both phases of formalin-induced licking, inhibition in licking being more active in the late phase. Apart from the above models, hydroalcoholic extract of the species also elicited significant reduction in the capsaicin-induced neurogenic pain. It was also observed that hydroalcoholic extract of the *Phyllanthus* species was less potent and efficacious when given orally compared to intraperitoneal route.

Antimicrobial activity

Antimicrobial activity of ethanol and water extracts of *Phyllanthus amarus* were evaluated against the test organisms *Salmonella typhi*. This study establishes one of the traditional uses of *Phyllanthus amarus* against typhoid fever. In another study, hexane, petroleum ether, chloroform, acetone and methanol extract of *Phyllanthus amarus* leaves were tested for antibacterial activity against *Pseudomonas aeruginosa, Klebsiella pneumonia, Proteus mirabilis, Streptococcus faecalis, Enterobacter species, Serratia marcescens, Staphylococcus*

aureus and *Escherichia coli* by agar well diffusion method. The results demonstrated methanol extract of *Phyllanthus amarus* for highest inhibitory activity against above bacterial species. Similarly, in another study antimicrobial potential of *Phyllanthus amarus* were investigated using agar well diffusion method for activity against several drug resistant pathogens such as *Escherichia coli, Pseudomonas aeruginosa, Staphylococcus aureus* and *Klebsiella Species.*

Antileptospiral Activity

Leptospirosis is globally important disease found mainly wherever human come in contact with the urine of infected animals or urine contaminated environment. *Phyllanthus amarus* have been investigated for the antileptospiral activity by micro dilution tests and tube dilution technique. The results revealed the inhibitory action of methanolic and aqueous extract of whole plant of *Phyllanthus amarus* against leptospira.

Anticonvulsant Activity

Epilepsy is a major neurological disorder characterized by the occurrence of recurrent seizures. The two widely proposed mechanisms involve alterations in the voltage-dependent ion channels such as reduction in inhibitory GABA-mediated drive or increase in excitatory glutamate mediated inputs. This chronic progressive CNS disorder affects a large population of the world. In search of herbal treatment, aqueous and ethanolic extract of *Phyllanthus amarus* were evaluated for anticonvulsant effect using pentylenetetrazole (PTZ) and maximal electroshock-induced seizures (MES) in swiss albino rats. The result showed ethanolic and aqueous extract of leaves and stem of *Phyllanthus amarus* significantly effective in abolishing hind limb extension induced by MES as well as PTZ induced seizures.

Antidiabetic Activity

Diabetes is a metabolic disorder of carbohydrate and is considered as the world's largest endocrine disease. The antidiabetic potential of *Phyllanthus amarus* investigated in an experiment model where fasted rats were made diabetic by single intraperitoneal injection of 60 mg/kg of stz model and then two doses of the aqueous and hydroalcoholic extract of *Phyllanthus amarus* administered orally which were then compared with the normal control group that received distilled water only. After 15 days treatment the result demonstrates aqueous and hydroalcoholic extract of *Phyllanthus amarus* decrease the blood glucose level significantly. Serum analysis of the treated experimental animals showed an increase in insulin and reduction in the malondialdehyde concentration, therefore demonstrated the potential antidiabetic property of aqueous and hydroalcoholic extract of *Phyllanthus amarus*. In another study the methanolic extract of *Phyllanthus amarus* was found to inhibit lipid perxidation & scavenge hydroxyl and superoxide radicals. Since free radicals are linked with diabetes, therefore quenching of free radical could be one mechanism of action.

Anti-Inflammatory Activity

The Hexane extract (HE), the lignan-Rich Fraction(LRF), or the lignans phyltetralin, nirtetralin, niranthin of *Phyllanthus amarus* when given orally inhibited carrageenan (Cg)-induced paw oedema and neutrophil influx. The Hexane Extract, the LRF, or nirtetralin also inhibited the increase of IL1-β tissue levels induced by Carrageenan. Bradykinin (BK)-, platelet activating

factor (PAF)- and endothelin-1 (ET-1)-induced paw oedema were significantly inhibited by the HE or LRF. Finally, nirtetralin or phyltetralin caused inhibition of paw oedema induced by PAF or ET-1. These results show that the HE, the LRF and the lignans niranthin, phyltetralin and nirtetralin exhibited marked anti-inflammatory potential.

Nephroprotective and cardioprotective activity

Nephroprotective and cardioprotective effect of *Phyllanthus amarus* is evident from the study in which methanol extract of *Phyllanthus amarus* leaves caused a significant dose dependent decrease in the levels of total cholesterol, urea, total protein, uric acid, and prostatic, alkaline and acid phosphatases, aspartate transaminase (AST) and alanine transaminase (ALT). Since increase in these enzymes is related to hepatic and heart disorders therefore their reduction shows that the leaves of *Phyllanthus amarus* have hepato protective, nephroprotective and cardioprotective properties.

Antiviral activity

Phyllanthus amarus possess antifungal, antiviral properties. Antiviral activity of *Phyllanthus* species were evidented from experiment study where aqueous extract of *Phyllanthus amarus* along with other species of *Phyllanthus* genus were evaluated against Herpes Simplex Virus type-1 and Herpes Simplex Virus type-2 in vero cells by quantitative polymerase chain reaction. Western blot and 2D-gel electrophoresis were used to study protein expressions of treated and untreated infected vero cells. *Phyllanthus amarus* along with *Phyllanthus urinaria* demonstrate the strongest antiviral activity against *Herpes Simplex Virus type-1* and *Herpes Simplex Virus type-2* which is proposed to its action in the early stage of infection and replication.

Conclusion

Phyllanthus amarus possesses flavonoids, alkaloids, lignans etc. The pharmacological activities mentioned in this review establish the therapeutic value of this herb. Thus activity guided phytochemical may leads to development of novel agents for various disorders. The available literature regarding the chemical compositions and pharmacological activities appear to be very impressive.

References

1. Mazumder A, Mahato A, Mazumder R. Antimicrobial potentiality of *Phyllanthus amarus* against drug resistant pathogens. Natural Product Research 2006; 20(04):323–326.
2. Tahseen M, Mishra G. Ethnobotany and Diuretic Activity of Some Selected Indian Medicinal Plants. The Pharma Innovation 2013; 2:112.
3. Itoro E, Ukana D, Ekaete D. Phytochemical screening and nutrient analysis of *Phyllanthus amarus*. Asian Journal of Plant Science and Research 2013; 3:116-122.
4. Sayyada Khatoon Vartika Rai, "Comparative pharmacognostic studies of three *Phyllanthus* species" Journal of Ethnopharmacology 2006; 104: 79–86.
5. Joseph B, Raj SJ. An Overview: Pharmacognostic Property of *Phyllanthus amrus* linn. International Journal of Pharmacology 2011; 1:41.
6. Chandewar A, Dhongade H. Pharmacognostical and Phytochemical studies of *Phyllanthus amarus* leaves. International Journal of Biomedical and Advance Research 2013; 4:383.

7. Adegoke AA, Iberi PA, Akinpelu DA, Aiyegoro P. Studies on phytochemical screening and antimicrobial potentials of *Phyllanthus amarus* against multiple antibiotic resistant bacteria. International Journal of Applied Research in Natural Products 2010; 3:6.

8. Patel JR, Tripathi P, Sharma V, Chauhan NS, Dixit VK. *Phyllanthus amarus* Ethnomedicinal uses phytochemistry and pharmacology: A review. Journal of Ethnopharmacology 2011; 138(2):286–313.

9. Zingare A. Antimicrobial activity of six members of Euphorbiaceae. New Interdisciplinary National Research Journal 2013; 2:112.

10. Khatoon S, Rai V, Rawat A. Comparative pharmacognostic studies of three *Phyllanthus* species. Journal of Ethnopharmacology 2004; 104:79-86.

11. Sen A, Batra A. The study of in vitro and in vivo antioxidant activity and total phenolic content of *Phyllanthus amarus Schum Thonn*: A medicinally important plant. International Journal of Pharmacy and Pharmaceutical Sciences 2013; 5:947.

12. Ushie O, Neji P, Etim E. Phytochemical screening and antimicrobial activities of *Phyllanthus amarus* stem bark extracts. International Journal of Modern Biology and Medicines 2013; 3:101-112.

13. Rajeshkumar NV, Joy KL, Kuttan G, Ramsewak RS, Nair MG, Kuttan R. Antitumour and anticarcinogenic activity of *Phyllanthus amarus* extract. Journal of Ethnopharmacology 2002; 81(1):17-22.

14. Lim Y, Murtijaya J. Antioxidant properties of *Phyllanthus amarus* extracts as affected by different drying methods. Food Science and Technology 2007; 40(9):1664-1669.

15 Murugaiyah V et al. Antihyperuricemic lignans from the leaves of *Phyllanthus niruri*. Planta Med 2006; 72(14): 1262-7.

16. Micali S et al. Can *Phyllanthus niruri* affect the efficacy of extracorporeal shock wave lithotripsy for renal stones? A randomized, prospective, longterm study. J. Urol 2006; 176(3): 1020-2.

17. Itoro E, Ukana D, Ekaete D. Phytochemical screening and nutrient analysis of *Phyllanthus amarus*. Asian Journal of Plant Science and Research 2013; 3:116-122.

18. Oluwafemi F, Debiri F. Antimicrobial Effect of Phyllanthus amarus and Parquetina nigrescens on Salmonella typhi. African Journal of Biomedical Research 2008; 11(2):215- 219.

19. Saranraj P, Sivasakthivelan P. Screening of Antibacterial Activity of the Medicinal Plant *Phyllanthus amarus* Against Urinary Tract Infection Causing Bacterial Pathogens. Applied Journal of Hygiene 2012; 1(3):19-24.

20. Chandan S, Umesha S, Balamurugan V. Anti Leptospiral Antioxidant and DNA damaging properties of Eclipta alba and *Phyllanthus amarus*. Open Access Scientific Reports. 2012; 1(4):1-8.

21. Manikkoth S, Deepa B, Joy AE, Rao S. Anticonvulsant activity of *Phyllanthus amarus* in experimental animal models 2011; 4:144-149.

22. Moshi MJ, Lutale JJ, Rimoy GH, Abbas ZG, Josiah RM, Swai AB. The effect of *Phyllanthus amarus* aqueous extract on blood glucose in non-insulin dependent diabetic patients. Phytotherapy Research 2001; 15(7):577-80.

23. Evi PL, Degbeku K. Antidiabetic Activity of *Phyllanthus amarus* Schum and Thonn on Alloxan induced diabetes in Male Wistar Rats. Journal of Applied Sciences 2011; 11(16):2968-2973.

24. Kiran D, Rohilla A, Rohilla S. *Phyllanthus amarus* an ample therapeutic potential herb. International Journal of Research in Ayurveda & Pharmacy 2011; 2(4):1099.

25. Oberley LW. Free radicals and diabetes. Free Radical Biology and Medcine 1988; 5(2):113–24.

26. Kassuya, C.A.L., F.P.L. Daniela, V.M. Lucilia, G.R. Vera-Lucia and B.C. Joao, 2005. Anti-inflammatory properties of extract, fractions and lignans isolated from *Phyllanthus amarus*. Planta Med., 71: 721-726.

27. Obianime AW, Uchie FI. The phytochemical screening and the effects of methanolic extract of *Phyllanthus amarus* leaf on the biochemical parameters of male guinea pigs. Journal of Applied Sciences and Environmental Management 2008; 12(4):73-77.

28. Tan W, Jaganath I, Manikam I. Evaluation of antiviral activities of four local Malaysian *Phyllanthus* species against Herpes simplex viruses and possible antiviral target. International Journal of Medical Sciences 2013; 10(13):1817-1892.

Regeneration dynamics of dominant tree species in temperate forests of Keran valley, Kashmir Himalaya

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Abstract

The existence of a species in the forest ecosystems depends to a greater extent on its natural regeneration capacity under varied environmental conditions. The regeneration potential is the ability of a species to complete its life cycle in a given environment, which indicates the fate of the forest in general and suitability of a species to forest environmental conditions in particular. The present study was undertaken to study the regeneration potential of the dominant tree species in the temperate forest of Keran Valley, Kashmir Himalaya. For this purpose, two forest sites were selected based on community composition. The plant associations were recognized on the basis of IVI values of the species. Forest site I (FS-1) was dominated by the species like *Pinus wallichiana, Parrotiopsis jacquemontiana and Dyropteris stewartii,* where as forest site II (FS-II) showed the predominance of species such as *Cedrus deodara, Parrotiopsis jacquemontiana, Stipa sibirica*. A total of 37 plant species belonging to 35 genera and 23 families were recorded from the sampled forest sites. The seedling density of (FS-1) (3200 seedlings per ha) was higher than that of (FS-II) (1200 seedling per ha). Sapling density also followed the same trend, i.e., higher (2300 saplings per ha) at (FS-1) and lower (800 saplings per ha) at (FS-II). The ratio of seedling and saplings to trees indicated the regeneration performance of the tree species in the two forest sites. The regeneration performance was not very much satisfactory because most of the species had low Se/T and Sa/T ratios. 50% and 33% of the tree species had 'no regeneration performance' at (FS-1) and (FS-II) respectively. The results of the present study highlight that there is a urgent need of scientific measures to be taken especially by local government to improve the regeneration performance of these forests so that they can be conserved for sustainable utilization.

Keywords: Forests; Kashmir Himalaya; Regeneration potential; Seedling density;

Introduction

Forests are dynamic entities. Seedlings germinate, grow and compete with each other and with larger trees. Some survive for hundreds of years while others perish during development because of many reasons. Forests are renewable only because they regenerate (Tripathi and Khan, 2007; Malik 2014). Regeneration is the process of silvigenesis by which trees and forests survive over time (Bhuyan et al., 2003). Regeneration potential is the ability of a

species to complete the life cycle. Regeneration is a key process for the existence of species in a community under varied environmental conditions. Regeneration is also a critical part of forest management, because it maintains the desired species composition and stocking after various disturbances (Khumbongmayum et al., 2005). A sustained regeneration and growth of all species in the presence of older plants is required for the growth of any plant community (Taylor and Zisheng, 1988).

The successful regeneration of a tree species depends on the ability of its seedlings and saplings to survive and grow (Good and Good, 1972). Successful regeneration is perhaps the single most important step towards achieving long term sustainability of forests (Malik and Bhatt, 2016). The population structure characterized by the presence of sufficient number of seedlings, saplings and young trees depicts satisfactory regeneration behavior; inadequate number of seedlings and saplings of tree species in a forest indicates poor regeneration, while complete absence of seedlings and saplings of tree species in a forest indicates no regeneration (Saxena and Singh, 1984).

The successful regeneration of a tree species depends on the ability of its seedlings and saplings to survive and grow (Good and Good, 1972). Successful regeneration is perhaps the single most important step towards achieving long term sustainability of forests (Saikia and Khan, 2013). The population structure characterised by the presence of sufficient number of seedlings, saplings and young trees depicts satisfactory regeneration behaviour, inadequate number of seedlings and saplings of tree species in a forest indicates poor regeneration, while complete absence of seedlings and saplings of tree species in a forest indicates no regeneration (Saxena and Singh, 1984). The study of regeneration of forest trees has important implications for the management of natural forests, and is one of the thrust areas of forestry. Research in this field contributes to planning, conservation and decision making in forest resources management programmes and hence the dynamics of regeneration forms a major area of thrust into the study of management of natural forests (Dekker and de Graaf, 2003).

In general, it has been observed that mountain forests have poor regeneration capacity (Krauchi et al. 2000) and the same is true for the Himalayan forests (Singh et al. 2016). Several workers have also presented quantitative tree regeneration status from different region of Himalayas like Western Himalaya (Gairola et al. 2012;Malik and Bhatt 2016;Singh et al. 2016),Central Himalaya (Pant and Samant 2012) and Eastern Himalaya (Rawat et al. 2018). However, there is a paucity of quantitative information on tree regeneration status in Kashmir Himalaya region. Keeping in mind the aforesaid facts, the objective to study the regeneration performance of tree species in the two forests of Keran Valley (Kashmir Himalaya) was undertaken.

Materials and methods

Study area

Kashmir Himalaya, located in the extreme northwest of the Himalayan biodiversity hotspot, harbors a rich floristic diversity (Dar and Khuroo 2013). The region is endowed with a recorded forest cover of 50.97%. Broadly, the region possesses Himalayan dry temperate forest type (FSI 2017). For the present study, we have selected the forest sites representative of the

region from the Keran valley. Falling under administrative unit of District Kupwara, the Keran valley is located between 34º 34’ 0” - 34º 42’ 30” N and 73º 55’ 15”- 74º 17’ 05” E (Fig. 1 and Table 1). Drained by the Kishanganga (Neelum) river, the valley is mostly inhabited by *Pahari* and *Gujjar* tribes. With a total human population of 12026, the valley is divided into three *Panchayats* (village administrative units): Keran, Mundiyan and Pathran.

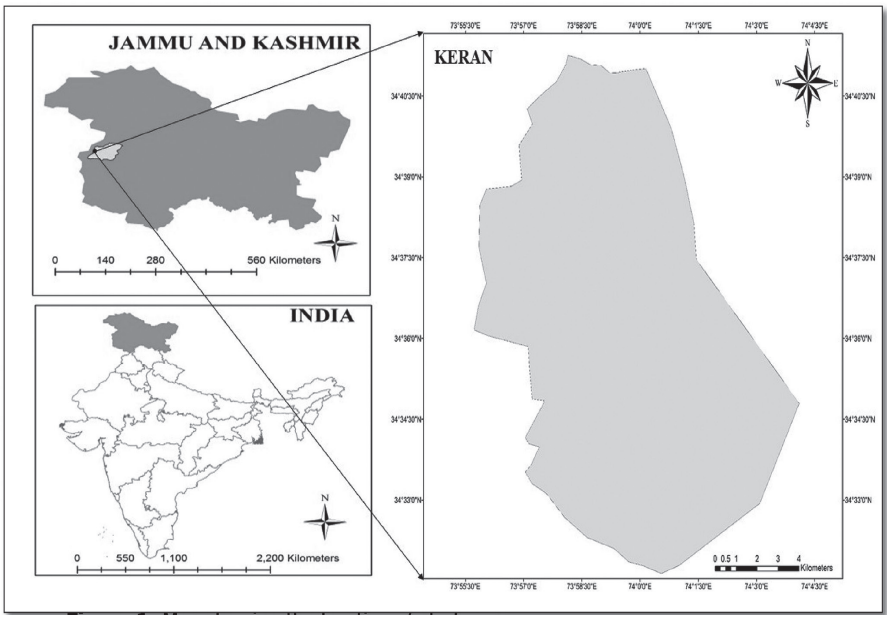

Fig. 1: Map showing the location of study area.

Table 1: Details of the study area

Parameter	Forest Site I	Forest Site II
Geo-coordinates	34º 39’ 06.2” 73º **57’ 18.6”**	34º 38’ 52” 73º **57’ 59”**
Altitudinal range	1550-1650 m asl	1530-1630 m asl
Slope (°)	33.97± 15.24	35.1± 8.04
Crown density (%)	52.75± 8.38	47.95± 5.06

Methodology

The selected forests at different altitudes were visited round the year to assess the regeneration status of tree species and survival of the seedlings. Two forest sites were selected based on community composition. The plant associations were recognized on the basis of IVI values of the species. Population structure of the entire tree species occurring in each forest was studied during April 2016 -April 2017 using quadrat method following Khan et al. (1986) and Khumbongmayun et al., (2005). In each of the selected forests twenty permanent quadrats of 5m×5m size were established. Species were identified and density of all the individuals of seedlings (<20 cm height), saplings (<30 cm collar circumference at the base and>20

cm in height) and trees (≥30cm dbh) were determined. Regeneration status of species was determined based on population size of seedlings and saplings (Khan et al., 1987; Uma Shankar, 2001). Regeneration performance was determined by the ratio of seedling and saplings to trees (Gairola et al., 2012).

Results

Community composition

A total of 37 plant species belonging to 35 genera and 23families were recorded from the sampled forest sites (Table 2). The maximum number of species was represented by herbaceous life form, followed by trees, and shrubs (Fig. 2). 31 and 27 species were reported from FS-1 and FS-II respectively; twenty (20) species were common to both of them (Table 2).

At FS-I, *Pinus wallichiana* with highest IVI (135.8) was found to be the dominant tree species, and *Cedrus deodara* (IVI=131.7) was growing as a co-dominant tree species. In contrast, at the FS-II, *Cedrus deodara* was dominant (IVI-159.4) while *Pinus wallichiana*(IVI-108.5)was growing as co-dominant (Table 2).In case of shrub layer, *Parrotiopsis jacquemontiana*with IVI values of 130 and 119.4 was dominant species at the FS-I and FS-II respectively (Table 2). Among the herbaceous layer, fern *Dyropteris stewartii* and *Stipa sibirica* with highest IVI values of 60.58 and 43.6were dominant at FS-I and FS-II respectively (Table 2).The different phytosociological attributes of the studied forest sites varied from each other (Table 3).

Table 2: Forest community composition of the FS-I and FS-II forest sites with constituent species IVI values

Species	Family	Habit	IVI (FS -1)	IVI (FS-II)
*Cedrus deodara*G.Don	Pinaceae	Tree	131.7	159.2
*Pinus wallichiana*A.B.Jacks.	Pinaceae	Tree	135.8	108.5
Aesculusindica Hook.	Sapindaceae	Tree	20.91	16.19
*Prunuscornuta*Steud.	Rosaceae	Tree	11.61	-
Morusnigra L.	Moraceae	Tree	-	16.19
*Parrotiopsisjacquemontiana*Rehder	Hamamelidaceae	Shrub	130.2	119.4
Viburnum grandiflorum Wall. ex DC.	Adoxaceae	Shrub	104.5	107.2
Rosa webbiana Wall. ex Royle	Rosaceae	Shrub	28.45	-
*Sorbariatomentosa*Rehder	Rosaceae	Shrub	36.9	73.33
Adiantumvenustum D. Don	Pteridaceae	Herb	21.66	-
Aspleniumofeliae Salgado, A.E	Aspleniaceae	Herb	4.632	20.21
Chenopodium album L.	Lamiaceae	Herb	4.47	6.868
Conyzacanadensis (L.) Cronquist	Asteraceae	Herb	-	5.341
Digitalis purpurea L.	Plantaginaceae	Herb	6.447	14.99
Dryopterisstewartii Fraser-Jenk.	Dryopteridaceae	Herb	60.58	29.35

Species	Family	Habit	IVI (FS -1)	IVI (FS-II)
*Fragarianubicola*Lindl. ex Lacaita	Rosaceae	Herb	13.33	39.45
Galiumpalustre L.	Rubiaceae	Herb	9.49	-
*Geranium wallichianum*D.Don ex Sweet	Geraniaceae	Herb	9.751	15.16
Hedera helix L.	Araliaceae	Climber	8.791	7.003
*Hederanepalensis*K.Koch	Araliaceae	Climber	11.19	11.44
Myosotisarvensis Hill	Boraginaceae	Herb	6.447	-
Leucanthemumvulgare Lam.	Asteraceae	Herb	-	12.66
Oxalis acetosella L.	Oxalidaceae	Herb	10.63	19.95
*Polygonumamplexicaule*D.Don	Polygonaceae	Herb	13.33	10.78
*Potentillaatrosanguinea*G.Lodd. ex D.Don	Rosaceae	Herb	17.3	-
Pteracanthusalatus(Nees) Bremek.	Acanthaceae	Herb	-	7.003
Potentillanepalensis Hook.	Rosaceae	Herb	6.067	-
Pteriscretica L.	Pteridaceae	Herb	10.71	-
*Rumexnapalensis*Meisn.	Polygonaceae	Herb	6.447	5.895
Sambucuswightiana Wall. ex Wight &Arn.	Adoxaceae	Herb	4.47	-
*Silene vulgaris*Garcke	Caryophyllaceae	Herb	4.47	-
Stipasibirica Lam.	Poaceae	Herb	37.03	43.6
*Stellaria media*Vill.	Caryophyllaceae	Herb	-	12.54
*Taraxacumofficinale*Weber ex F.H.Wigg	Asteraceae	Herb	-	12.66
Trifoliumpratense L	Fabaceae	Herb	7.749	8.613
*Veronica laxa*Benth.	Plantaginaceae	Herb	11.68	-
Viola odorata L.	Violaceae	Herb	13.33	11.15

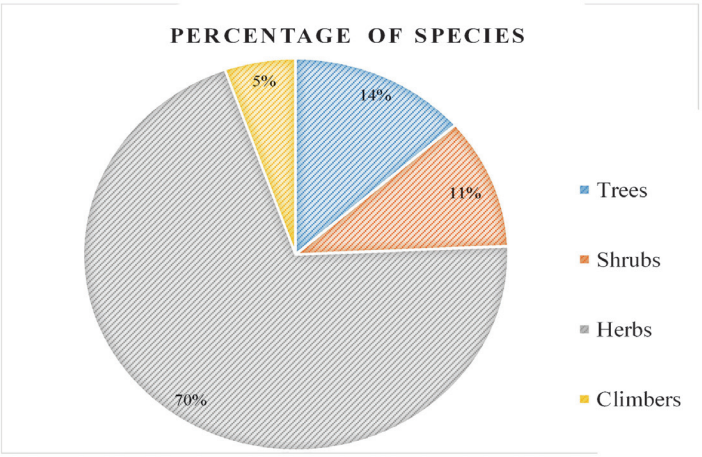

Fig. 2: Percentage of plant species in different life forms

Table 3 Phytosociological attributes of the studied forest sites

Forest Site	Habitat type	No of species recorded	Margalef richness index	Species diversity ($\bar{H}$)	Dominance Index	Equitability index	Density (stems/ha)	Total Basal Area (m^2/ha)
FS-I	Open	31	1.3	2.48	0.78	0.48	222 ± 60	284± 80
FS-II	Open	27	1.1	1.89	0.48	0.21	180 ± 67	357 ± 115

Regeneration performance

The number of tree species representing seedling and sapling stage varied in the two sites (Table 4). The seedling density of FS-I (3200 seedlings per ha) was higher than that of FS-II (1200 seedling per ha). Sapling density also followed the same trend, i.e., higher (2300 saplings per ha) at FS-I and lower (800 saplings per ha) at FS-II. The ratio of seedling and saplings to trees indicated the regeneration performance of the tree species in the two forest sites (Table 4and Figure 3).

Table 4. Regeneration performance indicated as the ratio of seedling and sapling to tree densities in the studied forests*.

	Forest Site I				Forest Site II			
Tree species	**Densities/ ha**	**Ratios**	**FS-I**	**Regeneration performance**	**Densities/ ha**	**Ratios**	**FS-II**	**Regeneration Performance**
	Se, Sa and T	**(Se, Sa/T)**			**Se, Sa and T**	**(Se, Sa/T)**		
Cedrus deodara	900 (Se), 600 (Sa)	Se/T	8.18	Sufficient	100 (Se)	Se/T	0.84	Hampered
	110 (T)	Sa/T	5.45		118 (T)	Sa/T	0/118	
Pinus wallichiana	2300 (Se), 1700 (Sa)	Se/T	24.7	High	200 (SE), 100 (Sa)	Se/T	4.41	Moderate
	93 (T)	Sa/T	18.3		68 (T)	Sa/T	2.94	
Aesculus indica	-	Se/T	0/5	Absent	-	Se/T	0/3	Absent
	5 (T)	Sa/T	0/5		3 (T)	Sa/T	0/3	
Prunus cornuta	-	Se/T	0/3	Absent	-	Se/T	-	-
	3 (T)	Sa/T	0/3		-	Sa/T	-	
Quercus baloot	-	Se/T	-	-	600 (Se), 500 (Sa)	Se/T	600/0	Establishing

	-	Sa/T	-		-	Sa/T	500/0	
Morus nigra	-	Se/T	-	-	-	Se/T	0/3	Absent
	-	Sa/T	-		3 (T)	Sa/T	0/3	
Quercus incana	-	Se/T	-	-	-	Se/T	200/0	Establishing
	-	Sa/T	-		-	Sa/T	100/0	
Total	3200(Se); 2300(Sa)	Se/T	15.16		1200 (Se), 800 (Sa)	Se/T	6.26	
	211 (T)	**Sa/T**	**10.9**		192 (T)	Sa/T	4.16	

*Density= number of individuals per hectare, Se=seedling, Sa=Sapling, T=Tree

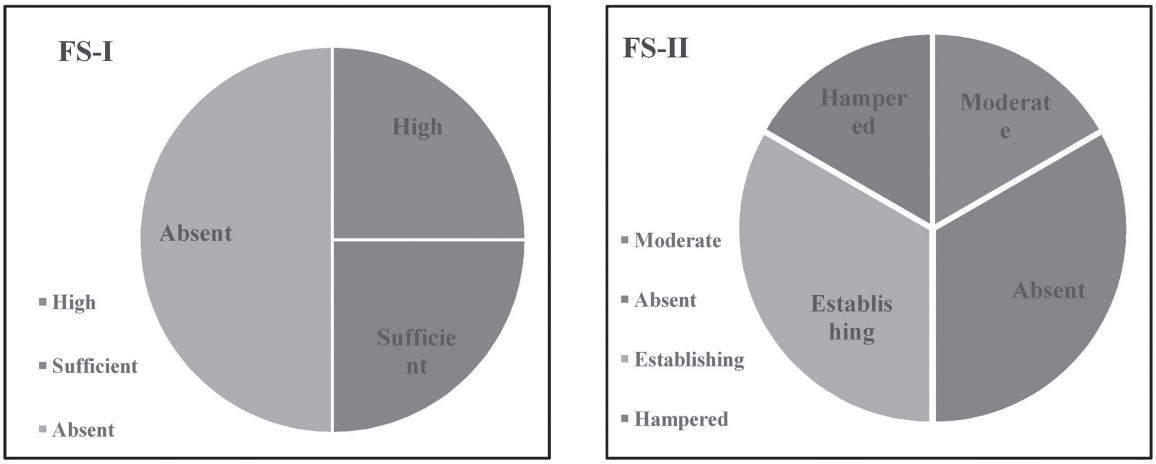

Fig. 3: Regeneration performance of tree species in the studied forests

Discussion

The wealth of forest depends on the potential regenerative status of species composing the forest stand, in space and time (Jones et al., 1994). The regeneration of a forest is a vital process in which old trees die and are replaced by young ones in perpetuity (Malik, 2014; Malik and Bhatt, 2016). Knowing the regeneration potential and regeneration performance is of crucial importance for the maintenance of natural forests. In this study an attempt was made to study the tree regeneration performance of Keran Valley forests of Kashmir Himalaya. The overall picture of the regeneration performance of the tree species in the studied forests is shown in Fig. 3 and Table 4. At FS-I, 50% of the tree species had zero regeneration performance. These species include *Aesculus indica* and *Prunus cornuta.* This was due to absence of seedling and sapling stages of these species (Table 4). *Cedrus deodara* showed 'sufficient' regeneration performance due to moderate values of seedlings per tree (Se/T=8.18)

and saplings per tree (Sa/T=5.45). *Pinus wallichiana* had 'high' regeneration performance due to high values of Se/T (24.73) and Sa/T (18.27). In case of FS-II, 17%, 33%, 33% and 17% had moderate, absent, establishing and hampered regeneration performance respectively (Figure 3). *Cedrus deodara* had hampered regeneration performance due to low value of Se/T ratio and absence of sapling stage (Se/T=0.84; Sa/T=0/118). *Pinus wallichiana* showed moderate regeneration performance due to moderate values of Se/T and Sa/T ratios (Se/T=4.41; Sa/T=2.94). *Aesculus indica* and *Morus nigra* (both had Se/T=0/3; Sa/T=0/3) had 'no' regeneration performance in the FS-II due to absence of seedling and sapling stages. At FS-II, the 'establishing' regeneration performance was shown by the two species of *Quercus* i.e. *Q. baloot* and *Q. incana.* These were represented only by seedling and sapling stages and not by any adult tree (Table 4). These species are in the transition state of establishment and hence showed establishing regeneration performance.

In the present study, seedling and sapling densities (per hectare) varied between 1200 (FS-II)- 3200 (FS-I) and 800 (FS-II)-2300 (FS-I) respectively. Malik and Bhatt (2016) while studying the regeneration status of tree species of Kedarnath Wildlife Sanctuary reported the seedling and sapling densities to be 1670-7485 seedlings/ha and 1850-5690 saplings/ha respectively. Singh et al., 2016 also reported the similar results from (seedlings 1376-9600/ha and saplings 167-1296/ha) Garhwal Himalaya.

In the present study area, the regeneration performance was not very much satisfactory because most of the species had low Se/T and Sa/T ratios. Various anthropogenic disturbances such as over grazing, lopping and forest fires adversely affect the regeneration performance of Himalayan forests (Malik et al., 2016). The tree species that showed either 'absent' or 'hampered' regeneration performance will be trouble in future. So it is the duty of citizens and local government to take care of these forests so that their regeneration performance in increased. The results of the present study highlight that there is a urgent need of scientific measures to be taken especially by local government to improve the regeneration performance of these forests so that they can be conserved for sustainable utilization.

References

1. Bhuyan, P., Khan, M. L. and Tripathi, R. S. (2003). Tree diversity and population structure in undisturbed and human-impacted stands of tropical wet evergreen forest in Arunachal Pradesh, Eastern Himalayas, India. Biodiversity and Conservation, 12(8): 1753-1773.
2. Dar GH, Khuroo AA (2013) Floristic diversity in the Kashmir Himalaya: progress, problem and prospects. Sains Malaysiana 42: 1368-1377.
3. Dekker, M. I. and de Graaf, N. R. (2003). Pioneer and climax tree regeneration following selective logging in Suriname. Forest Ecology and Management, 172: 183–190.
4. Gairola, S., Sharma, C. M., Ghildiyal, S. K. and Suyal, S. (2012). Regeneration dynamics of dominant tree species along an altitudinal gradient in moist temperate valley slopes of the Garhwal Himalaya. Journal of Forestry Research, 23(1): 53-63.
5. Good, N. F. and Good, R. E. (1972). Population dynamics of tree seedlings and saplings in mature Eastern hardwood forest. Bulletin of the Torrey Botanical Club, 99 (4): 172-178.
6. Jones, R. H., Sharitz, R. R., Dixon, P. M., Segal, P. S. and Schneider, R. L. (1994). Woody plant regeneration in four flood plants forests. Ecological Monographs, 64: 345–367.
7. Khan, M. L., Rai, J. P. N. and Tripathi, R. S. (1986). Regeneration and survival of tree seedlings and sprouts in tropical deciduous and sub-tropical forests of Meghalaya, India. Forest Ecology and Management, 14: 293–304.

8. Khan, M.L., Rai, J. P. N. and Tripathi, R. S. (1987). Population structure of some tree species in disturbed and protected sub-tropical forests of North East India. Acta Oecologica: Oecologica Applicata, 8: 247–255.

9. Khumbongmayum, A. D., Khan, M. L. and Tripathi, R. S. (2005). Survival and growth of seedlings of a few tree species in the four sacred groves of Manipur, Northeast India. Current Science, 88 (11): 1781-1788.

10. Krauchii, N., Brang, P. and Schonenberger, W. (2000). Forests of mountainous regions: Gaps in knowledge and research needs. Forest Ecology and Management, 132: 73–82.

11. Malik ZA, Bhatt AB (2015) Regeneration status of tree species and survival of their seedlings in Kedarnath Wildlife Sanctuary and its adjoining areas in Western Himalaya, India. Tropical Ecology 57(4): 677-690.

12. Malik ZA. 2014. Phytosociological behavoiur, anthropogenic disturbances and regeneration status along an altitudinal gradient in Kedarnath Wildlife Sanctuary (KWLS) and its adjoining areas. PhD thesis. HNB Garhwal University, Srinagar Uttarakhand, India.

13. Malik, Z. A., Pandey, R and Bhatt, A. B. (2016). Anthropogenic disturbances and their impact on vegetation in Western Himalaya, India. Journal of Mountain Science, 13 (1): 69–82.

14. Pant, S. and Sammant, S. S. (2012). Diversity and regeneration status of tree species in Khokhan Wildlife Sanctuary, north-western Himalaya. Tropical Ecology, 53(3): 317-331.

15. Rawat D.S., Dash S.S., Sinha B.K., Kumar V., Banerjee A. and Singh P. (2018). Community structure and regeneration status of tree species in Eastern Himalaya: A case study from Neora Valley National Park, West Bengal, India. Taiwania, 63(1): 16–24.

16. Saikia, P. and Khan, M. L. (2013). Population structure and regeneration status of Aquilaria malaccensis Lam. in homegardens of Upper Assam, northeast India. Tropical Ecology 54(1): 1-13.

17. Saxena, A. K. and Singh, J. S. (1984). Tree population structure of certain Himalayan forest associations and implications concerning the future composition. Vegetatio, 58 (2): 61-69.

18. Singh, S., Malik, Z. A., and Sharma, C. M. (2016). Tree species richness, diversity, and regeneration status in different oak (*Quercus* spp.) dominated forests of Garhwal Himalaya, India. Journal of Asia-Pacific Biodiversity9 (3): 293-300.

19. Taylor, A. H. and Zisheng, Q. (1988). Regeneration patterns in old growth Abies-Betula forest in the Wolong Natural Reserve, Sichuan, China. Journal of Ecology, 76: 1204–1218.

20. Tripathi, R. S. and Khan, M. L. (2007). Regeneration dynamics of natural forests - a review. Proceedings of Indian National Science Academy, 73: 167-195.

21. Uma Shankar (2001). A case study of high tree diversity in a sal (Shorea robusta)- dominated lowland forest of Eastern Himalaya: floristic composition, regeneration and conservation. Current Science, 81: 776–786.

Biotechnology in Animal Production in Developing Countries

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Abstract

Biotechnology in animal production is widely used to increase not only the number of a species of livestock animals to meet the requirement for world demand of animal products but also for endangered species to enhance the propagation and sustaining the current levels of biodiversity and genetic diversity. Animal production biotechnology can be defined as the application of scientific and engineering principles to the processing or production of materials by animals or aquatic species to provide goods and services for the well being of human population (NRC 2003). Examples of animal biotechnology include generation of transgenic animals or transgenic fish (animals or fish with one or more genes introduced by human intervention), using gene knockout technology to generate animals in which a specific gene has been inactivated, production of nearly identical animals by somatic cell nuclear transfer (also referred to as clones), or production of infertile aquatic species. However, the only alternative way to improvement or increase the animal production performance is through application of assisted reproductive techniques (ART) in the farm practices. The techniques are such as semen cryopreservation, artificial insemination (AI), oestrus synchronisation and superovulation, laparoscopic ovum pick-up (LOPU), in vitro maturation, fertilisation and culture (IVMFC), intracytoplasmic sperm injection (ICSI), embryo sexing, embryo/oocyte cryopreservation, cloning, stem cell, embryo transfer, ultrasonography (pregnancy diagnosis) and radioimmunoassay (RIA).

Keywords: Animal production, Biotechnology, Developing countries.

Introduction

According to the estimation by Food and Agriculture Organisation of the United Nations (FAO), 70% of world population will be in hunger in 50 years from now (2060). It has been reported that the world human consumption for the animal protein was 29 g per capita daily (or 10 kg per capita consumption). Especially in the advanced countries, the human consumption was approximately 90 kg animal protein per capita consumption. However, the trend toward increased per capita demand for animal source foods is occurring primarily in developing countries (80% of world population). Through biotechnology, it has the potential to improve the productivity of animals via increase growth, carcass quality and reproduction, improved nutrition and feed utilisation, improved quality and safety of food, improved health and welfare of animals and reduced waste through more efficient utilisation of resources. Therefore, the biotechnology of livestock production is growing faster than any other sectors; and by 2020

livestock is predicted to become the most important agricultural sector in terms of value-added commodity [1]. The global meat production in year 2000 is 229 million metric tones; and it has been predicted will increase up to a 465 million metric tonnes in year 2050. Therefore, the application of biotechnology in production of livestock animal is a need and must to meet the worldwide demand as well as for the genetic improvement in the animal diversity. However, in order to meet this challenge we need the requirement of global efforts to develop and use sustainable practices. Through the biotechnology activities in production of livestock animal, it has the ability and potential to increase the income and sustained growth in per capita income and changes in diet and lifestyle of human population. It has been reported that the livestock production currently accounts for about 43% of the gross value of agricultural production [2]. In developed countries, livestock accounts for more than half of agricultural production, while in developing countries the share is about one-third [1].

Implications of Biotechnology in Animal Production

Purchasing power of the poor increases (average incomes and access to staple food products are improved). Rapid growth of animal production stimulates demand for land and increased the value of land, labour and non-agricultural goods and services, leading to economic growth [3, 4]. Poor people spend this additional income due to animal improvement through biotechnology to buy food. Consequently, nutrition, prevention of disease and health-care will be improved. However, biotechnology should be tailored specific to socio-economic situation of a country (e.g. aids in infrastructures and marketing mechanism). However, studies have revealed that the commercialisation of agriculture has reduced the nutritional security of the poor [5, 6]. Therefore, technology, infrastructure and related institution with multi-enterprise are essentials and carefully planned and implemented to ensure animal production is economically viable and sustainable, particularly for the developing countries. The introduction of multi-enterprise systems in agricultural diversification is seen as the way forward for agriculture in the economic growth especially in developing world; such systems could lift small-scale and marginal farmers out of poverty [7]. Through the introduction of this multi-enterprise system into the production of livestock animal would enhance the purchasing power of farmers and would help them to obtain food security. Besides that, these systems may also support the natural environment and contribute to the wealth creation, thus leading to higher overall growth in the agricultural economy [1].

Livestock Industry in India

The livestock industry in India comprises the large and highly commercialised sub-sector of poultry and pigs. In India, the ruminant sub-sector products are highly dependent on importation, for examples 50% of beef, 90% of mutton/goat meat and 95% of milk and milk products are imported annually to meet the local demand. Correspondingly, India has attained self-sufficiency in poultry meat, egg and pork, but only 30% self-sufficiency in beef, 10 % in mutton/goat meat and 5% in milk. While, for the source of fish, marine fisheries account for over 60%, whereas aquaculture accounts for about 10%. The priority areas of animal biotechnology in India are as follows: 1) animal production improvement through reproductive technology, 2) animal feed improvement from local sources, 3) application of biotechnology in aquaculture health management, and 4) production of biological reagent through recombinant DNA technology (such as vaccines, diagnosis system and vaccines delivery). In other words, the specific

research priority areas in India are focused on genetic engineering of animals for improved production and quality, improvement of reproductive technologies, development of cheap feedstuff from local resources, novel vaccines and drug delivery systems and development of rapid diagnostic kits. Animal reproductive biotechnologies are essential to improve the genetics of animals at a rapid rate, to multiply the population of animals at a rapid rate, to facilitate import and export of animals through cryopreservation of gametes and embryos and to increase the income of entrepreneurs and farmers especially in developing countries. As for the animal breeding and reproduction, the thrust areas are in vitro conservation and use of animal genetic resources from indigenous domestic and wild animals and genetic improvement of ruminants using reproductive biotechnologies and recombinant DNA technology. The stage is now set to expand the available technologies to accelerate genetic improvement for identification of individual genes to increase the accuracy of predicting breeding performance. For the animal nutrition and production, the thrust areas include enzymes and microbial additives, growth promotants and regulators, manipulation of rumen ecosystem and bioprocessing of low quality feed. Feed constitutes a major portion of the total animal production costs. Efficient utilisation of feed to produce meat, milk and eggs can therefore significantly reduce overall production costs. For the fish production and health, the thrust areas encompass genetic improvement of selected food and ornamental fish, disease diagnosis and control, conservation of genetic resources and fish as a sensor of pollution. Genetic manipulation and gene transfer can improve production and quality of both cultured and ornamental fish. Studies are also needed on conservation of genetic resources by cryopreservation and use of fish as a sensor of pollution of the aquatic environment. For the animal health, the thrust areas include development of diagnostic reagents and kits, development of vaccines and food safety. Effective disease control is a major prerequisite in enhancing livestock productivity. Effective rapid diagnostic tests to identify the causative agents are either not commercially available or they are too expensive to be cost effective. Food safety and zoonotic diseases are also of major concern.

Major Technologies in Animal Production in Developing Countries

In the developing countries, application of animal biotechnology is essential to improve animal production and to conserve the indigenous animal genetic resources. Specifically, animal reproductive biotechnologies will be useful in augmenting reproduction, implementing embryo transfer and related technologies, diagnosing diseases and controlling and improving nutrient availability. One application of animal biotechnology is through the production of transgenic animals which is also known as genetically modified organism. Currently, no genetically modified animals have yet been released on farms. However, active research activities have been made globally to develop transgenic animals targeting specific genetic traits of interest, such as growth hormone gene (to increase growth rate), phytase gene (to reduce phosphorous emissions from pigs) and keratin gene (to improve wool of sheep). At this point in time, development of transgenic animal technologies is at its infancy and at research level due to high costs, inefficiency of the gene transfer technique and low reproductive rate of animals. However, human therapeutic proteins in their milk, have organs for xeno-transplantation and resistant to diseases have been produced satisfactorily through application of animal cloning research. In an effort to improve health through vaccines development, two approaches to develop vaccines using rDNA are proposed: 1) deleting genes that determine the virulence

of the pathogen (producing attenuated organisms to produce live vaccines) and 2) identifying protein subunits of pathogen that can stimulate immunity. This approach to improve human and animal health through vaccination is one of the most effective and sustainable methods of controlling diseases in the future. As for diagnostics and epidemiology, it is important for epidemic disease to pinpoint the source of infection in order to control the diseases and to enable to identify the agents causing diseases (e.g. viruses, bacteria and fungi) by nucleotide sequencing, enabling their origins to be traced. The nutrition and feed utilisation of livestock animals in developing countries include shortages of feed and increase cost of feed ingredients, improvement of nutrient availability and animal productivity currently used through biotechnology approaches {(enzymes, probiotics, single-cell protein and antibiotics in feed) and (gene-based technologies modifying feed to be more digestible or modifying digestive and metabolism systems to use feed efficiently)}.

Major Constraints on Applying the Technology in Developing World

The constraints and limitation of biotechnology in animal production in developing countries are due to factors such as the poor conditions of the human population in such countries that include poverty, malnutrition, disease, poor hygiene and unemployment [8]. In other words, the progress of biotechnology applications is hampered by physico-edu-medico-socio-economic situations of the developing countries. The major constraints have been specifically listed out by Madan (2003), which include:

- Lack of database on livestock and animal owners in most of the developing world
- Biodiversity within species and breeds
- Biotechnologies development in developed countries not suitable for developing countries
- Uniqueness of animal breeds in developing world (each has its own developmental, production, disease resistance and nutrient utilisation characteristics)
- Lack of trained scientists, technicians and field-workers
- Absence of mechanism between industry, universities and institutions for technology transfer
- Expensive technology to be purchased from developed world
- High cost of technological inputs
- Poor biosafety measures of biotechnology developed in developing countries
- Negligible investment in animal biotechnology
- Lack of clear policy and commitment from the government

Conclusions

Biotechnology in animal production in developing countries has been applied only in a few areas such as conservation, animal improvement, healthcare (diagnosis and control of diseases) and augmentation of feed resources. Adopting biotechnology has benefitted by in

animal improvement and economic returns to the livestock entrepreneurs and small producers. However, developing countries has to address issues relating to political commitment, trained manpower, infrastructure and funding in research development as well as industries. In a nutshell, investing in animal production and biotechnologies is a must because it can bring social sustainability, economic prosperity, food security and safety, rural wealth creation and health improvements especially to poor populations in the developing countries.

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References

[1]. M. L. Madan. Animal biotechnology: applications and economic implications in developing countries. Rev. Sci. Tech. Off. Int. Epitz. 2005, 24(1): 127-139.

[2]. S. Jutzi. Applications of gene-based technologies for improving animal production and health in developing countries. FAO/IAEA International Symposium, Vienna, Austria, 6-10 October 2003. Opening address. Food and Agriculture Organisation/ International Atomic Energy Agency, Vienna.

[3]. S. Fan, P. Hazell, and S. Thorat. Government spending, growth and poverty: an analysis of literlinkages in rural India. Environment and Production Technology Division discussion paper No. 33, International Food Policy Research Institute, Washington, DC. 1998, p. 92.

[4]. P. Hazell, and S. Haggblade. Farm-nonfarm growth linkages and the welfare of the poor. In: M. Lipton and J. Van der Gaag (eds.). Including the poor. World Bank, Washington, DC. 1993, pp. 190-204.

[5]. H. Hobbelink. New hope or false promise? Biotechnology and Third World agriculture. International Coalition for Development Action, Brussels. 1987, p. 72.

[6]. J. W. Mellor. The new economics of growth: 40 years of agricultural development; what is old, what is new. Asian J. Agric. Econ. 1997, 2, 123-129.

[7]. K. Dorjee, S. Broca, and P. Pingali. Diversification in South Asian agriculture: trends and constraints. ESA Working paper 03-15. Food and Agriculture Organisation, Rome. 2003, p. 23.

[8]. M. L. Madan. Opportunities and constraints for using gene-based technologies in animal agriculture in developing countries and possible role of international donor agencies in promoting R&D in this field. In: FAO/IAEA international symposium on applications of gene-based technologies for improving animal production and health in developing countries, Vienna, Austria, 6-10 October 2003. Food and Agriculture Organisation/ International Atomic Energy Agency, Vienna. 2003, pp. 103-104.

Aerobic Rice –An Efficient Water Management Strategy for Rice Production

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Abstract

Rice (*Oryza sativa* L.) is the world's most important staple food. Although mainly produced in Asia (91%), it is consumed on all continents and its global importance and consumption is increasing. The limited scope to expand production areas coupled with increasing resource constraints (mainly the lack of or competing demands for land and water) make it difficult to meet necessary production increases. Water shortage is becoming severe in many rice-growing areas in the world, prompting the introduction of water-saving aerobic rice, which is direct-seeded in nonpuddled, nonflooded aerobic soil. Aerobic rice saved 73% of irrigation water for land preparation and 56% during the crop growth period, 'Aerobic rice' and 'upland rice' are both grown under aerobic conditions. However, the former is under controlled water management, but the latter is not. Although the technology of growing rice with the new aerobic rice system need to be advance refined or developed, a broad adoption of this systems is expected to ensure rice production in water-short areas, and result in significant water saving.

Keywords: Aerobic rice, Upland, Water management, Water saving

Introduction

Rice is the staple food of about 3 billion people and demand is expected to continue to grow as population increases [1] .Globally rice is grown over an area of about 149 million ha with an annual production of 600 million tonnes [2]. In India, rice is cultivated round the year in one or the other part of the country, in diverse ecologies spread over 43.46 M ha with a production of 101.8 MT of rice and average productivity of 3.36 t ha^{-1} [3]. Scarcity of fresh water resources, such as in the world´s leading rice-producing countries China and India has threatened the production of the flood-irrigated rice crop [4]. Asia's food security depends largely on irrigated lowland rice fields, which produce three-quarters of all rice harvested. However, the increasing scarcity of fresh water threatens the sustainability of the irrigated rice ecosystem [5]. Irrigated lowland rice in Asia usually has standing water for most of the growing season. In NW-IGP, increasing use of groundwater for rice cultivation has led to declines in water table by 0.1 to 1.0 m yr^{-1}, resulting in water scarcity and increased cost for pumping water [6].

One way to reduce water and labour demand is to grow dry seeded rice (DSR) instead of the puddled transplanted rice [7]. A new development in water-saving technologies is the concept of aerobic rice. In aerobic rice systems, fields remain unsaturated throughout the season. Rice has been grown under non flooded, aerobic soil conditions in uplands for centuries, but average yields are only 1-2 t ha^{-1}, because of adverse environmental conditions (poor soils, little rainfall, weeds), low use of external inputs, and low yield potential of upland

rice cultivars. The new concept of aerobic rice entails the use of nutrient-responsive cultivars that are adapted to aerobic soils [8], aiming at yields of 70–80% of high-input flooded rice. The target environments are irrigated lowlands where water is insufficient to keep lowland (rain fed or irrigated) paddy fields flooded and favourable uplands with access to supplementary irrigation. To keep up with increasing demand for food combined with increasing scarcity of water, several water-saving technologies such as alternate wetting and drying (AWD) [9] and aerobically grown rice have been developed in order to increase water productivity. Aerobically grown rice may be an option for farmers where water has become too scarce or expensive to grow flooded rice, and in rainfed areas where rainfall is insufficient for flooded rice production but sufficient for upland crops [10].

Origin and History

International Rice Research Institute (IRRI) developed the aerobic rice technology to address the water crisis in tropical agriculture. In aerobic rice systems, wherein the crop is established in non-puddled, non-flooded fields and rice is grown like an upland crop (unsaturated condition) with adequate inputs and supplementary irrigation when rainfall is insufficient [11]. The new concept of aerobic rice may be an alternate strategy, which combines the characteristics of rice varieties adopted in upland with less water requirement and irrigated varieties with high response to inputs. In China, the water use for aerobic rice production was 55–56% lower than the flooded rice with 1.6–1.9 times higher water productivity. It indicates that aerobic rice may be a viable option where the shortage of water does not allow the growing of lowland rice.

Effect of aerobic rice on yield attributes

The yield difference between aerobic and flooded rice was attributed more to biomass production than to harvest index. Among yield components, sink size (spikelets m^{-2}) contributed more to the yield gap between aerobic and flooded rice than grain filling percentage and 1000-grain weight. In general, flooded rice produced more panicles with more spikelets per panicle than aerobic rice. Like grain yield, the difference in yield attributes between the first season aerobic rice and flooded rice was small. Rapid yield decline was reported under continuous upland rice cropping [12] and under monocropping of aerobic rice [13] in the Philippines. Studies on bottlenecks in yield formation under aerobic condition analysed using Handao varieties in North China have shown, sink size as the major limitation of aerobic rice yield, because in aerobic rice spikelet number m^{-2} was too low (20000-24 000) compared with the lowland rice. So, future research should focus on effects of water regimes on tiller dynamics to increase yield [14].

Effect of aerobic rice on Yield

The yield difference between aerobic and flooded rice ranged from 8 to 69% depending on the number of seasons that aerobic rice has been continuously grown. The yield gap between aerobic and flooded rice widened as the number of cropping seasons increased [15]. Peng *et al.* (2006) reported the maximum yield gap in the seventh season when the difference between the aerobic rice and flooded rice reached 69% in 'Apo' [16]. In general, the difference in yield between aerobic and flooded rice was greater in DS than in WS, which was associated with difference in the soil water status of aerobic rice between DS and WS [11]. The soil was wetter

in WS because of more frequent rains than in DS. Yield declined by 30–60% in the second season under continuous upland rice cropping for variety 'IR 2061- 464-2-4' [12]. Grain yield decreased by up to 73% in the third season compared to the second season under mono cropping of aerobic rice for variety "UPLRi-5" [13].

Effect of aerobic rice on Organic Nutrition and uptake

Minhas and Sood (1994) reported that the organic matter after decomposition release macro- and micronutrients to the soil solution, which becomes available to the plants, resulting in higher uptake. Singh *et al* (1998) reported that the application of 7.5 t FYM ha^{-1} produced significantly more grain and straw yields over unfertilized fields. The entire yield attributing characters of rice increased with increasing rates of FYM. Organic farming with *dhaincha* (*Sesbania aculeata* L.) made considerable improvement in grain yield of rice. Belder *et al.* (2005) reported relatively low uptake of nitrogen under aerobic conditions as compared to flooded conditions which was reflected by the relatively low fertilizer-N recovery under aerobic conditions [14]. Of the 150 kg N ha^{-1} applied, only an average of 22% was taken up by the crop while 31% was left in the soil and roots after harvest. Since nitrate concentrations in groundwater and soil water were negligible, most of the 47% N unaccounted for must have left the system as gaseous-N losses promoted by rapid nitrification–denitrification processes. A higher recovery of N in aerobic rice (more than the 22%) was desirable to increase N application efficiency, thereby reducing fertilizer costs to farmers, and reduce gaseous-N losses to the environment such as N_2O, which is a potent greenhouse gas. Belder *et al.* (2005) suggested combining water treatments with N treatments to optimize yield and resource-use efficiency. Fertilizer N application as basal just before transplanting showed the lowest N recovery. High N recoveries up to 0.6–0.7 kg kg^{-1} in arable cereal crops show that higher N recoveries in aerobic rice might be possible when N dose and timing better match the N requirement of the crop [11].

Effect of aerobic rice on Changes in soil properties

Peng *et al.* (2006) reported decline in soil organic matter as a possible reason for a decline in yield under aerobic cultivation, because total soil N at physiological maturity in the micro plots was not significantly lower in aerobic than in continuously flooded soil in both 2002 and 2003 [16]. Since soil-extractable NO_3 + NH_4+ did not constitute more than 0.2% of total N at physiological maturity, almost all N was in organic form. Assuming that C:N ratios were not different between flooded and aerobic soils lead them to conclude that soil organic matter content did not differ between the two water regimes after both seasons. They predicted a decline in soil organic matter under aerobic system as compared with permanent flooding or the rotational flooded rice-aerobic rice.

Effect of aerobic rice on micronutrient status

For upland rice production, Yoshida (1975) mentioned inadequate water supply as the primary constraint to yield, followed by N when water is sufficient. But also restricted uptake of nutrients other than N may be a limitation for rice in aerobic soils [17]. In flooded soils, the majority of plant nutrients are usually more available, with exceptions for S, Zn, Cu, and P, availability of Fe and Mn is often particularly high in anaerobic soils because of low redox potential [18]. In aerobic

soils, however, Fe and Mn may become limiting, especially when the soil pH is high. Moreover, nutrient uptake and supply to plants may be reduced because of lower delivery rates to roots through mass flow and diffusion as both of these processes are influenced by the reduced soil water content.

Effect of aerobic rice on Physiological changes under water stress

Drought is undoubtedly one of the most important environmental stresses limiting the productivity of crop plants around the world. Rice is considered a drought sensitive crop species, however, within this species; there are considerable varietal differences in sensitivity to this environmental stress. In aerobic rice crop may face water stress. Drought stress decreases the rate of photosynthesis [23]. Severe drought stress also inhibits the photosynthesis of plants by causing changes in chlorophyll content, by affecting cholorophyll components and by damaging the photosynthetic apparatus [24]. Plants can partly protect themselves against mild drought stress by accumulating osmolytes. Proline is one of the most common compatible osmolytes in drought stressed plants. Proline accumulation can also be observed with other stresses such as high temperature and under starvation. Proline metabolism in plants, however, has mainly been studied in response to osmotic stress. Proline does not interfere with normal biochemical reactions but allows the plants to survive under stress [25]. The accumulation of proline in plant tissues is also a clear marker for environmental stress, particularly in plants under drought stress [26].

The aerobic rice production system has been reported to be less sustainable than irrigated rice systems operated under predominantly flooded soil conditions, especially when aerobic rice is grown in sequence for several years. In a long-term aerobic rice experiment at IRRI, yields of aerobic rice gradually declined over time as compared to a continuously flooded control [16]. In Brazil, yield declined after 2 years of consecutive upland cultivation and rice yields after 5 years of monoculture were only 1.2 t ha^{-1} compared with 4.3 t ha^{-1} after 3 years of soybean [27]. For continuously grown upland rice in the Philippines, yield reductions of 30–60% as well as yield failures [12] and rapid yield loss in repeated cropping of aerobic rice George *et al.,* 2002) were reported. Such a yield decline may be associated with auto toxicity (allelopathy), as assumed for Brazil [27], or the phenomenon of soil sickness, which comprises the potentially interwoven effects of allelopathy, nutrient depletion, buildup of soil-borne pests and diseases, and soil structural degradation [12].

Effect of aerobic rice on Water saving and water productivity

Water requirement of low land rice varies from 1,650 to 3000 mm. Aerobic rice production system eliminates continuous seepage and percolation losses, greatly reduces evaporation as no standing water is present at any time during the cropping season, and effectively uses the rainfall and thus helps in enhancing water productivity, concomitant loss of soil sediments, silt and fertility from the soil. A comparison of water requirement of lowland flooded rice and aerobic rice system clearly shows that aerobic rice system can save about 45 per cent of water [28]. Water saving in the aerobic rice system compared with the conventionally irrigated lowland rice results mainly from (1) no water losses during land preparation, (2) less percolation and seepage due to the elimination of the pressure head of the ponded water layer normally maintained in an irrigated field, and (3) less evaporation [11].

Weed problems in aerobic rice

In traditional irrigated lowland rice systems, rice has a two- to three-week head start over weeds, which favours rice in competition against weeds that have not emerged yet at transplanting, and the water layer after transplanting effectively suppresses the emergence and growth of most weed flora, including upland and semi-aquatic weeds. Among rice ecosystems, therefore, the greatest weed pressure and competition occurs in upland and aerobic rice, and the least in transplanted irrigated and rainfed lowland rice. Mahajan *et al*. (2011) found almost double weed density and biomass in aerobic rice field than those of conventional transplanted rice at 35 and 75 days after sowing/transplanting [29]. In conventional transplanted system, weeds are suppressed by standing water and by transplanted rice seedlings, which have a 'head start' over germinating weed seedlings. On the other hand, aerobic soil dry-tillage and alternate wetting and drying conditions are conducive for germination and growth of weeds causing grain yield loss of 50 to 91% [30]. Thus, it appears that weed is the major constraint to aerobic rice production and therefore, success of this technology mostly depends on effective weed management.

Conclusion

Over the centuries, lowland rice has proven to be a remarkably sustainable system for rice production mostly because of its luxurious water availability. But the present day water crisis threatens the sustainability of lowland rice production and necessitates the adoption of water saving irrigation technologies. Technologies like saturated soil culture and alternate wetting and drying are receiving renewed attention by researchers. These technologies reduce water inputs only at the expense of yield. Aerobic rice is a new concept to decrease water requirements in rice production and is highly suitable for irrigated lowland rice with insufficient rainfall and favourable uplands with access to Experiments on aerobic rice have shown that water requirement in aerobic rice were more than 50 per cent lower (only 470-650 mm) and water productivities were 64-88 per cent higher than the lowland rice.

Rapid degradation of rice ecologies due to imbalanced use of fertilizers and unscientific water management has put tremendous pressure on the rice growers to make rice farming economically viable and ecologically sustainable. The concept of aerobic rice holds promise for farmers in water-short irrigated rice environments where water availability at the farm level is too low or where water is too expensive to grow flooded lowland rice. In India, aerobic rice systems are still very much in the research and development phase and varieties developed for another environment are evaluated under aerobic system. However, more varieties need to be evaluated and their nitrogen requirement should be assessed. From the review, it is unambiguous that, aerobic rice cultivation has been identified as a potential new technology, which can reduce water use in rice production and also recognized as an economically attractive crop. But, the major hurdle of mounting weed pressure has to be removed so as to make aerobic rice cultivation more efficient in terms of returns on farmer investments and use of water resources.

References

1. Carriger S. and Vallee D. More crop per drop, Rice Today, 6 (2), 10-13, **(2007).**
2. Bernier J. et al. Review, Breeding upland rice for drought resistance. Journal of Science, Food and Agriculture 88,927-939, **(2008)**.

3. Anonymous, *Digest of Statistics*. Directorate of Economics, Statistics, Planning and Development. DOS (32) 110:112, **(2013)**
4. Singh R, Van Dam JC, Feddes RA, Water productivity analysis of irrigated crops in Sirsa district, India. Agric. Water Manage., 82, 253-278, **(2006).**
5. Tuong T.P. and Bouman B.A.M. Rice production in water-scarce environments. In, Kijne J.W., Barker R., Molden D. (Eds.), Water Productivity in Agriculture, Limits and Opportunities for Improvement. CABI Publishing, UK, 53–67,**(2003).**
6. Humphreys E. et al., Halting the groundwater decline in north-west India—Which crop technologies will be winners? Advances in Agronomy, 109, 155-217, **(2010).**
7. Yadav S. et al., Effect of water management on dry seeded and puddle transplanted rice. Part 1. Crop performance. Field Crops Research, 120, 112-122, **(2010).**
8. Lafitte H.R. and Courtois B. Genetic improvement of rice in aerobic systems, progress from yield to genes. Field Crop Research, 75,171–190 **(2002).**
9. Cabangon R.J. et al., Comparing water input and water productivity of transplanted and direct seeded rice production systems. Agricultural Water Management, 57,11– 31,**(2002).**
10. Bouman B.A.M. et al., Performance of aerobic rice varieties under irrigated conditions in North China. Field Crops Research, 97,53–65, **(2006).**
11. Bouman B.A.M. et al., Rice and water. Advances in Agronomy, 92,187-237,**(2005).**
12. Ventura W. and Watanabe, I. Growth inhibition due to continuous cropping of dryland rice and other crops. Soil Science and Plant Nutrition, 24,375–389, **(1978).**
13. George T. et al., Rapid yield loss of rice cropped successively in aerobic soil. Agronomy Journal 94,981–989, **(2002).**
14. Xie G.H., et al., Agri. Sci. China. 6, 641-646**, (2008).**
15. Belder P. et al., Crop performance, nitrogen and water use in flooded and aerobic rice. Plant Soil, 273,167–182, **(2005)**.
16. Peng S. et al., Comparison between aerobic and flooded rice in the tropics, agronomic performance in an eight-season experiment. Field Crops Research, 96,252–259, **(2006).**
17. Yoshida S. Factors that limit the growth and yields of upland rice. In, Major Research in Upland Rice, International Rice Research Institute, Los Ban˜os, Laguna, 46–71, **(1975).** Int. J. Res. BioSciences 6
18. Dobermann A. and Fairhurst T. Nutrient Management. In, Rice. Nutrient Disorders & Nutrient Management. IRRI. Makati City, Philippines, 13-17, **(1999).**
19. Prot J.C. and Matias D.M. Effects of water regime on the distribution of Meloidogyne graminicola and other root parasitic nematodes in a rice field toposequence and pathogenicity of M. graminicola on rice cultivar UPLR15. Nematology, 41,219–228, **(1995).**
20. Soriano I.R. and Reversat G. Management of Meloidogyne graminicola and yield of upland rice in South-Luzon, Philippines. Nematology, 5,879–884, **(2003).**
21. Bridge J. et al., Nematode parasites of rice. In, Luc M., Sikora R.A., Bridge J. (Eds.), Plant Parasitic Nematodes in Subtropical and Tropical Agriculture. 2nd ed. CABI Publishing, Cambridge, 87–130, **(2005).**
22. Kreye C. et al., Causes for soil sickness affecting early plant growth in aerobic rice. Field Crops Research, 114,182-187 **(2009).**
23. Kawamitsu Y. et al., Photosynthesis during desiccation in an Intertidal Alga and a Land Plant. Plant Cell and Physiology, 41(3), 344-353, **(2000).**
24. IturbeOrmaetxe I., Escuredo PR, Arrese-Igor C., Becana M., Oxidative damage in pea plants exposed to water deficit or paraquat. Plant Physiol. 116, 173–181, **(1998).**
25. Stewart C.R., Proline accumulation, Biochemical aspects. In, Paleg LG, Aspinall D (Eds), Physiology and Biochemistry of drought resistance in plants, 243-251, **(1981).**
26. Routley D.G. Proline accumulation in wilted ladino clover leaves. Crop Sciences, 6,358-361 **(1966).**
27. Fageria N.K. et al., Micronutrients in crop production. Advances in Agronomy, 77,185– 268, **(2002).**
28. Lampayan R. M., and Bouman B. A. M., Management strategies for saving water and increase its productivity in lowland rice-based ecosystems. In, proceedings of the First Asia-Europe Workshop on Sustainable Resource Management and Policy Options for RiceEcosystems (SUMAPOL), 11–14 May 2005, Hangzhou, Zhejiang Province, P.R. China. On CDROM, Altera, Wageningen, Netherlands **(2005).**
29. Mahajan G. et al. Optimizing seed rate for weed suppression and higher yield in aerobic direct seeded rice in North Western Indo-Gangetic Plains. Journal of New Seeds, 11, 225-238, **(2010)**.
30. Rao A. N. et al., Weed management in direct-seeded rice. Advances in Agronomy, 93, 153–255, **(2007).**
31. Minhas, R.S. and Sood, A.1994. Effet of inorganic and organic on yield and nutrients uptake by three crops in rotation in aid alfisol, *Journal of the Indian Society of Soil Science*, vol. 42, pp. 27–260.
32. Singh, G., Singh, O.P., Yadava, R.A., Singh, P.P.and Nayak,R. 1998. Response of rice (Oryza sativa) varieties to nitrogen levels in flash flood conditions, *Indian Journal of Agronomy*, vol. 43, no. 3, pp. 506–510.

Problems and Prospects of the Saffron Industry

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Abstract

The study identified the problems and prospects of the saffron industry. It found the presence of lengthy marketing channels. The primary data was collected from 201 respondents in the three saffron growing villages of Pampore namely Letpora, Ledhu, and Konibal based on the interview. Purposive-Stratified-cum-Proportional sampling framework was followed for selecting the respondents of the study. The One-way ANOVA was used to analyse the relationship between saffron income and size of landholdings. The test was significant, indicating a positive relationship between saffron income and the size of land holdings which means as the size of cultivable land increases the income of the growers also increases.

Keywords: problems, prospects, saffron industry, saffron income, size of land holdings.

1. Introduction

Horticulture is the backbone of the J&K economy. The majority of the population is reliable on the horticulture sector particularly, saffron. Over the years, horticulture emerged as an important sub-sector of agriculture, proposing a wide range of varieties, choices, and opportunities to the growers for crop diversification. And the most important horticulture crop that has higher efficiency and marketing stadium is saffron (Ganie & Nusrath, 2016). More than 10,000 farm families of 226 villages are directly or indirectly linked with saffron whose cultivation is highly labour intensive where most of the field and post-harvest operations are carried out by women (Kamli & Wani, 2004). More than 95,000 farm families in Iran & India are strongly linked with saffron (Nehvi et al., n.d.), for that reason, efforts are to be made to increase the production and income of saffron which has its bearing upon the decision making of marketing channels. Iran's continuous efforts for area expansion under saffron and phenomenal export growth (90%) during the past many years provides a robust and enough satisfactory evidence of its growing market for saffron in the world which can be tapped effectively for Kashmiri saffron, on condition that the production, marketing, and quality are improved considerably.

In agricultural business, profitability is a function of the choice of proper marketing channels and size of land holdings. The economic growth and development of many developing nations of the world are very much dependent on agricultural production and growth (Stamm et al., 2006). There is no denying the fact that India's agriculture is also heavily dependent upon the agriculture sector (Acharya, 1998). As far as saffron marketing in Jammu and Kashmir is concerned the growers have many channel choices to sell their produce: direct marketing, informal involvement, and formal involvement in the market. However, informal markets dominate the entire scene. Under informal markets, there are unofficial communications between growers and intermediaries. On the other hand, formal markets clearly demarcated grades, quality standards, certifications and safety regulations, and prices are properly set

(Grimsdell, 1996). Small saffron growers find it very difficult to penetrate the formal markets as they cannot grade, pack and store the produce at the individual level (Zaki, 2002) due to high transaction costs, high risks, missing markets, and lack of collective action (Jari, 2009).

Saffron growers face many problems due to various causes such as small land holdings (Munshi, 2002) causing fall in the production and productivity levels, incidence of large number of intermediaries bringing about price and quality distortions, traditional cultivation practices (Kubrevi & Khare, 2006; Khaki, 1997, Hussaini et al., 2010). Saffron is very sensitive to handling because it is a food grade material and it has to pass through a series of food safety certifications. Furthermore, processing of Kashmiri saffron takes place outside the state because of poor industrial set-up. Adulteration is a major problem which multiplies the existing marketing problems. Apart from these, saffron growers are facing severe problems with marketing information and know-how (Munshi, 2002; Kubrevi & Khare, 2006). They are also unaware of modern marketing tools, strategies, and themes like quality, branding, delivery schedule, and packaging, after-sales-servicing, feedback etc. Accordingly, they are not able to give strong competition to their counterparts outside the state. It is a matter of great concern particularly when the graph of the saffron industry in the state of Jammu and Kashmir is decreasing.

1.1 Objectives

- To analyse the relationship between saffron income and the size of land holdings.
- To highlight the problems and prospects of the saffron industry in Jammu and Kashmir.

1.2 Hypothesis

- There is no relationship between saffron income and the size of land holdings.

Materials and Methods

The present study is based on both primary as well as secondary data. It adopted *Purposive Stratified-cum- Proportional sampling* for the selection of respondents. Out of 10 districts of Kashmir Valley saffron is prominently cultivated in district Pulwama and district Budgam. District Pulwama was selected purposively because the district covers the maximum area under saffron cultivation. Out of 4 tehsils of Pulwama, tehsil Pampore was purposively selected because Pampore accounts for the majority of saffron production. Out of 23 villages of tehsil Pampore, 3 villages- namely Letpora, Ledhu, and Konibal- having highest land under saffron cultivation were selected purposively. From the 3 selected villages, we randomly took growers, dalals & local traders, retailers/wholesalers and firms. Since the size of population (N) is known, the proportional method has been used for determining the sample size (n) of growers. Proportion is taken as 10% and therefore the formula for proportion method becomes $n=N\times0.1$. On the basis of this formula 83, 82 and 36 growers were selected from Letpora, Ledhu, and Konibal respectively. In this way, the sample size for the growers was 201. As far as dalals & local traders, retailers/wholesalers and firms are concerned, they were randomly selected (6 dalals, two from each village, 10, 5 and 2 retailers/wholesalers from Letpora, Ledhu, and Konibal respectively and 3 firms from Letpora and 1 each from other two villages were selected respectively), making the total sample size for the present study 229. Thus, 229

sample respondents were interviewed. Interview with other stakeholders also proved helpful for the present study. One-way ANOVA was used to analyse the relationship between saffron income and size of landholdings.

The secondary data has also been used which is obtained from different sources such as Census, 2011, Spices Board of India, Department of Agriculture, Government of Jammu and Kashmir, Saffron Research Station Pampore, Saffron Research Station SKUAST-K and various economic surveys, particularly Economic Survey, 2010 & 2016.

3. Analysis of Data

In this section, the relationship between the income of the saffron growers and the size of land holdings (land under saffron cultivation) is reported and presented. The relationship between the incomes of the saffron growers with respect to their size of land holdings is shown in Table 3.1 and Table 3.2 respectively.

Table 3.1: Income of saffron growers with respect to their size of land holdings

Land Size (in Kanals)	N	Minimum	Maximum	Mean	Std. Deviation
1-5K	68	22500.00	64500.00	46777.9412	12241.41302
6-11K	66	67500.00	135000.00	98338.6364	22245.85665
12 and above	67	138000.00	450000.00	209619.4030	75412.58031
Total	201	22500.00	450000.00	117988.8060	82170.79035

Source: *Field survey*

Table 3.1 shows that the income of saffron growers whose land holdings lie in the range of 1-5 Kanals varies from Rs 22500 to Rs 64500 with an average income of Rs 46777 and the income of the growers whose land holdings lie in the range of 6-11 Kanals varies from Rs 67500 to Rs 135000 with an average income of Rs 98338. Similarly, it shows that the income of saffron growers whose size of the land holdings is above 12 Kanals varies from Rs 138000 to Rs 450000 with an average income of Rs 209619. It follows from the Table 3.1 that as the size of cultivable land increases the income of the growers also increases which imply that there is a positive relationship between saffron income and the size of land holdings.

Table 3.2: Results of One Way ANOVA Test

Sources of Variation	**d. f.**	**F**	**Sig.**
Between Groups	2	221.176	.000
Within Groups	198		
Total	**200**		

Source: *Field survey*

In Table 3.2, P-value is < 0.05 which indicates that there is a strong evidence against the null hypothesis of no significant difference in income received by the growers from their production with respect to their size of land holdings. In other words, there is a significant difference in income received by the growers from their production with respect to their size of land holdings. Hence, we conclude that the income of saffron growers varies according to the size of their land holdings.

4. Problems of saffron industry

The primary survey uncovered the following problems in the saffron marketing:

1. Saffron Marketing is very expensive in the state because of various deficiencies and limitations like insufficient infrastructure for storage facilities, inaccessibility of required transport facilities, and mishandling and maladministration during grading, packaging, handling and transportation.
2. There is absence of market intelligence system for saffron in Jammu and Kashmir. As a result, Dalals and local traders exploit the growers by buying 12 grams as 1 Tolla and sell it as 10 grams as 1 Tolla to the saffron dealers, firms, retailers/ wholesalers and end users/consumers (Ganaie, et al., 2017). Saffron growers are not aware of the ruling prices of their produce prevailing in the markets. Consequently, they have to accept any un-remunerative price for their produce as offered by traders or middlemen. There is high input cost due to presence of inefficiency among the factors of production etc. There is asymmetric information on the part of both buyers as well as sellers of saffron in the market thereby degrading the quality of the saffron traded. That is to say that saffron market is a lemon market (Akerlof, 1970). Growers are not aware of the marketing channels and market structure of saffron. Similarly, buyers or consumers are not aware of the market system. The uninformed consumer's price makes an adversarial choice problem that drives the high-quality saffron from the market.
3. Saffron growers and dealers don't consider promotion and advertisement tool of marketing significant. Since, majority of the saffron growers sell their produce to Dalals the scope of advertisement and promotion is very less. But, the big firms, large dealers and traders of saffron somehow consider such marketing strategies important. With the result they are able to capture wide market and fetch good price.
4. Delayed stigma separation is another important problem having its direct bearing upon the quality of saffron. It is found in almost all saffron growing villages. Growers are ignorant about the disadvantages of delayed stigma separation. Delayed stigma separation lowers saffron recovery from 30 (optimum) to 22 g/Kg of fresh flower. This is the main reason for abandonment of saffron cultivation by farmers or diversification of their land use.
5. There are no scientific or mechanical ways of plucking saffron in Jammu and Kashmir. All growers (including sample units) do hand plucking of saffron (Ali et al., 2014). Plucking of saffron needs extra care. It must be done quickly after dawn. The task consists of picking the flowers and separating the stigmas from the petals and stamens. During field survey it was reported that growers pick saffron flowers in a very rough manner. The flowers are not picked at the bottom of the segments and are put into basket in

thick layers resulting into excess pressure and deformation of flowers organs, mainly of the stigmas. It is exposed to the sunlight resulting into loss of its colour and flavour. Picking saffron flowers and separation of stigmas from the flower is a most challenging task. It is very time consuming, painstaking and makes saffron the most expensive spice of the world. Delay in picking flowers is the most important reason behind quality deterioration and market losses for Kashmiri saffron in the present-day times. It is important to note that absence of family farming in saffron now-a days is one of the reason for delay in picking process.

6. There is absence of proper regulations standardization, certification and quality assurance in saffron in Jammu and Kashmir. Standardization augments quality levels, safety levels, and compatibility levels of a product. While as certification confirms certain attributes of a good, person or entity. Adulteration in saffron is rampant here because of lack of standardizations and certifications. There are no processing centres for saffron in our state. There is no modern technology or there is lack of efficient post-harvest techniques for cleaning, drying, grading, packaging at the district and provincial level. Government is not supporting the saffron firms, associations, big traders to get ISO certification.
7. There is a communication gap between the agricultural scientists and saffron growers in the state of Jammu & Kashmir which is one of the cause responsible for the poor quality and low production. Majority of the growers don't have faith on the recommendations and advises of the expertise which reflect that the experts may not be carrying their services up to the expectations of the growers.
8. The growers practice sun drying. Quality deterioration in saffron due to sun drying lowers colouring strength from 16 to 8 %. This results in distress sale by the growers. For drying as well as packaging purpose machines are not used at all by the small growers. Even very few large growers prefer modern tools and techniques. For drying saffron, natural sun drying is preferred and packing is done manually. In Khorasan province (Iran), standard packaging is followed for saffron marketing as it plays very vital role in increasing sales and profitability. It augments exports as well as adds value to exports through quality packaging. It is very unfortunate that standard packaging is absent in case of Kashmiri saffron.

5. Prospects of saffron industry

1. ***Growing international trade:*** Iran has increased area under saffron during the last many years and exports 90% of its total production. This alone provides a strong and sufficient evidence of its growing market for saffron in the world which can be tapped successfully for Kashmiri saffron, provided the production and quality are improved significantly. Literature shows that the countries which don't produce saffron are also exporting saffron thereby showing its growing international trade Export of saffron is considered a vital component of value-added growth of the agriculture sector (Mehdi & Reza, 2012).
2. ***Increasing demand:*** The healing and pharmaceutical attributes of saffron have been emphasized in a number of reports and research papers (Shah et al., 2017; Ahmad,

2005). Saffron has a major use in Ayurvedic and herbal medications to upkeep a dynamic global drive for improving quality of life and fit and active living that is gaining impetus which results in snowballing the demand substantially apart from an increase in its use as a functional spice for cooking purposes. The demand would upswing further once there is an improvement in production and marketing to bridge the gap between demand and supply. Furthermore, saffron has also found use in the wine industry. Some varieties and brands of wine use saffron as the main ingredient to provide a special flavour, and sell at a first-class price. The rapid growth and development in the wine industry being observed in India after the ban on producing intoxicating drinks were lifted in the country has unlocked yet another prospect or opportunity for raising the consumption levels of saffron. Because of its greater inherent features, Kashmiri saffron will beyond doubt have an upper hand over the imported and adulterated saffron (Nehvi et al. 2008). Many Herbal and Ayurvedic companies use saffron as raw material. Patanjali Company, one of the leading FMCG Company in India, uses saffron as one of the main raw material. The demand for saffron is rising day by day with the growth and progress of all the big FMCG industries.

3. ***Extension of saffron in non-traditional areas:*** The observation of saffron being extremely location-specific and not open to cultivation in other settings in the state has in the meantime been removed after saffron was grown efficaciously in uplands or Karewas of Srinagar and Budgam districts of Kashmir province. This unbolts up a countless scope for area extension on a large scale in the well-drained Karewa lands of non-traditional areas available in Baramulla, Sopore, Handwara, and Kupwara etc. districts of Kashmir province; Kishtwar and upper areas in Udhampur districts in Jammu province; and Leh and Kargil districts of Ladakh region. These should be exploited after location-specific trails are conducted by the government in general and SKAUST, in particular, to assess crop performance and then regulate crop managing and controlling strategies suitable to each location (Nehvi et al. 2008).

4. ***Farmer's Openness:*** The most important crops of the state of Jammu and Kashmir are rice, maize and wheat (Jammu and Kashmir, n.d. National Disaster Risk Reduction Portal). The demand and supply cavity in agriculture in Jammu and Kashmir is increasing at an increasing rate but the production level is increasing at a decreasing rate. And for enhancing agricultural productivity on a sustainable basis, improving Seed Replacement Rate (SRR) is an important component. It is very good that agriculturalists and ranchers of the state having a trade-off with other food, marketable and viable crops have shown a great receptiveness to the modern techniques of production for augmenting production, processing, marketing and exports to fetch better prices. This is obvious from the remarkable success achieved in improving the production and productivity levels of paddy in particular and vegetables, decorative crops, and fruits in general and above all the revolution brought about in the dairy industry (Nehvi et al. 2008) and apple industry in the state. This shows a good sign for investments in saffron industry in the state, exploiting the strengths already mentioned above. SWOT Analysis is an acronym for strengths, weaknesses, opportunities, and threats and is a structured planning method that evaluates these four elements of an organization, project or business venture. A SWOT analysis can be carried out for

Saffron industry so as to specify the objectives of the saffron business venture and identifying the internal and external factors that are favourable and unfavourable to achieve that objective.

5. ***Government backing:*** By putting National Saffron Mission into practice it has been possible for the state to revitalise the traditional less productive zones of saffron and it have been practiced that the proposed new corms has helped the farmers by way of increasing their income and output and has developed taste for undertaking the farmhouse management of business for growth and development of saffron business. Under National Saffron Mission Government of India provides financial support for all-inclusive and integrated growth and development of saffron in J&K for creation of irrigation facility at target sites, upgrade old and sterile saffron fields, provide solar dyers to saffron growers, create vermicomposting units and, develop infrastructure, quality check and marketing, improve Research and Extension capabilities, etc.

6. Results and Discussion

The results of ANOVA show that there is a direct and positive relationship between income and the size of land holdings. Higher the size of land holdings, higher the production and higher will be the income. Furthermore, the field survey uncovered many problems of saffron industry in general and production cum marketing in particular. However, adulteration is a most important problem which the present study observed, finding mention in many recent research studies (Fernandez, 2007; Hussaini et al., 2010).

7. Conclusion

The saffron business is highly dependent upon income (Qadri, 2018), production and size of land holdings of the grower. For that reason, government and the concerned bodies should provide great financial support along with skill development programmes and training to saffron growers and all the stakeholders associated with this trade directly or indirectly so that their income and output will increase. Saffron farming is very much labour intensive in nature where most of the ground and post-harvest tasks are performed by females (Kamli & Wani, 2004), superior hands-on practical training to saffron growers on the field and post-harvest operations can help in improving the area, production and productivity levels which at present are very unfavourable. Furthermore, such practical demonstrations and training can help in tackling the post-harvest and marketing related problems.

8. Recommendations

1. Marketing and promotion of Kashmiri saffron should be through a full-fledged and all-inclusive organization in order to improve the size of land holdings and income levels in saffron which will improve production and productivity levels as well, control and improve marketing and export prices of saffron. Besides, the working of such organizations can be improved as long as proper marketing facilities, proper infrastructure and the competent working team are provided.
2. The development of saffron exchange as regional and specialized exchange board in the focal areas of production and marketing can be an important method to improve saffron in both quantitative and qualitative terms and will match and bring

into line production, marketing, exports and maintain market which at present is very unorganized.

3. Adequate market information, value addition, proper market infrastructure, and grading affect the choice of marketing channels (Panda & Sreekumar, 2012). Growers need to be provided with better market facilities so as to make their decision regarding marketing channels better and convincing.
4. Choice of marketing channels among growers depends upon both technical and institutional factors like education and training, market infrastructure, road infrastructure, processing centres, assured markets etc. The poor institutional and technical factors are, the higher will be the difficulties for growers in marketing their produce through organized and unorganized markets (Jari, 2009; Panda & Sreekumar, 2012). Saffron market being loaded with chain of intermediaries, poorly institutionalized, have technical errors on field and post-harvest level, in order to improve the marketing efficiency of saffron and growers' share in consumer rupee these institutional and technical factors should be given top-most priority and steps should be taken to improve the quality standards and safety levels of saffron as presently there is a lack of Standardization, Certification, and Quality Assurance in saffron in Jammu and Kashmir (Qadri, 2017).

References

Acharya, S. S. (1998). Agricultural marketing in India: Some facts and emerging issues. Indian Journal of Agricultural Economics, 53(3), 311–32.

C. R. Kothari. (2009). Research Methodology: Methods & Techniques (Second Revised Edition). New Age International Publishers, New Delhi.

Ganaie, M. A., & Nusrath, A. (2016). Marketing and Trade Mechanism of Saffron.IOSR Journal of Economics and Finance (IOSR-JEF) e-ISSN: 2321-5933, p-ISSN: 2321-5925.Volume 7, Issue 5 Ver. IV (Sep. - Oct. 2016), PP 55-62.

Laerd Statistics. n. d. Chi-Square Test for Association using SPSS. Retrieved from https://statistics.laerd.com/spss-tutorials/chi-square-test-for-association-using-spss-statistics.php.

Economic Survey, 2010.

Grimsdell, K. (1996). The supply chain for fresh vegetables: What it takes to make it work. Supply Chain Management, 1(1), 11–14.

Hamid, N., Kachroo, J., Bhat, A., & Qaudri J.Peer. (2017). An economic analysis of marketing and price spread of saffron in J&K State. Journal of Pharmacognosy and Phytochemistry. Vol.6 (5): 1231-1239.

Jari, B. (2009). Institutional and technical factors influencing agricultural marketing channel choices amongst smallholder and emerging farmers in the Kat River Valley (Master's thesis, University of Fort Hare, Alice, South Africa).

Kamli, S. A. and M. H. Wani. (2004). Research Priority Setting in Saffron: A Legendary Crop of Himalayas. Sher-i- Kashmir Agricultural University of Science and Technology (SKAUST-K), Shalimar, Kashmir.

Munshi, A.M. (2002). Marketing and trade mechanism of Saffron in Jammu and Kashmir. Proceedings of the seminar cum workshop on the Development of Saffron, 2001.PP81-91.

Nehvi et al. n.d. New Emerging Trends on Production Technology of Saffron. Retrieved from http:// conf news. um.ac. ir/ images /41/ conferences /saffron /DOC/p49.doc.

Nehvi et al. (2008). Status of Saffron in Jammu and Kashmir. In Nehvi, F.A., Wani, S.A. (Eds) Saffron Production in Jammu and Kashmir, Directorate of Extension Education. SKUAST-K, India, Pp. 1-21.

Qadri B. (2017). Saffron Adulteration: Let's Bunk the Saffron Junk. Indian Horticulture Journal .Vol.7 (3/4): 212-215. DI: 507-17-IHJ-1510-44.

Qadri B. (2018). Examining Saffron Income and Choice of Marketing Channel Connection. Asian Journal of Managerial Science. Vol.7 (1). PP. 25-30.

Panda, K.R. & Sreekumar (2012): Marketing Channel Choice and Marketing Efficiency Assessment in Agribusiness, Journal of International Food & Agribusiness Marketing, 24:3, 213-230

Shah, A.A., Tripathi, R.B. &Hussain, T. (2009). An Estimation of Production and Marketing of Kashmir Saffron.Journal of Research, SKUAST-J.Vol.8 (2).pp186-191. DI: 507-17-IHJ-1510-44.

Stamm, A., Jost, C., Kreiss, C., Meier, K., Pfister, M., Schukat, P., & Speck, H. A. (2006). Strengthening value chains in Sri Lanka's agribusiness: A way to reconcile competitiveness with socially inclusive growth. The German Development Institute (DIE) Studies, Research Report 15.

Umberger, W.J., Stringer, R., & Muelller, S.C. (2010). Using best-worst scaling to determine market channel choice by small farmers in Indonesia: Agricultural and Applied Economics Association.

Wani M.H., Saraf Abdullah Sajad., Wani S.A. (2008). Economics of Production and Marketing of Saffron in Jammu and Kahmir.PP316-323.Agricultural Marketing, Vol. VIII No.2, pp. 116.

Zaki, F. A. (2002). Development of Saffron in Kashmir. Sher-I-Kashmir, Agricultural University of Science and Technology (SKAUST-K), Shalimar, Kashmir.

Site-Specific Nutrient Management (SSNM)

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Site-Specific Nutrient Management (SSNM) provides guidance relevant to the context of farmers' fields. SSNM maintains or enhances crop yields, while providing savings for farmers through more efficient fertilizer use. By minimizing fertilizer overuse, greenhouse gas emissions can be reduced, in some cases up to 50%. Though farmers are operating on a personal farm scale, each of them is an integral and sensitive part of the global food security and food safety scheme. As such they do take responsibility not only for food production, but are also liable for use of resources and minimum interventions into the environment, for instance, by implementing codes of Good Agricultural Practice (GAP) through controlling nutrient surpluses and deficiencies on field level by applying the concept of balanced fertilization. This practice leads to the treatment of soils on their smallest scale of significant variability, i.e., site-specific nutrient management (SSNM) to realize the ambitious goal of minimum use of resources and impact on the environment. In US agriculture, 28% of the total energy expenditure is for fertilizers (Miranowski, 2005). The total expenditure, which includes costs for fertilizers and pesticides, on an average is two times higher for specialty crops such as fruits, vegetables and nursery than for cereals, cotton and soybean (Miranowski, 2005). An indicator of excessive fertilizer application rates is the measured non-point nutrient losses to the environment. Eutrophication by nitrogen and phosphorus is a global problem, which affects both surface and marine waters equally. Both nutrients are of prime interest for balanced fertilization that matches their small-scale variability in the soil with exclusively demand-driven nutrient inputs (Haneklaus and Schnug, 2006). Agriculture can be at conflict with nature conservation, irrespective of the land use system; SSNM, however, provides a scientific and technical basis to bring more balance to agricultural and environmental demands. One of the main reasons for the low adoption of SSNM technology is the inadequate economic return on the investment (Haneklaus and Schnug, 2006). In the face of climate change concern and depletion of fossil fuels, not only the local products with only short routes of transport, but also production techniques that utilize resources efficiently will become increasingly relevant. Farmers who implement Precision Agriculture (PA) technologies will meet both demands by reducing energy inputs for instance through coordinated, cost-effective field traffic and by reducing non-point nutrient losses through SSNM strategies.

Key Messages

Site-Specific Nutrient Management (SSNM) optimizes the supply of soil nutrients over space and time to match crop requirements.

1. SSNM increases crop productivity and improves efficiency of fertilizer use.

2. SSNM mitigates greenhouse gases from agriculture in areas with high nitrogen fertilizer use. 4 Incentives for adoption of SSNM depend strongly on fertilizer prices.

Overview of Site-Specific Nutrient Management (SSNM)

Fertilizer application recommendations are often based on crop response data averaged over large areas, though farmers' fields show large variability in terms of nutrient-supplying capacity and crop response to nutrients. Thus, blanket fertilizer application recommendations may lead farmers to over-fertilize in some areas and under-fertilize in others, or apply an improper balance of nutrients for their soil or crop. An alternative to blanket guidance, Site Specific Nutrient Management (SSNM) aims to optimize the supply of soil nutrients over time and space to match the requirements of crops through four key principles. The principles, called the "4 Rs", date back to at least 1988 and are attributed to the International Plant Nutrition Institute (Bruulselma et al. 2012). They are:

Right product: Match the fertilizer product or nutrient source to crop needs and soil type to ensure balanced supply of nutrients.

Right rate: Match the quantity of fertilizer applied to crop needs, taking into account the current supply of nutrients in the soil. Too much fertilizer leads to environmental losses, including runoff, leaching and gaseous emissions, as well as wasting money. Too little fertilizer exhausts soils, leading to soil degradation.

Right time: Ensure nutrients are available when crops need them by assessing crop nutrient dynamics. This may mean using split applications of mineral fertilizers or combining organic and mineral nutrient sources to provide slow-releasing sources of nutrients.

Right place: Placing and keeping nutrients at the optimal distance from the crop and soil depth so that crops can use them is key to minimizing nutrient losses. Generally, incorporating nutrients into the soil is recommended over applying them to the surface. The ideal method depends on characteristics of the soil, crop, tillage regime and type of fertilizer.

Benefits

Higher profits: SSNM can increase and maintain yields by optimizing the balance between supply and demand of nutrients and providing more balanced plant nutrition (Wang *et al.* 2007). In general, it improves nutrientuse efficiency and provides greater returns on investments in fertilizer (Ortiz-Monasterio and Raun 2007).

Reduced nitrous oxide emissions: Agriculture contributes 70-90% of nitrous oxide (N_2O) emissions, mostly from N fertilizer. SSNM reduces N2O emissions by reducing total N application and/or timing applications to crop needs, thus avoiding N losses to volatilization, leaching and runoff.

Improved disease resistance: The more balanced NPK nutrition that comes with SSNM may lead to improved resistance to plant diseases (Pasuquin *et al.* 2014).

Challenges to Adoption of Ssnm

Technology and knowledge requirements. SSNM requires knowledge of underlying soil properties and the ability to monitor crops' nutrient status and adjust fertilizer inputs accordingly.

While the need to conduct on-farm nutrient trials and soil tests has historically been a barrier to implementation of SSNM, the development of decision support systems and farmer-friendly tools and techniques that use proxy information to calculate nutrient requirements make SSNM more accessible to farmers and farm advisors.

Availability of fertilizers. Cost and access to fertilizers—whether synthetic or organic—is not universal. Development of input markets or identification of on-farm nutrient sources may be a necessary precursor to adoption of SSNM, though SSNM can help farmers make best use of limited nutrient resources.

Variable economic benefit. For SSNM to increase farmers' profits, SSNM must deliver either a) savings from reduced fertilizer use without a reduction in yields, or b) yield increases that are valued higher than the costs of acquiring and using SSNM technology. Farmers are more likely to see positive net returns with high-value crops, where yield increases can substantially increase profits, or when fertilizer prices are high.

Tools for implementing SSNM on the farm

Optical sensors Farmers and extension agents can use optical sensors to develop SSNM recommendations, particularly for N. Optical sensors measure reflectance from the leaves to generate a vegetative index called NDVI (Normalized Difference Vegetation Index), which measures the nutrient status of the plants based on their size and color (green versus yellow). The original technology was developed for large farms; however, a small handheld version that costs a fraction of the original technology (approximately USD 500) is now commercially available (Crain *et al.* 2012). The application of optical sensor-based nutrient management requires a local calibration of the sensor for a given nutrient, crop and region. This calibration relates the grain yield of the crop to the NDVI readings. Once calibration is complete, optical sensors require:

(1) Establishment of a reference strip in the farmer's field that will receive a non-limiting amount of N,

(2) Collection of an NDVI reading in the reference strip and in the field area where the farmer needs to know how much N should to be applied, and

(3) The NDVI readings collected from these two areas in the field together with the date of planting and date of sensing are entered in a mathematical model developed for each region. Such models have already been developed for common crops in certain countries such as China, India, Mexico, and Zimbabwe.

Capturing the Variability of Soil and Plant Nutrients

Soils are characterized by a four-dimensional space-time structure; monitoring of the associated variation of soil features is essential for optimizing land use in a sustainable way. A major and persisting obstacle for the reliable determination of the spatial variation of soil characteristics on a large scale is the expenditure for data acquisition. The capacity of plants to extract nutrients seems particularly pronounced for macro nutrients and balances partly the effect of spatial variability in these nutrients. This is reflected in measured ranges of semivariograms that can be more than twice as long for plant features compared to soil features. This equals a fourfold

lower sampling density for grid sampling of plant material compared to soil material. These general and basic relationships may prove to be relevant when defining management zones. For example, an elevated nitrate content of vegetable crops is primarily a problem of an excess N supply. Maximum permitted nitrate levels in lettuce according to European Commission Regulation (EC) No. 563/2002 vary between 2,500 - 4,500 mg/kg (f.w.), depending on season of cultivation and cultivation practice (Santamaria, 2006). SSNM may provide added value for vegetable products by reducing the nitrate content efficiently: management zones are selected so that they reflect zones differing in plant available soil nitrogen supply; the nitrate content in the vegetative plant tissue, determined by rapid tests, might serve as a control tool for adjusting fertilizer rates. Another powerful option to adapt SSNM to farm conditions comes from the results of a combined field and state's survey. Optimum nutrient ranges for an individual field were compared to those derived from surveys of sugar beet fields in three neighboring provinces by employing BOLIDES (Boundary Line Development System) for the interpretation of soil analytical data (Haneklaus et al., 1998; see below). The range of variation and the coefficient of variation of soil parameters were distinctly higher in the survey data, but optimum nutrient ranges were similar though somewhat lower for plant-available phosphate on field level. Such reliable assessment of critical nutrient ranges was shown to provide the highest potential for fertilizer savings when compared to normal practice of following universal recommendations. These and other data reveal also that BOLIDES is a reliable tool to assess critical nutrient values and ranges for the soil and plant nutritional status on field and regional scale (Schnug and Haneklaus, 2008). The availability of a nutrient is governed by two factors, its chemical speciation and mobility, which is linked to the first factor. Soil testing for plant available nutrients is discrete in space and time and thus does not reflect dynamic changes between different nutrient pools. For a balanced and site-specific fertilizer input, however, it is critical to evaluate all available nutrient pools that may contribute to the nutrition of the plant. Gassner (2003) defined spatial speciation as the chemical reactivity of a nutrient with site specific environmental factors, and the subsequent formation of geochemical species that display different spatial dependencies. In the Gassner studies, multivariate geo-statistical analysis was successfully applied to assess local functions of spatial speciation of phosphorus in soils: the readily, reversibly and sparingly available phosphorus pools were reproduced by variations in soil texture, soil type/equifertiles and landscape characteristics (Gassner, 2003). It can be expected that the prognosis of changes in the chemical speciation and equilibrium distribution of nutrient pools in relation to land use including fertilizer practice, geomorphology, and soil type will substantially improve the adaptation of site-specific fertilizer strategies.

Technologies to precisely apply nutrients and soil amendments

Nutrients and soil amendments are available in gaseous, liquid, solid, and granulated form. They are soil and foliar-applied using different technologies; in irrigated farming, fertigation is common practice. Here, nutrients are partitioned through irrigation systems. VRT needs to be implemented for SSNM to adjust the rate by either a prescription map, which is created by the user integrating yield, soil, topography, remote sensing, plant and local knowledge data, or from information recorded by sensors in real-time. Stewart et al. (2005) compared and appraised sensor-based and map-based VRT systems. Specialty crops such as fruits provide

the best option for SSNM from the viewpoint of economic return, but the development of PA machinery has thus far focused on cereal and other field crops so there is a need to develop appropriate technologies. Increasing efforts can be seen to develop technology for fertilizing fruit trees, which varies the fertilizer rate in relation to tree size employing ultrasonic sensors or laser light detection and ranging sensors.

References

Bruulselma TW, Fixen PE, Sulewski GD (eds) (2012) 4R Plant Nutrition Manual: A Manual for Improving the Management of Plant Nutrition. International Plant Nutrition Institute (IPNI), Norcross, GA, USA.

Crain J, Ortiz-Monasterio I, Raun B (2012) Evaluation of a reduced cost active NDVI sensor for crop nutrient management. J Sensors.

Gassner A (2003) Factors controlling the spatial speciation of phosphorus in agricultural soils (special issue). FAL Agricultural Research 244

Haneklaus S, Schnug E (2006) Site specific nutrient management – objectives, current status and future research needs. In: Srinivasan A (Ed), Precision Farming – A global perspective, Marcel Dekker, New York, pp 91-151

Miranowski JA (2005) Energy consumption in US agriculture. In: Outlaw J, Collins KJ, Duffield JA (Eds), Agriculture as a consumer and producer of energy, CABI, pp 156-167

Ortiz-Monasterio JI, Raun W (2007) Reduced nitrogen and improved farm income for irrigated spring wheat in the Yaqui Valley, Mexico, using sensor based nitrogen management. J Agric Sci 145:215–222.

Pasuquin JM, Pampolino MF, Witt C, et al (2014) Closing yield gaps in maize production in Southeast Asia through site-specific nutrient management. F Crop Res 156:219– 230.

Santamaria P (2006) Nitrate in vegetables: toxicity, content, intake and EC regulation. J. Sci. Food Agric. 86: 10-17

Schnug E, Haneklaus S (2008) Evaluation of the Relative Significance of Sulfur and Other Essential Mineral Elements in Oilseed Rape, Cereals, and Sugar Beet Production. In: Jez J (Ed), Sulfur: A Missing Link Between Soils, Crops, and Nutrition. B. Crops and Sulfur. CSSA-ASA-SSSA, pp 219-233

Stewart C, Boydell B, McBratney A (2005) Precision decisions for quality cotton: A guide to site-specific cotton crop management. The University of Sydeny and Cotton Research and Development Coporation, Sydney. 115 pp [online accessed at the 09.01.2009: http://www.usyd.edu.au/su/agric/acpa/pag.htm].

Wang G, Zhang QC, Witt C, Buresh RJ (2007) Opportunities for yield increases and environmental benefits through sitespecific nutrient management in rice systems of Zhejiang province, China. Agric Syst 94:801–806.

Natural Change Occurs Through Such Processes as Succession

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Abstract

Forest succession is a continuous stochastic process that occurs at the level of individual trees and results in the replacement of one tree species by another at the level of forest stands. Succession is a key process in a healthy forest and given a chance woodland can regenerate itself. However to have really healthy, dynamic ecosystems with all stages of succession present, we would need to establish large areas of forest, ideally with a range of large herbivores and carnivores, so that a wider range of natural processes can take place. Succession access minerals in bare rock and help to begin the process of creating soil. Mosses and grasses can then get established along with annual and perennial herbs then shrubs, pioneer woodland. The plants that colonise will be affected by environmental conditions such as soil type and wetness, altitude, the number of herbivores and which seed sources are nearly. The general trend in succession is for dominant plants in the earlier stages to be herbaceous annuals and for those in later stages to be slow growing woody perennials. Ecosystems are continuously undergoing natural change. This natural change occurs through such processes as long term evolution or through relatively short term processes such as succession, in which one plant community gradually supplants another. Replacement of early succession trees by late successional trees is driven by small scale disturbances caused by wind, tree diseases and tree removal. Large scale disturbance such as forest fire, clear cutting and some rare catastrophic events e.g. volcano eruptions significantly change the successional stage of forest stands by promoting development of early successional species.

Keywords- Succession, Ecosystems, Environmental, Herbivores, Carnivores.

Introduction

Succession is a directional non-seasonal cumulative change in the types of plant species that occupy a given area through time. It involves the processes of colonization, establishment and extinction which act on the participating plant species. Most successions contain a number of stages that can be recognized by the collection of species that dominate at that point in the succession. Succession begins when an area is made partially or completely devoid of vegetation because of a disturbance. Some common mechanisms of disturbance are fires, wind storms, volcanic eruptions, logging, climate change, flooding, diseases and pest infestation. Succession stops when species composition changes no longer occur with time and this community is said to be a climax community.

The concept of a climax community assumes that the plants colonizing and establishing themselves in a given region can achieve stable equilibrium. The idea that succession ends in the development of a climax community has had a long history in the fields of biogeography

and ecology. Disturbance acts on communities at a variety of spatial and temporal scales. Further, the effect of disturbance is not always hundred percent. Many disturbances remove only a part of the previous plant community. As a result of these new ideas, plant communities are now generally seen as being composed of numerous patches of various size at different stages of successional development.

The first stage of succession was characterized by the pioneering colonization of annual plant species on bare ground and nutrient poor soils. These annual species had short life spans one growing season, rapid maturity and produce numerous small easily dispersed seeds. The annuals were then quickly replaced in dominance in the next year by biennial plants and grasses. After about 3 to 4 years, the biennial and grass species gave way to perennial herbs and shrubs. These plants live for many years and have the ability to reproduce several times over their life spans.

Ecological succession occur

Every species has a set of environmental conditions under which it will grow and reproduce most optimally. In a given ecosystem and under that ecosystem's set of environmental conditions, those species that can grow the most efficiently and produce the most viable offspring will become the most abundant organisms. As long as the ecosystem's set of environmental conditions remains constant, those species optimally adapted to those conditions will flourish. The engine of succession, the cause of ecosystem change, is the impacts of established species have upon their own environments. A consequence of living is the sometimes subtle and sometimes overt alteration of one's own environment. The original environment may have been optimal for the first species of plant or animal but the newly altered environment is often optimal for some other species of plant or animal. Under the changed conditions of the environment, the previously dominant species may fail and another species may become ascendant.

Change from one biological community to another can happen because:

- Smaller species of plants and animals generally grow and reproduce rapidly. Larger plants and animals take more time to grow and their population growth is slower. As a result, the rapidly growing plants and animals populate a site first and the slower ones take over later. For example, if a fire or logging destroys a forest, there will be many species of grass growing on the site within months because grasses grow quickly. Later, shrubs grow over the grasses and after that trees grow over the shrubs.
- A biological community can create conditions that lead to its own destruction. For example, as trees grow older, they become weak and vulnerable to destruction by insects or diseases. When this happens, a biological community grows old and dies and another biological community takes its place.
- One biological community can create conditions that are more suitable for another biological community. A biological community can change the physical or biological

conditions of a site, making it more favourable for another biological community. One biological community therefore leads to another.

- A biological community can be destroyed by natural or human generated disturbances and replaced by another biological community. Fires, storms and floods are examples of natural disturbances. Human activities such as logging or clearing land to make agricultural or urban ecosystems can also destroy a biological community. Activities such as excessive fishing or livestock grazing can change a biological community so much that it is replaced by a different community.

Types of Succession

Primary succession – It is the establishment of plants on land that has not been previously vegetated and begins with colonization and establishment of pioneer species.

Secondary succession – It is the invasion of a habitat by plants on land that was previously vegetated. Removal of past vegetation may be caused by natural or human disturbances such as fire, logging, cultivation or hurricanes.

Allogenic succession – It is caused by a change in environmental conditions which in turn influences the composition of the plant community.

Autogenic succession – It is a succession where both the plant community and environment change and this change is caused by the activities of the plants over time.

Progressive succession – It is a succession where the community becomes complex and contains more species and biomass over time.

Retrogressive succession – It is a succession where the community becomes simplistic and contains fewer species and less biomass over time. Some retrogressive successions are allogenic in nature. For example, the introductions of grazing animals result in degenerated rangeland.

Comparison of plant, community and ecosystem characteristics between early and late stages of succession

Attribute	**Early Stages of Succession**	**Late Stages of Succession**
Plant Biomass	Small	Large
Plant Longevity	Short	Long
Seed Dispersal Characteristics of Dominant Plants	Well dispersed	Poorly dispersed
Plant Morphology and Physiology	Simple	Complex
Photosynthetic Efficiency of Dominant Plants at Low Light	Low	High
Rate of Soil Nutrient Resource Consumption by Plants	Fast	Slow
Plant Recovery Rate from Resource Limitation	Fast	Slow
Plant Leaf Canopy Structure	Multilayered	Monolayer

Attribute	Early Stages of Succession	Late Stages of Succession
Site of Nutrient Storage	Litter and Soil	Living Biomass and Litter
Role of Decomposers in Cycling Nutrients to Plants	Minor	Great
Biogeochemical Cycling	Open and Rapid	Closed and Slow
Rate of Net Primary Productivity	High	Low
Community Site Characteristics	Extreme	Moderate (Mesic)
Importance of Macro environment on Plant Success	Great	Moderate
Ecosystem Stability	Low	High
Plant Species Diversity	Low	High
Life-History Type	r	K
Seed Longevity	Long	Short

Process of Plant Succession

Nudation - An area is exposed.

Migration - The process of dispersal of seeds, spores and other structures of propagation of the species to bare area is known as migration.

Germination - It occurs when conditions are favourable.

Ecesis - Successful germination of propagules and their establishment in a bare area is known as ecesis.

Colonisation and Aggregation - After ecesis, the individuals of the species increase in number as the result of reproduction.

Competition and Co-action - Due to limited resources, species show both inter and intraspecific competition. This results into elimination of unsuitable and weaker plants.

Invasion - Various other types of plants try to establish in the spaces left by the elimination of plants due to competition.

Reaction - The newly arrived plants interrupt with the existing ones. As a result of reaction, environment is modified and becomes unsuitable for the existing community which sooner or later is replaced by another community.

Stabilisation - Finally, there occurs a stage in the process when the climax community becomes more or less stabilized for a longer period of time and it can maintain itself in equilibrium with the climate of the area. As compared to seral stage community, the climax community has larger size of individuals, complex organization, complex food chains and food webs, more efficient energy use and more nutrient conservation.

Major Trends during Succession

- There is an increase in structural complexity
- Diversity of species tends to increase

- Biomass and standing crop increase
- There is a decrease in net community production
- Increase in non-living matter
- Food chain relationship becomes complex
- Niche becomes special and narrower
- Energy use and nutrient conservation efficiency increases
- Stability increases

Conclusion

Ecological succession is the observed process of change in the species structure of an ecological community over time. Within any community some species may become less abundant over some time interval or they may even vanish from the ecosystem altogether. Similarly, over some time interval, other species within the community may become more abundant or new species may even invade into the community from adjacent ecosystems. This observed change over time in what is living in a particular ecosystem. Ecological succession may occur when the conditions of an environment suddenly and drastically change. A forest fires, wind storms and human activities like agriculture all greatly alter the conditions of an environment. These massive forces may also destroy species and thus alter the dynamics of the ecological community triggering a scramble for dominance among the species still present.

Influence of Integrated Use of Manures and Fertilizers on Physico-Chemical Properties of Soil as well as Yield and Cost of Cultivation of Coconut

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Abstract

A field experiment was conducted during 2014-15 and 2015-16 in a thirty years old coconut garden of cultivar Pratap at the farm of Asond block, Central Experiment Station, Wakawali, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Tal.- Dapoli, Dist.- Ratnagiri (M.S.). The experiment was laid out in Randomized Block Design comprising ten treatments replicated thrice. The treatments were applied in three splits (*viz*., Stage I- June, Stage II- October and Stage III- February) in a year. The soil were collected periodically before fertilizers application and analyzed for different physico-chemical properties (*viz*., pH, EC and organic carbon). The yield of the each palm was recorded throughout the year under experimental plot. The year wise yield was worked out and analyzed statistically.

The application of RDN through FYM at 25 kg/palm/year + Neem Cake at 15 kg/palm/year + Vermicompost at 6 kg/palm/year (T_{10}) recorded significant increase in pH, EC and organic carbon content in soil of coconut orchard. Also the physico-chemical properties of soil found to be improved during second year over the first year of experimentation. The application of RDF + Azadirachtin + Micronutrients through briquettes (Treatment T_5) received highest yield along with maximum net return and B:C ratio. Therefore, it is concluded that the application of RDF along with Azadirachtin and Micronutrients through Konkan Annapurna Briquettes in three splits (i.e. June, October and February) is beneficial for increasing the yield of coconut with maximum profit.

Keywords: INM, Coconut, Soils, Physico-chemical Properties, Yield and Maharashtra

Introduction

The coconut (*Cocos nucifera* L.) palm eulogized as “Kalpavriksha” and “Tree of Heaven”, it provides not only edible parts but also fuel, shelter, medicine and employment to the millions of people in tropics. In India, coconut is grown in 19 states and 3 union territories, mostly along the coastal region of the country. The area under coconut in Ratnagiri district (M.S.) is 4,549 hectares with an annual production of 409.41 lakh nuts and average productivity of 9,001 nuts ha^{-1} (Anonymous, 2015). The coconut palm requires balanced fertilization of NPK; the response of N and K was common while response of P was under certain conditions. Palms with larger yield potential need higher dose of NPK. Worldwide people realized that pure chemical farming undermines the natural mechanism operating in the ecosystem and often leads to soil degradation, pollution of ground water and eutrophication of water bodies with

nitrates, phosphates and pesticides (Upadhyay *et al.,* 1998). Organic manures are important in sustaining soil productivity especially for a perennial crop like coconut, which requires continuous supply of nutrients.

It has therefore, integrated nutrient management been always considered for best fertilization of crops. Therefore, considering all these facts, present study was undertaken.

Materials and Methods

The experiment was conducted during 2014-15 and 2015-16 in a thirty years old coconut garden of cultivar Pratap at the farm of Asond block, Central Experiment Station, Wakawali, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Tal.- Dapoli, Dist.- Ratnagiri (M.S.) which is located at 17.68337^0 N latitude and 73.27761^0 E longitudes with an altitude of 250 m MSL. The research station receives very high annual average rainfall of 3500 mm in rainy days. The soils of experimental site are well drained, sandy clay loam in texture, slightly acidic in reaction with low electrical conductivity and high in organic carbon content. The soil is medium in available nitrogen, low in available phosphorus and high in available potassium content. Kaolinite is the dominant clay mineral in this soil.

The experiment was laid out in Randomized Block Design comprising ten treatments (*viz*., T_1- Absolute Control (No manure, no fertilizer), T_2- Recommended Dose of Fertilizers (RDF) only, T_3- Application of RDF through briquettes, T_4- Application of RDF + Azadirachtin through briquettes, T_5- Application of RDF + Azadirachtin + Micronutrients through briquettes, T_6- Application of RDF + Neem oil through briquettes, T_7- Application of RDF through briquettes and neem cake at 15 kg/palm, T_8- Application of RDF + Root feeding with Azadirachtin 5 % @ 7.5 mL + 7.5 mL water, T_9- Application of RDF + Drenching with Eriophyid smash 250 mL/ 20 L of water and T_{10}- RDN through FYM at 25 kg/palm/year + Neem cake at 15 kg/palm/ year + Vermicompost at 6 kg/palm/year) replicated thrice. Two palms for each treatment were selected at Farm of Asond Block, C.E.S. Wakavali, Dr. B. S. Konkan Krishi Vidyapeeth, Dapoli, Dist.- Ratnagiri during 2014-15 and 2015-16. The treatments were applied in three splits (*viz*., Stage I- June, Stage II- October and Stage III- February) in a year. The soil were collected periodically before fertilizers application and analyzed for different physico-chemical properties (*viz*., pH, EC and organic carbon). The pH and EC in soil was determined by potentiometriclly and conductometrically as per the procedure given by Jackson (1973) while, organic carbon was determined by Walkley and Black's wet digestion method as described by Black (1965). The yield of the each palm was recorded throughout the year under experimental plot. The year wise yield was worked out and analyzed statistically for Randomized Block Design by following the standard procedures given by Panse and Sukhatme (1967).

Results and Discussion

From the data presented in Table 1, it is clearly observed that the physico-chemical properties of soil in coconut orchard were improved due to application of manures and fertilizers during both the years of experimentation. The treatments receiving application of RDN through FYM at 25 kg/palm/year + Neem Cake at 15 kg/palm/year + Vermicompost at 6 kg/palm/year (T_{10}) and application of RDF through briquettes and neem cake at 15 kg/palm (T_7) showed the maximum improvement in pH of soil. An overall the mean soil pH during first year and second year ranged between 5.46 to 5.89 and 5.43 to 6.04, respectively. In comparison of both years

an increasing trend of soil pH was noticed from first year to second year due to application of organic manures in treatments T_{10} and T_7. In general, due to application of organic manure like FYM, neem cake and vermicompost soil pH was found to be increased over rest of the treatments including recommended dose of fertilizers (T_2) during both years of the experiment. The soil samples in all treatments were 'moderately to slightly acidic' in reaction as per the ratings given by Bangar and Zende (1978). The increase in pH of acid soil due to addition of organic manures is attributed to the deactivation of Fe^{3+} and concomitant release of basic cations during their decomposition (Lal and Mathur, 1988). Similar results were also recorded by Temgire (2007) and Maheswarappa *et al*. (2014) in lateritic soils of coconut orchard due to application of manures and fertilizers.

In case of electrical conductivity (Table 2), it did not much more influenced due to application of manure and fertilizers through different treatments applied during both the years of experiment. The electrical conductivity of soil during first year and second year varied between 0.062 to 0.102 dS m^{-1} and 0.073 to 0.118 dS m^{-1}, respectively. There is slight increase in electrical conductivity of soil due to application of all treatments of manures and fertilizes over absolute control. Comparatively, the electrical conductivity of soil during second year was increased over first year. The electrical conductivity of soil in all treatments was low and having no any potential threat to the productivity of the soils to crop growth. It was also observed that the electrical conductivity of soil was significantly increased due application of manures and fertilizers over absolute control during both the years. In general, the soil samples under all treatments were found under 'normal' (i.e. < 1.0 dS m^{-1}) class of electrical conductivity based on the ratings given by Seth (1967) indicating low salt concentration in these soils. Increase in electrical conductivity with application of organic manures and fertilizers were also reported by Diwale (2012) and Bhosale (2016) for lateritic soils of Konkan.

The data given in Table 3, clearly explain that application of manures and fertilizers significantly increased organic carbon content of soil in all stages of both the years of experimentation. The organic carbon content in soil during first year and second year was ranged between 1.57 to 2.36 per cent and 1.47 to 2.73 per cent, respectively. The maximum build up of soil organic carbon in soil was noticed due to application of treatments receiving application of RDN through FYM at 25 kg/palm/year + Neem Cake at 15 kg/palm/year + Vermicompost at 6 kg/palm/year (T_{10}) and application of RDF through briquettes and neem cake at 15 kg/palm (T_7) and during both the years of trial. In comparison of both years, an increasing trend of soil organic carbon was noticed from first year to second year due to application of organic manures in treatments T_{10} and T_7.

The soil samples in all treatments were categorized under 'very high' class (ratings by Bangar and Zende, 1978) showing presence of excess amount of organic carbon content in the soils of coconut orchards.

The improvement in organic carbon content of soil in organic manure treated plots might be ascribed to direct addition of organic matter through organic manures and also due to addition of considerable amount of leaf litter of crops. High amount of organic carbon content in these soils might be attributed to luxurious growth of grasses and vegetation due to high rainfall and thus addition of organic matter through litter, residues and cover crops and thereby subsequent increased humification (Preethi *et al*., 1998). An increase in organic carbon content

of soil due to the application of various organic manures were noted by Hapse *et al.* (1993), Kadam (2000), Yaduvanshi (2003), Gedam *et al.* (2008), Gadade (2007), Yadav *et al*. (2009) and Diwale (2012) for different soils.

Effect on Yield

The data given in Table 4, clearly explain that the yield of coconut significantly increased due to application of manures and fertilizers in both the years of trial i.e. 2014-15 and 2015-16. The application of RDF + Azadirachtin + Micronutrient through briquettes (T_5) recorded significantly higher nut yield (125.33 and 129.50 nuts palm^{-1} year^{-1}) over rest of the treatments during both years of experimentation, respectively except treatments T_8 and T_9. Treatment T_5 was at par with treatments T_8 and T_9. The lowest yield was recorded by the treatment T_1 (Absolute control).

An overall the nut yield of coconut during first year and second year ranged between 85.33 to 125.33 nuts palm^{-1} year^{-1} and 84.67 to 129.50 nuts palm^{-1} year^{-1}, respectively. In comparison of both years an increasing trend of nut yield from first year to second year was noticed due to application of manures and fertilizers. The increase in nut yield during second year might be due to combined effect of manures and fertilizers applied during second year as well as the residual impact of manures and fertilizers applied during first year.

In general, due to application of manure and fertilizers through different treatments the nut yield in coconut orchard was found to be increased over absolute control during both years of the experiment. The increase in nut yield with integration of organics with fertilizers was attributed to increased female flowers and nut setting per cent due to improved availability of nutrients to coconut.

The beneficial response of manures and fertilizers over absolute control to yield might be attributed to the availability of sufficient amount of plant nutrients throughout the year to the crop, improvement of soil environment resulting in higher root proliferation leading to better absorption of moisture and nutrients, plant vigour and ultimately higher yield. After proper decomposition and mineralization, the manures supplied available nutrients directly to the plants and also had solubilising effect on fixed forms of nutrients in soil (Sinha *et al.,* 1981).

Similar results of higher nut yield with integrated use of manures and fertilizers also reported by Temgire (2007) and Talashilkar *et al*. (2008).

Effect on economics of coconut cultivation

The perusal data presented in Table 5 indicate the economics of coconut cultivation due to application of different treatment in both the years i.e. 2014-15 and 2015-16. The application of RDF + azadirachtin + micronutrients through briquettes (T_5) recorded highest B:C ratio and net return during both the years of experiment.

During first year, a scrutiny of the data indicated that the treatment T_5 (Application of RDF + azadirachtin + micronutrients through briquettes) recorded highest in B: C ratio (2.29) followed by treatment T_8 (2.25), T_4 (2.24), T_3 (2.19), T_6 (2.15), T_9 (2.07), T_1 (2.07), T_2 (2.00), T_7 (1.44) and T_{10} (1.18). The treatment T_{10} receiving application of RDN through FYM at 25 kg/palm / year + Neem cake at 15 kg/palm/year + Vermicompost at 6 kg/palm/year recorded lowest B: C ratio in first year. The maximum net return was highest in treatment T_5 receiving application of

RDF + azadirachtin + micronutrients through briquettes (Rs. 2,07,241) followed by treatment T_8 receiving application of RDF + Azadiractin + Micronutrient through briquettes (Rs. 2,00,212) during first year. The lowest net return (Rs. 47,262) was recorded by treatment T_{10} (RDN through FYM at 25 kg/palm/year + Neem cake at 15 kg/palm/year +Vermicompost at 6 kg/palm/year) during first year.

In the second year the data showed that treatment T_5 (application of RDF + azadirachtin + micronutrients through briquettes) recorded highest B: C ratio (2.33) followed by treatment T_4 (2.30), T_8 (2.29), T_6 (2.27), T_3 (2.25), T_9 (2.10), T_2 (2.08), T_1 (2.06), T_7 (1.46) and T_{10} (1.16). Treatment T_{10} receiving application of RDN through FYM at 25 kg/palm/year + Neem cake at 15 kg/palm/year + Vermicompost at 6 kg/palm/year recorded lowest B: C ratio in the second year. The maximum net return was obtained in treatment T_5 receiving application of RDF + Azadiractin + Micronutrient through briquettes (Rs. 2,17,444) followed by treatment T_8 receiving application of RDF + Root feeding with azadirachtin 5 % @ 7.5 ml + 7.5 ml water (Rs. 2,08,778) during second year. The lowest net return (Rs. 40,332) was recorded by treatment T_{10} (RDN through FYM at 25 kg/palm/year + Neem cake at 15 kg/palm/year +Vermicompost at 6 kg/palm/year) during second year.

The B:C ratio obtained in T_7 (1.44 and 1.46) and T_{10} (1.18 and 1.16) were lower than the absolute control during first year and second year, respectively. The cost of inputs *viz*., neem cake, vermicompost and FYM required in bulk quantity were the contributing factors for higher cost of cultivation under treatment T_7 (Application of RDF through briquettes and neem cake at 15 kg/palm) and T_{10} (RDN through FYM at 25 kg/palm/year + Neem cake at 15 kg/palm/year + Vermicompost at 6 kg/palm/year), which eventually reduce the net return and B:C ratio of these treatments.

The root feeding with azadirachtin requires skilled person for its application and it is quite difficult for uneducated farmers to practice such operations in field. The wages of skilled labours are higher than the unskilled labour that increase the cost of production. The drenching of eriophyid smash and root feeding with azadirachtin are the separate operations which also increasing the cost of production. However, instead of root feeding and drenching of eriophyid smash, if the azadirachtin and micronutrients are supplied through briquettes mixing with inorganic fertilizers it will be beneficial as well as become simple for its application in coconut orchard even at unskilled farmer level.

Conclusion

On the basis of data obtained from the present investigation, it could be concluded that the application of RDN through FYM at 25 kg/palm/year + Neem Cake at 15 kg/palm/year + Vermicompost at 6 kg/palm/year in three splits (i.e. June, October and February) is beneficial for improving physico-chemical properties of soil of coconut orchard. The application of RDF + Azadirachtin + Micronutrients through briquettes (Treatment T_5) receiving highest yield along with maximum net return and B:C ratio. Therefore, it is concluded that the application of RDF along with Azadirachtin and Micronutrients through Konkan Annapurna Briquettes in three splits (i.e. June, October and February) is beneficial for increasing the yield of coconut with maximum profit.

Reference

Anonymous (2015). www.coconutboard.gov.in/presentation/ statistics/ statistics.aspx.

Bangar A.R. and Zende G.K. (1978). Soil Testing : A new basis for efficient fertilizer use. *J. Maharashtra Agric. Univ.* **3**(2): 81-84.

Bhosale A.R. (2016). Effect of graded levels of nitrogen and potassium on yield and quality of watermelon in lateritic soils of Konkan, M.Sc. (Ag.), Thesis submitted to Dr. B. S. K. K. V. Dapoli, Dist. Ratnagiri, (M.S).

Black C.A. (1965). Methods of Soil Analysis, Part-I, *American Society for Agronomy,* Inc., Madison, Wisconsin, U.S.A.

Diwale S.R. (2012) Effect of Manures on soil properties and crop response under cowpea-green gram- rice cropping sequence in lateritic soil. Ph. D Thesis submitted to Dr. B. S. K. K. V. Dapoli, Dist. Ratnagiri, (M.S).

Gadade O.B. (2007) Effect of integrated nutrient management on yield, quality and nutrient uptake by cowpea (*Vigna unguiculata* (L) Walp) in lateritic soil. *M.Sc. (Agri) thesis,* submitted to Konkan Krishi Vidyapeeth, Dapoli.

Gedam V.B., Rametke J.R., Rudragouda and Powar M.S. (2008) Influence of organic manures on yield, nutrient uptake of groundnut and change in physico-chemical properties of soil after harvest of groundnut. *Crop Research,* **36** (1, 2 & 3): 111-114.

Hapse D.G., Murkute S.B. and Zende N.A. (1993) *Effect of vermicompost on sugarcane yield and sugar recovery*. 10th annual State Level Sugarcane Development Workshop on low cost Technology for cane and sugar production organized by U.S. I. Manjari (BK) on 9-10 the July,1993.

Jackson M.L. (1973). Soil Chemical Analysis, Prentice Hall of India Pvt. Ltd., New Delhi: 134-182.

Kadam R.G. (2000) Effect of vermicompost with and without inorganic fertilizers on yield, quality and mineral nutrition of cowpea- cowpea cropping sequence. *M.Sc. (Agri.) thesis,* submitted to Konkan Krishi Vidyapeeth, Dapoli Dist. Ratnagiri (MS).

Lal S. and Mathur B.S. (1988). Effect of long term manuring fertilization and liming on crop yield and some physical properties of acid soil. *Journal of the Indian Society of Soil Science,* **36 :** 113-119.

Maheswarappa H.P., George V.T., Gupta A., Bhat R. and Palaniswami C. (2014). Productivity and nutrient status of coconut (*Cocos nucifera*) as influenced by integrated nutrient management with vermicomposted coconut leaves. *Indian Journal of Agronomy*, **59**(3): 455-459.

Panse V.G. and Sukhatme P.V. (1967). Statistical methods for Agril. Workers, L.C.A.R., New Delhi.

Preethi P., Raja P., Sehgal J. and Gajbhiye K.S. (1998). Study on mineralogy of some selected soils from hot humid to per humid ecosystem of Kozhikode, Palaghat and Emalkulam areas in Kerala. *J. Indian Soc. Soil Sci.,* **46**: 430-435.

Seth, S. P. (1967). Indices for diagnosis and salinity in soils of Rajasthan canal area.

Sinha N.P., Prasad B. and Ghosh A.B. (1981). Effect of continuous use of fertilizers on yield and nutrient uptake in wheat-soybean-potato cropping system. *Journal of the Indian Society of Soil Science,* **29:** 537-542.

Talashilkar S.C., Nagwekar D.D., Akhave S.R. and Dabke D.J. (2008). Effect of integrated use of manures and fertilizers on coconut yield and changes in available nutrient content and N, P and K fractions of *Inceptisols* of Konkan region, *Journal of Plantation Crops*, **36**(2): 112-116.

Temgire A.M. (2007). Effect of integrated use of manures and fertilizers on yield, nutrient uptake and quality of coconut (*Cocos nucifera* Li.) and soil properties, M.Sc. (Agri.) Thesis submitted to Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Dist. Ratnagiri, Maharashtra.

Upadhyay A.K., Srinivasa Reddy D.V. and Biddappa C.C. (1998). Organic farming technology for coconut, *Indian Coconut Journal*, **24**: 74-78.

Yadav D.S., Kumar V. and Yadav V. (2009). Effect of organic farming on productivity, soil health and economics of rice (*Oryza sativa*)- wheat (*Triticum aestivum*) system. *Indian Journal of Agronomy,* **54** (3): 267-271.

Yaduvanshi N.P.S. (2003). Substitution of inorganic fertilizers by organic manures and their effect on soil fertility in rice-wheat rotation on reclaimed Sodic Soil in India. *Journal of Agricultural Sciences* **14** (2): 161-168.

Table 1.Effect of integrated use of manures and fertilizers on pH of soils in coconut orchard

Treat. No.	Treatments	2014-15				2015-16			
		Stage I	Stage II	Stage III	Mean	Stage I	Stage II	Stage III	Mean
T_1	Absolute Control (No manure, no fertilizer)	5.58	5.50	5.44	**5.51**	5.44	5.50	5.53	**5.49**
T_2	Recommended Dose of Fertilizers (RDF) only	5.52	5.44	5.43	**5.46**	5.47	5.40	5.44	**5.44**
T_3	Application of RDF through briquettes	5.79	5.70	5.49	**5.66**	5.47	5.41	5.42	**5.43**
T_4	Application of RDF + Azadirachtin through briquettes	5.59	5.59	5.51	**5.56**	5.48	5.54	5.53	**5.52**
T_5	Application of RDF + Azadirachtin + Micronutrient (B) through briquettes	5.56	5.54	5.36	**5.49**	5.54	5.74	5.46	**5.58**
T_6	Application of RDF + Neem oil through briquettes	5.50	5.60	5.46	**5.52**	5.37	5.47	5.45	**5.43**
T_7	Application of RDF through briquettes and neem cake at 15 kg/ palm	5.64	5.84	6.00	**5.83**	6.02	5.76	5.85	**5.88**
T_8	Application of RDF + Root feeding with Azadirachtin 5% @ 7.5 mL + 7.5 mL water	5.49	5.69	5.50	**5.56**	5.48	5.54	5.50	**5.51**
T_9	Application of RDF + Drenching with Eriophyid smash 250 mL/20 L of water	5.73	5.60	5.49	**5.61**	5.49	5.52	5.53	**5.51**
T_{10}	RDN through FYM at 25 kg/palm/year + Neem cake at 15 kg/palm/year + Vermicompost at 6 kg/ palm/year	5.54	6.05	6.07	**5.89**	6.12	5.98	6.01	6.04
	SE ±	0.11	0.05	0.06		0.05	0.06	0.02	
	CD @ 5 %	N.S.	0.15	0.19		0.14	0.18	0.07	

Note: Stage-I of first year is the initial stage and the values given under stage-I of first year are irrespective of treatments

Table 2. Effect of integrated use of manures and fertilizers on electrical conductivity (dS m^{-1}) of soil in coconut orchard

Treat. No.	Treatments	2014-15				2015-16			
		Stage I	Stage II	Stage III	Mean	Stage I	Stage II	Stage III	Mean
T_1	Absolute Control (No manure, no fertilizer)	0.065	0.060	0.061	**0.062**	0.078	0.072	0.068	**0.073**
T_2	Recommended Dose of Fertilizers (RDF) only	0.060	0.059	0.079	**0.066**	0.088	0.079	0.070	**0.079**
T_3	Application of RDF through briquettes	0.088	0.071	0.106	**0.088**	0.124	0.088	0.076	**0.096**
T_4	Application of RDF + Azadirachtin through briquettes	0.078	0.066	0.126	**0.090**	0.140	0.103	0.080	**0.108**
T_5	Application of RDF + Azadirachtin + Micronutrient (B) through briquettes	0.082	0.092	0.099	**0.091**	0.088	0.100	0.111	**0.100**
T_6	Application of RDF + Neem oil through briquettes	0.082	0.086	0.100	**0.089**	0.111	0.117	0.086	**0.105**
T_7	Application of RDF through briquettes and neem cake at 15 kg/ palm	0.081	0.086	0.096	**0.088**	0.139	0.118	0.084	**0.114**
T_8	Application of RDF + Root feeding with Azadirachtin 5% @ 7.5 mL + 7.5 mL water	0.096	0.096	0.115	**0.102**	0.109	0.117	0.095	**0.107**
T_9	Application of RDF + Drenching with Eriophyid smash 250 mL/20 L of water	0.091	0.093	0.110	**0.098**	0.135	0.112	0.107	**0.118**
T_{10}	RDN through FYM at 25 kg/palm/year + Neem cake at 15 kg/palm/year + Vermicompost at 6 kg/palm/year	0.090	0.081	0.089	**0.087**	0.116	0.108	0.121	**0.115**
	SE ±	0.007	0.004	0.007		0.009	0.007	0.005	
	CD @ 5 %	N.S.	0.011	0.020		0.027	0.021	0.016	

Note: Stage-I of first year is the initial stage and the values given under stage-I of first year are irrespective of treatments

Table 3. Effect of integrated use of manures and fertilizers on organic carbon (%) of soil in coconut orchard

Treat. No.	Treatments	2014-15				2015-16			
		Stage I	Stage II	Stage III	Mean	Stage I	Stage II	Stage III	Mean
T_1	Absolute Control (No manure, no fertilizer)	1.51	1.49	1.70	**1.57**	1.51	1.43	1.46	**1.47**
T_2	Recommended Dose of Fertilizers (RDF) only	1.55	1.50	1.66	**1.57**	1.74	1.57	1.34	**1.55**
T_3	Application of RDF through briquettes	1.64	1.94	1.63	**1.74**	1.78	1.66	1.68	**1.71**
T_4	Application of RDF + Azadirachtin through briquettes	1.55	1.77	1.74	**1.69**	1.72	1.65	1.62	**1.66**
T_5	Application of RDF + Azadirachtin + Micronutrient (B) through briquettes	1.63	1.77	1.61	**1.67**	1.25	1.83	1.75	**1.61**
T_6	Application of RDF + Neem oil through briquettes	1.51	1.78	1.49	**1.59**	1.48	1.51	1.57	**1.52**
T_7	Application of RDF through briquettes and neem cake at 15 kg/palm	1.69	2.15	2.07	**1.97**	2.12	2.22	2.29	**2.21**
T_8	Application of RDF + Root feeding with Azadirachtin 5% @ 7.5 mL + 7.5 mL water	1.59	1.52	1.81	**1.64**	1.55	1.72	1.54	**1.60**
T_9	Application of RDF + Drenching with Eriophyid smash 250 mL/20 L of water	1.77	1.40	1.76	**1.64**	1.62	1.75	1.59	**1.65**
T_{10}	RDN through FYM at 25 kg/palm/year + Neem cake at 15 kg/palm/year + Vermicompost at 6 kg/palm/year	1.85	2.54	2.68	**2.36**	2.59	2.70	2.89	**2.73**
	SE ±	0.09	0.09	0.08		0.12	0.09	0.06	
	CD @ 5 %	N.S.	0.26	0.24		0.36	0.26	0.18	

Note: Stage-I of first year is the initial stage and the values given under stage-I of first year are irrespective of treatments

Table 4. Effect of integrated use of manures and fertilizers on yield (nuts palm^{-1} year^{-1}) of coconut

Treat. No.	Treatments	2014-15	2015-16
T_1	Absolute Control (No manure, no fertilizer)	85.33	84.67
T_2	Recommended Dose of Fertilizers (RDF) only	98.67	104.50
T_3	Application of RDF through briquettes	102.17	114.17
T_4	Application of RDF + Azadirachtin through briquettes	112.50	117.67
T_5	Application of RDF + Azadirachtin + Micronutrient (B) through briquettes	125.33	129.50
T_6	Application of RDF + Neem oil through briquettes	103.33	113.00
T_7	Application of RDF through briquettes and neem cake at 15 kg/palm	114.83	116.67
T_8	Application of RDF + Root feeding with Azadirachtin 5 % @ 7.5 mL + 7.5 mL water	122.67	126.17
T_9	Application of RDF + Drenching with Eriophyid smash 250 mL/ 20 L of water	123.83	127.17
T_{10}	RDN through FYM at 25 kg/palm/year + Neem cake at 15 kg/palm/year + Vermicompost at 6 kg/palm/year	104.00	101.17
	SE $\pm$	3.43	3.31
	CD @ 5 %	10.19	9.84

Table 5. Effect of integrated use of manures and fertilizers on economics of coconut cultivation

Treat. No.	Yield (Nuts ha^{-1})		Gross Return (Rs. ha^{-1})		Cost of Cultivation (Rs. ha^{-1})		Net Return (Rs. ha^{-1})		Cost benefit ratio (B:C ratio)	
	2014-15	2015-16	2014-15	2015-16	2014-15	2015-16	2014-15	2015-16	2014-15	2015-16
T_1	15189	15071	250619	248672	121311	120987	129307	127685	2.07	2.06
T_2	17563	18601	289790	306917	144676	147530	145114	159386	2.00	2.08
T_3	18186	20322	300069	335313	136884	142758	163185	192555	2.19	2.25
T_4	20025	20945	330413	345593	147792	150322	182620	195270	2.24	2.30
T_5	22309	23051	368099	380342	160857	162898	207241	217444	2.29	2.33
T_6	18393	20114	303485	331881	141269	146002	162216	185879	2.15	2.27
T_7	20440	20767	337260	342656	233649	234548	103611	108108	1.44	1.46
T_8	21835	22458	360278	370557	160066	161779	200212	208778	2.25	2.29
T_9	22042	22636	363693	373494	176073	177706	187620	195788	2.07	2.10
T_{10}	18512	18008	305448	297132	258186	256800	47262	40332	1.18	1.16

Cost of Manures/ Fertilizers/ Chemicals:

Urea = Rs.7 kg^{-1}

Single Super Phosphate = Rs. 9 kg^{-1}

Muriate of Potash = Rs. 24 kg^{-1}

Fertilizers Briquettes = Rs. 26 kg^{-1}

FYM = Rs. 5 kg^{-1}

Vermicompost = Rs. 12 kg^{-1}

Neem cake = Rs. 32 kg^{-1}

Borax = Rs. 340 kg^{-1}

Ammonium molybdate = Rs. 12 g^{-1}

Eriopyied smash = Rs. 400 L^{-1}

Neem oil = Rs. 600 L^{-1}

Azadirachtin = Rs. 900 L^{-1}

Labour Charges:

Un-skilled Male = Rs. 192 day^{-1}

Skilled labour = Rs. 266 day^{-1}

Study of Weed Flora and Weed Control Efficiency Under Diversification and Intensification of Rice Based Cropping Systems

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Abstract

A field experiment was conducted on diversification and intensification of cropping system under irrigated production system over existing rice - wheat and rice - chickpea cropping systems during the year 2012-13 in clay loam soils of Jabalpur (M.P.). In *kharif* different rice varieties were grown under various crops sequences and the lowest weed biomass was recorded in rice - potato - maize cob + fodder (3.98q/ha) cropped sequences and highest weed biomass was recorded in rice - potato - groundnut (5.60q/ha) under among different crop sequences grown. During *rabi* season, the weed intensity was minimum (94.4 to 95.4/ m^2) in onion and garlic crop grown under two different crop-sequences, hence, the lowest weed biomass (1.24 to 2.07 q/ha) was recorded in onion and garlic fields. Both gobhi sarson crop faced almost similar kind of weed-infestation, which were higher as compared to potato, hence, these resulted into production of higher weed biomass (4.84 to 5.29 q/ha). During summer season, the weed intensity was maximum (118.0 weeds/m^2) in green gram field, which resulted into the highest weed biomass production (3.89 q/ha). The weed biomass was minimum (3.22 q/ha) in sesame associated fields due to the lowest weed density (97.8 weeds/ m^2). Other summer season crops viz. groundnut, maize, okra and green gram produced the weed biomass. In *kharif* different rice varieties were grown under various crops sequences and the highest weed control efficiency was recorded in rice - potato - maize cob + fodder (29.9%) cropped sequences. During *rabi* season, The weed control efficiency was highest (50.0 to 70.6%) in onion, garlic and at potato crop grown under three different crop-sequences hence, the lowest weed control efficiency was recorded in gabhi sarson and chickpea 2.36 and 6.14%, respectively. In summer season, the weed control efficiency was lowest (1.02%) in maize field which resulted into the highest weed biomass production (3.85q/ha). The weed biomass was lowest (3.22 q/ha) in sesame fields due to the highest weed control efficiency (17.2%).

Keywords: weed flora, weed density, weed biomass, weed control efficiency, diversification, and intensification.

Introduction

Rice - wheat is the most adopted cropping sequence in India, covering an area of 11m/ha, suffer due to severe weed infestation owing to congenial weather condition and cropping history of land. This cropping system is followed in irrigated eco- system of north and central India. In Madhya Pradesh, this system is fallowed mainly in kymore plateau and Satpura hills zone and some part of the Vidhyan pleateau, central Narmada valley and gird region in about

1.064 million hectares contributing nearly 10% of the total area under rice - wheat in the country (Annonymous 2007). The severe competition by weeds results in yield reduction as high as 40 – 60% depending upon the intensity and the type of weed flora. Many research workers have reported the predominant of *Phalaris minor, Avena fatua* among the monocots, *Chenopodium album*, *Melilotus indica* among the dicot weeds in wheat field (Yadav *et al.* 2005). Hence, there is an urgent need for diversification and intensification of cropping system in rice based cropping system by improving the productivity and profitability per unit area per unit time without jeopardizing the soil health. In the changing agricultural scenario during globalization, agriculture in India has to face new challenges to complete at the global level in many agricultural commodities. India agriculture is now facing second generation problem like rising or lowering water table, nutrient, weed and diseases, environmental pollution and decline in farm profit.

Materials and Methods

Field experiment was conducted on diversification and intensification of cropping system under irrigated production system over existing rice - wheat and rice - chickpea cropping systems during the year 2009 - 10 in clay loam soils of Jabalpur (M.P.). This study had been started since the *kharif* season 2006 - 07, thus the present investigation was the 4th year of experimentation and continuity at the same site without changing the layout plan and treatments. The treatments were consisted with 12 - crop sequences viz., T_1 - rice (Kranti) - wheat (GW - 273) top most existing cropping system, T_2 - rice (Kranti) - chickpea (JG-322) second existing cropping system, T_3 - Hy. rice (Pro Agro 6444) - onion (Pusa Red) - green Gram (Pusa Vishal) G + R, T_4 - rice (Sugandha - 5) - berseem (JB-5) fodder + seed, T_5 - Hy. rice (JRH-5) - potato (Kufri Sinduri) - maize (JM-12) Cob + fodder, T_6 - Hy. rice (JRH-5) - gobhi Sarson (Terri Uttam) - Maize (JM-12), T_7 - Hy. rice (JRH-5) - vegetable pea (Arkel) - Hy. sesame (TKG - 55), T_8 - Hy. Rice JRH-5 - potato (Kufri Sinduri) - groundnut (Jyoti), T_9 - Hy. rice (JRH-5) - gobhi sarson (Terri Uttam) - groundnut (Jyoti) + maize (JM-12) 4:2 rows, T_{10} - Hy. rice (JRH-5) - gobhi Sarson (Terri Uttam) - okra (Parbhani Kranti), T_{11} - Hy. rice (JRH-5) - garlic (G-41) - sorghum (MP - chari) + cowpea (Local) 4:2 rows, T_{12} - Hy. rice (Pro Agro 6444) - marigold (African Giant) - maize (JM-12) cob + fodder. These treatments were tested in randomized block design with 4 replications. The average rainfall received during the crop period was 1000 – 1500 mm in 2009 – 2010. The observation or relative weed intensity (species wise) were recorded at 30 DAS and harvesting stage by using a quadrate of (0.25 m^2) 4 places in each plot and then species wise total weeds / m^2 were determined.

$$\text{Relative density (\%)} = \frac{\text{Number of individual weed species}}{\text{Number of total weed species}}$$

Result and Dissuction

Effect of weed dynamics

The floristic composition of associated weeds became stable due to continuous cropping. Therefore, diversification as well as intensification of cropping systems might be helpful to change the infestation of existing weed flora. In present investigation, 12 cropping systems

were tested for their relative performance including most commonly prevalent rice - wheat and rice- chickpea cropping system.

Relative density of weeds

In *kharif*, the present weed flora was almost same in all plots under differerent rice varieties. The dominating weeds were *Echinochloa crusgalli (*37.19 *%), Cyperus iria* (31.10 %), *Fimbristylis barbata* (9.4%), *Commelina communis* (5.3 %) and *Eclipta alba* (6.0 %) with minor weeds (8.5 %) at 30DAT. Typically *Caesulia axillaris* had shown more infestation its presence at maturity which was almost (2.5%) at early stage. At maturity stage, the relative densities of all weeds were changed. At maturity, severity of Cyprus*. irria* was reduced to great extent followed by *Echinochloa crusgalli.*and *Cyperus difformis*. But relative density of *Fimbristylis barbata, Commelina communis* and other miner weeds increased at final stage over their density at 30 DAT. Recommended weed control and proper weeding were adopted to grow rice and finally at maturity stage. Weed control treatment applied in rice had no effect on weed or the crop performances in succeeding wheat crop. (Mishra *et.al.*2010)

During *rabi* season, relative density of weeds varied between different crops. *. Medicago denticulata* was found to be more dominant weed in wheat, gobhi sarson and marigold followed by berseem, onion, garlic, chickpea, vegetable pea and potato under different crop-sequences (Table 1). Its relative density was 42.3, 42.9, 46.9, 38.9, 32.4, 33.2, and 22.8% respectively at 30 DAS, But the density of these weeds changed as 42.1, 24.4, 10.1, 30.2, 42.4, 9.4 and 46.8 %, respectively at maturity stage. *Chenopodium album* and *Melilotus alba* were common weeds in almost all *rabi* crops. But severity of *Chenopodium album* was much serious in*,* marigold, gobhi season*,* wheat*,* potato, while *Melilotus spp.* severily dominated to wheat, chick pea and vegetable pea, marigold, berseem. Typically *Portulaca oleracea* infestated potato only during *rabi* season. And other predominating weeds shown their presence with their most associated crops like *Phalaris minor* and *Vicia sativa* in wheat, *Anagallis arvensis* in onion, garlic, gobhi sarson, potato and marigold; *Rumex dentatus* in potato, berseem and marigold; and *Chichorium intybus* in berseem. Frequent cuttings for fodder in berseem and earthing as well as cultural practices associated with potato, onion and garlic resulted in decline in its infestation. Due to *Melilotus alba* and *Medicago denticulata* weeds in chickpea field causes more losses (according to Gul *et al.,* 2008 and Singh *et. al*., 2007).

In summer season, most dominant weed are *Portulaca spp.* followed by *Cyperus irria Echinochloa spp.* in all summer crops. The *Trianthima monogyna* infested maize, groundnut, green gram and okra, but it did not show its accurance sesame field.

Weed biomass

Weed biomass varied between the crops in each season. In *kharif* different rice varieties were grown under various crops sequences and the lowest weed biomass was recorded in rice - potato - maize cob + fodder (3.98q/ha) cropped sequences and highest weed biomass was recorded in rice - potato - groundnut (5.60q/ha) under among different crop sequences grown. Since the total weed density did not differ remarkably among different rice varieties, hence weed biomass also did not show remarkable variations between them.

During *rabi* season, weed biomass significantly varied between different crops grown under various crop-sequences mainly due to marked variation in total weed intensity. The weed intensity was lowest (94.4 to 95.4/m^2) in onion and garlic crop grown under two different crop-sequences, hence, the lowest weed biomass was recorded in garlic and onion 1.24 and 2.07q/ha, respectively. Potato grown under two crop sequences faced almost similar kind of weed-infestation, which were higher as compared to onion & garlic, hence, these resulted into lesser weed biomass (1.26 to 1.28 q/ha). Remaining crops had higher weed biomass because of greater weed intensity during *rabi* season, than that of earlier mentioned crops (Table 2).

During summer season, the weed intensity was maximum (118.0 weeds/m^2) in green gram field which resulted into the highest weed biomass production (3.89q/ha). The weed biomass was minimum (3.22 q/ha) in sesame fields due to the lowest weed density (97.8 weeds/m^2). Weed intensity of other summer season crops viz. maize, groundnut, okra. sorghum and cowpea were 105.4 to 116.8, 102.9, 99.2 and 106.4 and with the weed biomass of 3.47 to 3.85, 3.71, 3.27 and 3.51. In summer cropping, inclusion of sesame in the rotation was beneficial from the point of decreasing weed biomass and dry weight by secreting some alkaloid in the soil whereas groundnut has slow growth in the early period resulting in more infestation of weeds (Samui *et al.*2006).

Weed control efficiency

In *kharif* different rice varieties were grown under various crops sequences and the highest weed control efficiency was recorded in rice - potato - maize cob + fodder (29.9%) cropped sequences and because of lowest weed biomass (3.98q/ha) was recorded in same crop sequences grown. During *rabi* season, weed control efficiency significantly varied between different crops grown under various crop-sequences mainly due to marked variation in total weed biomass. The weed control efficiency was highest (50.0 to 70.6%) in onion, garlic and at potato crop grown under three different crop-sequences, hence, the weed control efficiency was recorded in gabhi sarson and chickpea 2.36 and 6.14%, respectively. (Table 3). During summer season, the weed control efficiency was lowest (1.02%) in maize field which resulted into the highest weed biomass production (3.85q/ha). The weed biomass was lowest (3.22 q/ha) in sesame fields due to the highest weed control efficiency (17.2%).

References

Annonymous. 2007. *Agriculture at a glance*. Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India, New Delhi.

Gul-Hassn, Initiaz - Khan, Naquibullah - Khan 2008. Distribution of weed flora

in chickpea crop in district Dera Ismail Khan, pakistan.

Mishra, J.S.,Singh V.P. and Jain Namrata 2010. Long-Term Effect of Tillage and Weed Control on Weed Dynamics, Soil Properties and Yield of Wheat in Rice-Wheat System.

Samui, R. S., Subhendu - mondal, Debtanu - Dash 2006. Effect of diversification of rice - wheat cropping system on weed population and weed dry weight. 15th Australian weeds - conference, papers and proceeding Adelaide - South - AUSTRALIA, - 24 -28.

Singh,B.A. and Walia U.S.2007. Studies on Composition of Weed Flora of Wheat (*Triticum aestivum* **L.**) in Relation to Different Tillage Practices under Rice-Wheat Cropping System. *Indian Journal of weed science* **39** (3&4): 190 – 196.

Yadav DS, Shukla RP, and Kumar Birendra. 2005. Effect of zero tillage and nitrogen level on wheat after rice. *Indian Journal of agronomy* **50** (1): 53-53.

Table 1. Relative density of weeds at 30 DAS and maturity stages of various crops grown under different crop sequences

Crop	Predominant weeds	Relative density (%)	
		At 30 DAS	At maturity
Rice	*Echinochloa crusgalli*	37.19	14.2
	Cyperus iria / C. difformis	31.10	22.5
	Fimbristylis barbata	9.41	11.5
	Commelina communis	5.3	10.4
	Eclipta alba	6.0	5.8
	Caesulia axillaris	2.5	14.8
	Others	8.5	20.8
	Total	100.0	100.0
Wheat	*Medicago denticulata*	42.3	39.8
	Chenopodium album	16.5	12.6
	Melilotus alba	12.1	10.5
	Phalaris minor	8.7	8.5
	Vicia sativa	6.4	3.9
	Others	14.0	2 4.7
	Total	100.0	100.0
Berseem	*Medicago denticulata*	38.9	35.0
	Trifolium flagiferum	17.3	14.8
	Rumex dentatus	9.8	14.9
	Chenopodium album	7.5	3.8
	Chichorium intybus	6.8	9.2
	Othres	19.7	22.3
	Total	100.0	100.0
Onion & Garlic	*Medicago denticulata*	32.4	25.4
	Portulaca oleracea	26.6	35.8
	Chenopodium album	10.2	5.2
	Anagallis arvensis	12.8	7.8
	Others	18.0	25.8
	Total	100.0	100.0
Chick pea & vegetable pea	*Medicago denticulata*	33.2	30.0
	Melilotus alba	18.8	15.7
	Chenopodium album	15.1	12.5
	Anagallis arvensis	10.5	7.8
	Others	22.4	34.4
	Total	100.0	100.0

Gobhi sarson	*Medicago denticulata*	42.9	39.6
	Chenopodium album	20.3	12.4
	Melilotus alba	12.1	9.4
	Anagallis arvensis	8.8	10.0
	Others	15.9	28.6
	Total	100.0	100.0
Potato	*Portulaca oleracea*	39.7	32.4
	Medicago denticulata	22.8	14.5
	Chenopodium album	14.0	10.2
	Anagallis arvensis	8.6	4.3
	Rumex dentatus	5.2	12.0
	Others	9.7	26.6
	Total	100.0	100.0
Marigold	*Medicago denticulata*	46.9	38.8
	Chenopodium album	20.3	18.4
	Rumex dentatus	7.2	5.8
	Anagallis arvensis	8.4	6.9
	Others	17.2	31.1
	Total	100.0	100.0
Green gram	*Portulaca oleracea*	52.6	48.5
	Cyperus spp.	23.1	19.2
	Echinochloa crusgalli	8.4	9.2
	Others	15.9	23.1
	Total	100.0	100.0
Maize	*Portulaca oleracea*	43.8	38.2
	Cyperus spp.	17.4	12.8
	Trianthima monogyna	12.8	20.4
	Others	26.0	28.6
	Total	100.0	100.0
Sesame	*Portulaca oleracea*	42.7	40.9
	Cyperus spp	15.5	13.8
	Commelina communis	5.8	6.9
	Phyllanths niruri	9.2	7.5
	Others	26.8	30.9
	Total	100.0	100.0
Groundnut & Okra	*Portulaca oleracea*	43.6	48.9
	Cyperus spp.	25.3	14.3
	Trianthima monogyna	16.9	12.4
	Others	14.2	24.4
	Total	100.0	100.0

Table 2. Weed intensity and weed biomass at maturity stage under different crop -sequences

Crop- sequences Kharif	Weed intensity /m ^{2}			Weed biomass (q/ha)		
	Rabi	Summer	Kharif	Rabi	Summer	
T_1- Rice (Kranti) - Wheat (GW-273)	104.3	134.0	-	4.61	3.40	-
T_2- Rice (Kranti) - Chickpea (JG-322)	99.2	120.4	-	4.39	3.97	-
T_3- Rice (Pro Agro 6444) - Onion (Pusa red) – Green gram (Pusa Vishal) G+R	122.5	94.4	118.0	5.39	2.07	3.89
T_4- Rice (Sugandha - 5) - Berseem (JB-5) fodder +Seed	129.2	102.6	-	5.68	3.38	-
T_5- Rice (JRH-5) - Potato (Kufri Sinduri) -Maize (JM-12) cob + fodder	90.6	99.1	107.8	3.98	1.28	3.55
T_6- Rice (JRH-5)- Gobhi sarson (Terri Uttam) – Maize (JM-12)	110.0	128.2	105.4	4.84	4.23	3.47
T_7- Rice (JRH-5) - Vegatable pea (Arkel) - Sesame (TKG - 55)	118.9	106.9	97.8	5.23	3.52	3.22
T_8- Rice (JRH-5)-Potato (Kufri Sinduri)-Groundnut (Jyoti)	127.7	97.4	102.9	5.60	1.26	3.39
T_9- Rice (JRH-5) - Gobhi sarson (Terri Uttam) – Groundnut (Jyoti) + Maize (JM-12) 4:2 row	120.3	125.3	112.6	5.29	4.13	3.71
T_{10} Rice (JRH-5) - Gobhi sarson (Terri Uttam) – Okra (Parbhani Kranti)	118.4	115.2	99.2	5.20	3.80	3.27
T_{11} Rice (JRH-5) - Garlic (G-41)-Sorghum (MP Chari) + Cowpea (Local) 4:2 row	118.3	95.4	106.4	5.20	1.24	3.51
T_{12} Rice (Pro Agro 6444) - Marigold (African Giant) - Maize (JM-12) cob + fodder	121.1	104.2	116.8	5.32	3.8	3.85
SEm± CD (P=0.05)	0.135 0.390	0.122 0.351	0.147 0.424	0.015 0.459	0.014 0.041	0.016 0.046

Table 3. Weed control efficiency at maturity stage under different crop -sequences

Crop- sequences Kharif	Weed control efficiency (%)		
	Rabi	Summer	
T_1- Rice (Kranti) - Wheat (GW-273)	18.8	19.62	-
T_2- Rice (Kranti) - Chickpea (JG-322)	22.7	6.14	-
T_3- Rice (Pro Agro 6444) - Onion (Pusa red) – Green gram (Pusa Vishal) G+R	5.10	51.0	-
T_4- Rice (Sugandha - 5) - Berseem (JB-5) fodder +Seed	-	20.0	-
T_5- Rice (JRH-5) - Potato (Kufri Sinduri) -Maize (JM-12) cob + fodder	29.9	69.7	8.74
T_6- Rice (JRH-5)- Gobhi sarson (Terri Uttam) – Maize (JM-12)	14.7	-	10.7
T_7- Rice (JRH-5) - Vegatable pea (Arkel) - Sesame (TKG - 55)	7.92	16.7	17.2
T_8- Rice (JRH-5) - Potato (Kufri Sinduri) -Groundnut (Jyoti)	1.40	70.2	12.8
T_9- Rice (JRH-5) - Gobhi sarson (Terri Uttam) – Groundnut (Jyoti) + Maize (JM-12) 4:2 row	6.86	2.36	4.62
T_{10} Rice (JRH-5) - Gobhi sarson (Terri Uttam) – Okra (Parbhani Kranti)	8.45	10.61	15.9
T_{11} Rice (JRH-5) - Garlic (G-41) – Sorghum (MP Chari) + Cowpea (Local) 4:2 row	8.45	70.6	9.74
T_{12} Rice (Pro Agro 6444) - Marigold (African Giant) - Maize (JM-12) cob + fodder	6.33	10.16	1.02
SEm± CD (P=0.05)	0.50 1.51	0.11 0.31	0.11 0.33

Plant Resistance Mechanisms to Cold Stress

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Abstract

Plants cannot escape from many biotic and abiotic stresses being sessile, which affects their optimal conditions of growth and development. Low temperature constitutes one of the most harmful abiotic stresses affecting plants. The degree to which a plant becomes damaged by exposure to low temperature is governed by many factors such as developmental stage, severity of frost, the rates of cooling and whether ice formation takes place intracellularly or extracellularly in the intercellular spaces. Number of physiological and morphological means to improve survival in the face of extended cold periods have been evolved by crop species adjusted by natural selection to cold environments. Although conventional breeding techniques have resulted in modest improvements of cold tolerance through inter-specific or inter-generic hybridization but biotechnology offers new strategies that can be used to improve plant freezing tolerance and result in increased plant productivity and expand areas of agricultural production. Besides, *in vitro* induced variations have also been applied to improve the abiotic stress tolerance of various crop plants but without much success. Thus, the use of biotechnological interventions for identification of the pivotal genes underlying cold stress has thus become a major priority in the search for improved crop winter hardiness. Major study and understanding of the regulatory pathways of these genes and of their response to low temperature stress would facilitate clarification of the ways in which plants adjust to the stress. Knowledge of this type is widely expected to provide opportunities for the manipulation of gene expression in crop plants with a view to engineering higher levels of cold tolerance.

Keywords : Cold stress, cold acclimation, CBF/DREB

Introduction

Being sessile organisms, plants are unable to escape from many kinds of biotic and abiotic stresses that affect the optimal conditions of growth and development [1]. Low temperature represents one of the most harmful and damaging abiotic stresses affecting plants . Low temperature may inflict stress on a plant in multiple ways – The effects of low temperature alone causes dehydration of the cells and tissues when cellular water freezes [2]. Several means by how these stressors can affect a plant are shown in Fig. 1. Low temperatures overhead freezing point are detrimental to many plants of the tropics and subtropics which can not acclimatize to cold. This kind of damage has been termed ‘chilling’ and results primarily from loss of function of biomembranes connected with a decrease of their fluidity and an inactivation or at least reduction of the membrane bound ion pumps[3] . Many factors contribute to whether and to what extent a plant becomes damaged by exposure to low temperature and include its developmental stage, the duration and severity of frost, the rates of cooling and rewarming and whether ice formation takes place intracellularly or extracellularly in the

intercellular spaces. Intracellular ice formation, by disintegration of the cellular membranes, is known to be unavoidably lethal[4] .

During extended cold periods, species acclimatized by natural selection to cold habitats have evolved several physiological and morphological means to improve survival . Typically, these species including herbs, grasses, shrubs are of short stature, have a low leaf surface area and a high root/shoot ratio. Plants adapted to cold tend to be slow growing, have usually the C3 means of photosynthesis and store sugars in underground tissues[5]. Plants well adapted to cool environments have evolved an efficient respiration system, which allows them to rapidly mobilise stored reserves during the short growing season. The timing of developmental and physiological responses to environmental stress is under strict genetic control [6].

The mechanism of low temperature resistance in plants is indeed a complex trait, involving many different metabolic pathways and cell compartments .Tolerance to cold stress results from integrated events occurring at all organization levels, from the anatomical and morphological to the cellular, biochemical and molecular levels. Plants differ in their tolerance to chilling (0-15 ºC) and freezing (< 0ºC) temperatures [7].

Conventional breeding techniques to improve cold tolerance in plants lead to only modest improvements through inter-specific or inter-generic hybridization. The use of *in vitro* induced variations have also been applied to improve the abiotic stress tolerance of various crop plants with low rates of success [8]. Biotechnological sciences offer new strategies that can be put to use to improve plant freezing tolerance inorder to increase plant productivity and expanded areas of agricultural production. Proper understanding and identification of the pivotal key players and genes underlying cold stress has thus become a major priority in the search for improved crop winter hardiness. A deeper study of the regulatory signaling pathways of these genes and of their response to low temperature stress would allow clarification of the ways in which plants adjust to the stress[9]. Knowledge of this type is widely expected to provide opportunities for the manipulation of gene expression in crop plants, with a view to engineering higher levels of cold tolerance.

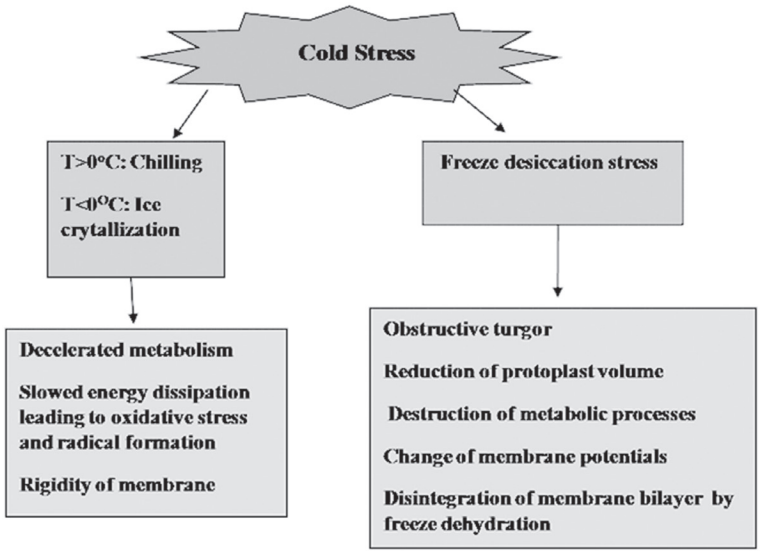

Fig.1 Effect of cold stressors on plants

Strategies adapted by plants to overcome cold stress

Avoidance and tolerance are two distinct strategies taken by plants to combat low temperature stress. Stress avoidance entails preventing the freezing of sensitive tissues. Some succulent species (with thick tissue mass and abundant water content) accumulate residual heat during the day and dissipate it slowly during the cold night, many annual herbs survive in the form of dormant organs or seed, others protect the shoot meristem with leaves. Supercooling is another defined avoidance strategy which prevents endogenous ice nucleation by inhibition of the formation of ice nucleators, even where the temperature falls as low as -40°C. Extremely winter hardy species are able to produce within their cells so-called 'liquid glass', a highly viscous solution that prevents ice nucleation even at -196°C [10]. Such cells become osmotically, thermally and mechanically de-sensitised to the presence of external ice. Tolerant plants have evolved the ability to acclimatise as the non-heritable modification of structure and function where the severity of the stress is more progressive, thereby reducing harm and improving fitness. The plant response to low-temperature stress can be divided into three distinctive phases. The first phase involves cold acclimation (pre-hardening) which occurs at low but above zero temperatures. The second stage is hardening, during which the full degree of tolerance is achieved, requires exposure to a period of sub-zero temperatures. The final phase is plant recovery after winter [11]. Trees inorder to fully develop their cold tolerance need a combination of short photoperiod and low temperature. In these cases, tolerance can be lost if the temperature is raised above zero and the photoperiod is lengthened. The level of tolerance varies in plant organs, typically roots are much more sensitive than the crown which is understandable given that the crown is the site of the major meristem responsible for production of new roots and shoots at the end of the cold period [12].

The CBF/DREB receptive pathway in crops

Knowledge obtained from the various studies of the model crop *Arabidopsis thaliana* has proven to be largely, but not completely, transferable to crop plants. Many key stress responses are not transferable unfortunately, e.g. over-expression of the barley low temperature induced gene HvCBF4 in rice, which resulted in the up-regulation of a set of genes not predicted from the heterologous expression of AtCBF3 in rice[13]. For cereal species, this disadvantage is to some extent balanced by the availability of the rice genome sequence, and its increasing level of annotation, since the cereal species genomes are all closely related to one another. In barley, the CBF genes HvCBF3, HvCBF4 and HvCBF8 are all components of the frost resistance quantitative trait locus (QTL) located on chromosome 5H [14].

The regulation of genes involved in CBF-responsive pathway although has been only marginally explored to date in woody plants, there are some indications that their regulation is more complex than in herbaceous species [15]. For example four *Eucalyptus gunnii* CBF1 genes displayed differential expression in response to cold treatment [16].

Functional proteins involved in cold acclimation

The level of cold hardiness and the level of expression of barley COR genes have been found to be correlated. During the process of cold acclimation, COR genes such as COR tmc-ap3 and COR14b are up-regulated, as are BLT (barley low temperature) genes (BLT14, BLT63,

BLT801, BLT4) and ELIP (early light inducible protein) genes [17]. Other genes are down-regulated most typically those associated with photosynthesis such LHC (light harvesting complex) and plastocyanin. During cold acclimation, induction of three genes including DHN5, DHN8 and COR14b in barley has been reported and found to be cold specific. Other up-regulated genes reported include those encoding enzymes involved in amino acid metabolism (chloroplast-dependent, except for proline, which is chloroplast-independent)[18].

Cold Tolerance using biotechnological interventions

To improve cold stress tolerance in plants, transgenic technology has opened up many exciting possibilities by introduction or removal of gene or genes that regulate a specific trait. It provides opportunities for improvement in genetic potential of plants in the form of development of specific crop varieties that are more resistant to biotic and cold stresses with increased nutritional levels. Identification of cold tolerant genes for applications in genetically transformed crops has put an end to the low temperature limitations. In transgenic tobacco (*Nicotiana tabacum*), chilling tolerance at 1 ºC for 7 d was achieved by the over expression of a gene encoding chloroplast *w*3 fatty acid desaturase. Advancement in field of plant biotechnology during last two decades has led to the identification and isolation of a number of transcription factors related to cold stress tolerance[19]. For production of cold stress tolerant crops, good number of genes have been identified in different studies, which briefly are given in (Table 1).

One of the most significant discoveries in the field of low temperature adaptation and signal transduction are CBF genes. This gene is almost possessed by all important crops and few vegetables species. Transgenic *Arabidopsis* plants constitutively overexpressing a cold inducible transcription factor (*CBF*1; *CRT/DRE* binding protein) showed tolerance to freezing without any negative effect on the development and growth characteristics[20] .

Overexpression of *Arabidopsis CBF*1 (*CRT/DRE* binding protein) has been shown to activate cor homologous genes at non-acclimating temperatures[21]. The *CBF*1 cDNA when introduced into tomato (*Solanum lycopersicum*) under the control of a CaMV35S promoter improved tolerance to chilling, drought and salt stress but exhibited dwarf phenotype and reduction in fruit set and seed number per fruit[22] . The expression of related cold shock proteins (CSPs) from bacteria, CspA from *Escherichia coli* and CspB from *Bacillus subtilis*, promotes stress adaptation in multiple plant species [23].

Table1: Selective genes that have been used for the development of cold stress tolerant crops

Gene (s) / Gene product	Cellular role	Transgenic Host-Plant	Performance of transgenic plants	Reference
cor15a Cold regulated Gene	Promotes freezing tolerance	*A. thaliana*	Transformants showed *in vivo* enhanced freezing tolerance of protoplasts and the chloroplasts	[24]

cbf1 CRT/DRE binding factor	Transcription factor	*A. thaliana*	Transformants showed regulation of several *cor* genes at the same time and showed freezing tolerance	[25]
dreb1 and dreb2 DRE-binding Protein	Transcription factor	*A. thaliana*	Transformants revealed freezing and dehydration tolerance but caused dwarfed phenotypes in transgenic plants	[26]
WCS120/COR39 CCGAC sequences like CRT/DREs in its promoter	Low temperature regulated Gene	*Triticum sativum*	cold inducible in monocotyledonous and dicotyledonous plants	[27]
Coda Choline oxidase A	Glycine betaine Biosynthesis	*O. sativa*	Transformants accumulated high levels of glycine betaine and showed increased tolerance to salt and low temperature stress	[28]
Coda Choline oxidase A	Glycine betaine Biosynthesis	*A. thaliana*	Transformants were tolerant to salt and cold	[29]
DREB1A (CBF3) DRE-binding Protein	Transcription factor	*Arabidopsis*	Increased salt, drought and cold tolerance in non acclimated plants	[30]
CBF3 DRE-binding Protein	Transcription factor	*Arabidopsis*	Increased freezing tolerance of cold acclimated Plants	[31]
CBF1/ DREB1b DRE-binding Protein	Transcription factor	*O. sativa*	The cold-responsive genes lip5, lip9, and OsDhn1 were up-regulated in the transgenic Plants	[32]
DREB1A (*rd29A)* DRE-binding Protein	Stress-inducible promoter	*N. tabacum*	Improved drought and low-temperature stress Tolerance	[33]
OSISAP1 Zinc-finger protein	Transcription factor	*N. tabacum*	The transcript level of *OSISAP*1 was increased to a very high level during a 12-h cold treatment	[34]

Conclusion and Future Perspectives

Plants especially crop species can withstand various kinds of stresses to a certain extent. A number of key basic genes and regulatory elements underlying the response to cold stress have been identified using combined investigative approach involving physiological and biochemical analyses, aided by genomics and proteomics based platforms [35]. Spring sown crop cultivars

differ from winter sown cultivars in the patterns of expression of various transcription factors with the consequent induction of a different spectrum of stress responsive genes [36].

As yet there is no simple general model that has been able to capture the complexity of the signalling pathways underlying the effectiveness of cold acclimation in strengthening freezing tolerance. Some metabolites are known to be multifunctional for example some sugars, which have pivotal role in osmoprotection but also contribute in signalling or certain proteins, which have ability to adjust their function according to the nature of the stress for example PR-2 and PR-11, which inhibit their glucanase and chitinase activity during cold stress, and induce antifreeze activity[37]. In many gene groups/families, the function of some members is just stress specific, but others react to many stresses (a good example of which is provided by dehydrins, some of which are induced specifically by cold stress, others are drought induced and others are salinity responsive)[38].

High throughput genomic and transcriptomic technologies for rather a limited number of plant species have been developed so far. The number of plant species whose genomes have been sequenced fully is however growing apace as the cost of sequencing technology falls. At the same time, advancements in transcriptomics and resequencing are opening new perspectives for unraveling the molecular mechanisms underlying many complex plant responses to the environment.

References

1. Wani, W., et al., *Engineering plants for heavy metal stress tolerance.* Rendiconti Lincei. Scienze Fisiche e Naturali, 2018: p. 1-15.
2. Ceusters, N., W. Van den Ende, and J. Ceusters, *Exploration of sweet immunity to enhance abiotic stress tolerance in plants: lessons from CAM*, in *Progress in Botany Vol. 78*2016, Springer. p. 145-166.
3. D'Amelia, V., et al., *Subfunctionalization of duplicate MYB genes in Solanum commersonii generated the cold□induced ScAN2 and the anthocyanin regulator ScAN1.* Plant, cell & environment, 2018. **41**(5): p. 1038-1051.
4. Hossain, M.A., et al., *Heat or cold priming-induced cross-tolerance to abiotic stresses in plants: key regulators and possible mechanisms.* Protoplasma, 2017: p. 1-14.
5. Hossain, M.S., et al., *Metabolite profiling at the cellular and subcellular level reveals metabolites associated with salinity tolerance in sugar beet.* Journal of experimental botany, 2017. **68**(21-22): p. 5961-5976.
6. Ye, Y., et al., *The role of receptor-like protein kinases (RLKs) in abiotic stress response in plants.* Plant cell reports, 2017. **36**(2): p. 235-242.
7. Heidarvand, L., A.H. Millar, and N.L. Taylor, *Responses of the Mitochondrial Respiratory System to Low Temperature in Plants.* Critical Reviews in Plant Sciences, 2017. **36**(4): p. 217-240.
8. Chatterjee, P., S. Biswas, and A.K. Biswas, *Research Article Sodium Chloride Primed Seeds Modulate Glutathione Metabolism in Legume Cultivars under NaCl Stress.* 2018.
9. Duruflé, H., et al., *Cell wall modifications of two Arabidopsis thaliana ecotypes, Col and Sha, in response to sub-optimal growth conditions: An integrative study.* Plant Science, 2017. **263**: p. 183-193.
10. Szymańska, R., et al., *Physiological and biochemical responses to high light and temperature stress in plants.* Environmental and Experimental Botany, 2017. **139**: p. 165-177.
11. Calvi, G., et al., *Analyses of several seed viability markers in individual recalcitrant seeds of Eugenia stipitata McVaugh with totipotent germination.* Plant Biology, 2017. **19**(1): p. 6-13.
12. Krasensky-Wrzaczek, J. and J. Kangasjärvi, *The role of reactive oxygen species in the integration of temperature and light signals.* Journal of experimental botany, 2018. **69**(14): p. 3347-3358.
13. Ghatak, A., P. Chaturvedi, and W. Weckwerth, *Metabolomics in Plant Stress Physiology.* 2018.
14. Jha, U.C., A. Bohra, and R. Jha, *Breeding approaches and genomics technologies to increase crop yield under low-temperature stress.* Plant cell reports, 2017. **36**(1): p. 1-35.
15. Akula, R. and G.A. Ravishankar, *Influence of abiotic stress signals on secondary metabolites in plants.* Plant signaling & behavior, 2011. **6**(11): p. 1720-1731.

16. Nguyen, H.C., et al., *Special trends in CBF and DREB2 groups in Eucalyptus gunnii vs Eucalyptus grandis suggest that CBF are master players in the trade□off between growth and stress resistance.* Physiologia plantarum, 2017. **159**(4): p. 445-467.
17. Krasensky, J. and C. Jonak, *Drought, salt, and temperature stress-induced metabolic rearrangements and regulatory networks.* Journal of experimental botany, 2012. **63**(4): p. 1593-1608.
18. Le Gall, H., et al., *Cell wall metabolism in response to abiotic stress.* Plants, 2015. **4**(1): p. 112-166.
19. Nuccio, M.L., et al., *Where are the drought tolerant crops? An assessment of more than two decades of plant biotechnology effort in crop improvement.* Plant Science, 2018.
20. Prasad, R., S.S. Gill, and N. Tuteja, *New and Future Developments in Microbial Biotechnology and Bioengineering: Crop Improvement through Microbial Biotechnology*2018: Elsevier.
21. Asensi-Fabado, M.-A., A. Amtmann, and G. Perrella, *Plant responses to abiotic stress: the chromatin context of transcriptional regulation.* Biochimica et Biophysica Acta (BBA)-Gene Regulatory Mechanisms, 2017. **1860**(1): p. 106-122.
22. Ricroch, A., P. Clairand, and W. Harwood, *Use of CRISPR systems in plant genome editing: toward new opportunities in agriculture.* Emerging Topics in Life Sciences, 2017. **1**(2): p. 169-182.
23. Khan, Z., et al., *Use of TALEs and TALEN technology for genetic improvement of plants.* Plant Molecular Biology Reporter, 2017. **35**(1): p. 1-19.
24. Khan, Z., et al., *Targeted Genome Editing for Cotton Improvement.* 2018.
25. Gairola, S., et al., *Strengthening desert plant biotechnology research in the United Arab Emirates: a viewpoint.* Physiology and Molecular Biology of Plants, 2018: p. 1-13.
26. Chang, S., et al., *Genetic engineering of trees: progress and new horizons.* In Vitro Cellular & Developmental Biology-Plant, 2018. **54**(4): p. 341-376.
27. López-Arredondo, D.L., L. Sánchez-Calderón, and L. Yong-Villalobos, *Molecular and genetic basis of plant macronutrient use efficiency: concepts, opportunities, and challenges*, in *Plant Macronutrient Use Efficiency*2018, Elsevier. p. 1-29.
28. Zsögön, A., et al., *Understanding and improving water-use efficiency and drought resistance in tomato*, in *Achieving sustainable cultivation of tomatoes*2017, Burleigh Dodds Science Publishing. p. 139-164.
29. Devarumath, R.M., et al., *Biotechnological approach: A new dimension for sugarcane improvement*, in *Biotechnology to Enhance Sugarcane Productivity and Stress Tolerance*2018, CRC Press. p. 1-24.
30. Nerkar, G.A., et al., *Biotechnological approach: A new dimension for sugarcane improvement*, in *Biotechnology to Enhance Sugarcane Productivity and Stress Tolerance*2018, CRC Press. p. 17-40.
31. Koźmińska, A., et al., *Recent strategies of increasing metal tolerance and phytoremediation potential using genetic transformation of plants.* Plant biotechnology reports, 2018: p. 1-14.
32. Pantchev, I., et al., *History of Plant Biotechnology Development.* Bioprocessing of Plant In Vitro Systems, 2018: p. 3-37.
33. Jha, U.C., *Current advances in chickpea genomics: applications and future perspectives.* Plant cell reports, 2018: p. 1-19.
34. Shamim, M. and K. Singh, *Biological and Molecular Approaches for Biotic Stress Management of Postharvest Losses in Rice*, in *Biotic Stress Management in Rice*2017, Apple Academic Press. p. 309-346.
35. Prasad, B.D., et al., *Plant Biotechnology, Volume 1: Principles, Techniques, and Applications*2017: CRC Press.
36. Samodelov, S.L. and M.D. Zurbriggen, *Quantitatively understanding plant signaling: novel theoretical–experimental approaches.* Trends in plant science, 2017. **22**(8): p. 685-704.
37. Khan, S. and L. ur Rahman, *Pathway modulation of medicinal and aromatic plants through metabolic engineering using Agrobacterium tumefaciens.* Transgenesis and Secondary Metabolism, 2017: p. 431-462.
38. Kendurkar, S.V. and M. Rangaswamy, *Genetic Transformation in Eucalyptus*, in *Biotechnologies of Crop Improvement, Volume 2*2018, Springer. p. 335-366.

Determinants of Technical Efficiency in Saffron Growing Farms of District Pulwama: Post National Saffron Mission Scenario

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Abstract

The National Saffron Mission (NSM) funded by Government of India in collaboration with Government of J&K was launched during 2010-11 to revive the saffron cultivation by introducing new technologies and improved farm management practices. To what extent NSM has been able to arrest the deteriorating trends is an issue of interest to the researchers and policy makers. In this paper the author intends to share some of the major results on technical efficiency. An empirical estimation of farm level technical efficiency and its determinants is based on a sample of 390 saffron growing farmers in District Pulwama. The technical inefficiency implies the inability of the farmer to achieve the maximum possible obtainable output under a given set of conditions. Thus the ratio of the actual output to the potential output is referred to as technical efficiency in the literature on efficiency. The major finding of the study is that technical efficiency of the sample farms ranged between 14 per cent and 93 per cent with an average value of 59 per cent. There is ample evidence that majority of farms are operating below the potential output due to technical inefficiency. As such with the judicious use of existing resources and technology, it is possible to increase the production of saffron by more than 40 per cent. The analysis also reveals that in about little less than half of the sample farms (46%), the technical efficiency values lie below the average efficiency level and as such these farms could reduce their input resources by 40 per cent to produce the same level of output through better practice of current technology. This paper stresses upon the role of the government in human resource development to achieve this feat for the farmer experience, education and extension contacts have been identified as powerful efficiency augmenting factors. This is in view of the fact that in our sample study it has been found that saffron farming is predominantly in the hands of old aged farmers associated with very low level of schooling resulting into low level of human capital; as such young, educated and unemployed youth should be motivated to adopt saffron farming as full time venture or else mere spending of the resources in upgrading the technology without making an efficient use of existing technology may actually prove to be more expensive.

I. Introduction

In the process of structural transformation associated with economic growth, improvements in the growth performance of agriculture sector has always remained at the centre stage of the policy makers in view of its diminishing relative importance vis-à-vis other sectors of the economy. As reported in Kaur and Sekhon (2005), the output growth is regarded stemming

from three broad sources viz., due to increased use of inputs, improvements in the level of technology (technological progress) and improvements in the efficiency with which existing inputs are used (technical efficiency). Thus given the level of inputs, efficient use of existing technology or introduction of new technology may affect output growth through improvements in total factor productivity (Fan, 1991; Kalirajan *et al.,* 1996).

One of the questions debated widely is that if the productivity gains through efficient use of existing technology are substantial, is it feasible to switch over to new technology or whether elimination of the existing inefficiencies can prove to be more cost effective and beneficial in raising the farm output and incomes? However, a general agreement on this issue goes in favor of the latter alternative if the extent of inefficiencies is significant and widespread. (Kalirajan *et al.,*1996*;* Belbase and Grabowski, 1985; Shapiro,1983; Dey *et al.,*2000 and 2005;Tzouvelekas *et al.,*1997*;* Kumar *et al.,*2004). According to Bravo-Ureta, *et al.,*(1993), "*The fact that significant increases in output could be obtained by making better use of inputs and technology does not mean that research designed to generate new technology should be overlooked. Rather, those in the business of increasing the supply of agricultural products should keep in mind that there is much that can be done while the scientists are hard at work in developing the new know-how".* As documented in Dey *et al., (2005) "if farmers are reasonably efficient, then an increase in productivity requires development and adoption of new technology* (Ali & Byerlee,1991; Dey *et al*., 2000)"

Moreover, in the developing countries where the resources are scarce and pace of technological innovations is slothful, the scope for growth largely lies in the technical efficiency improvements through a judicious use of given factor endowments (conventional inputs) and existing technology. Technical efficiency is expected to be affected by farm/farmer socioeconomic and demographic characteristics (non-conventional inputs). An understanding of the relationship between non-conventional inputs and farm level technical efficiency could act as a guide to the policy makers and extension agencies to devise measures needed to achieve potential output. In simple terms technical efficiency refers to a situation where a farmer/firm is able to produce maximum feasible output (potential output), given the available supply of inputs.

With this backdrop the objective of this paper is to share some of the major findings of my UGC funded major research project titled "Allocative and technical efficiency in Saffron Cultivation in Kashmir Valley".

II. Methodology and Estimation Procedure

In estimating the technical efficiency we have employed the stochastic frontier analysis approach based on the Cobb- Douglas production function. The parameters of the model are generated through the method of maximum likelihood estimates along with the individual farm level efficiency scores. In the second stage these efficiency scores have been regressed upon various socio-economic and demographic attributes of the farmers to work out the determinants of technical efficiency.

III. Major Findings

- **MLE Results**

1. Before interpreting the results we employed LR- tests for several hypotheses to ensure that technical inefficiency was significantly present in the model**.** These tests confirmed that saffron cultivation is characterized by presence of technical inefficiency.
2. The value of the variance parameter gama was 0.91 significant 1 per cent level implying that variations in the output among the sampled farmers are dominated by the factors well under the control of farmers and are capable of explaining the variation of observed output from the frontier output to the extent of 91 per cent and only 9 per cent variation from the frontier output are due to random shocks outside their control.
3. The ML estimation of the coefficients of the frontier production function revealed that land devoted to saffron cultivation, saffron bulb and Farm Yard Manure play a positively significant role in determining the efficiency of the farmers.
4. The negative coefficient of the chemical fertilizer and positive coefficient of plant protection variable were found both insignificant implying that these inputs did not have any major role in affecting the frontier levels of output of the best practicing farmers.
5. The average efficiency of the farmers was estimated as 59 percent with a low of 14 per cent and a high of 93 per cent. Thus providing the evidence that majority of the farmers were operating below the potential level of output due to technical inefficiency. As such with the optimal combination of the present input levels and the existing technology there is scope for increasing the level of output by at least 41 per cent.

- **Major Technical Efficiency Determinants**

1. The age deemed to be a proxy variable for experience revealed a positive relationship with technical efficiency of a farmer as explained by the regression coefficient significant at 5 per cent. Further examination of this relationship revealed an inverted U-shaped pattern tapering at the age group of 50-60 years and thereafter efficiency actually declined with further increase in age and this variation in technical efficiency among the various age groups was significant at 1 per cent level as revealed by single factor ANOVA analysis. This is an indication of diminishing returns to human capital and is well supported by a significant negative coefficient of age square variable in our study. This result is similar to the findings of Tzouvelekas *et al.,* (1997); Pantzios *et al*., (2002); Reddy and Sen (2004).
2. Education of household head measured in terms of years of schooling exhibited a positive and highly significant relation with technical efficiency. This relationship was found significant across the groups with different education levels demonstrating a clear pattern. Technical efficiency was observed highest (68%) among the farmers with college level education and lowest (56%) among the farms operated by non-literate farmers accounting for 43 per cent of the total sampled farmers. This finding is in conformity with the results of other studies like Mittal and Kumar (2000); Kumar *et. al.,* (2004); Reddy and Sen (2004); Dey *et al.,* (2005*).* As documented in Pantzios *et al*., (2002), education acts as a strong complement in deciding optimal combination of

inputs in the production process lending support to Welch's (1970) hypothesis about the "worker effect".

3. The impact of extension contacts on efficiency level of the farmers was found positive and significant at 1 per cent level. In about 52 per cent of the sampled households, who had some kind of contacts with extension agencies, efficiency was markedly higher at 62 per cent relative to rest of 48 per cent sampled farmers with an average efficiency of 56 per cent.

4. Availability of adult family members for farm operations is an important determinant of efficiency. For this purpose the sampled households were divided into four distinctive groups consisting of families with less than 2 farm workers, 2-4 workers, 4-6 workers, and 6 & above. Regression coefficient between technical efficiency and family farm workers, expectedly, was positive at 5 per cent significance level. This relationship also followed a clear pattern across the various groups, although it increased markedly for those households having more than 6 active farm workers.

5. Access to financial resources is an important determinant of any economic activity which has a direct bearing on productivity and efficiency of a venture. We gathered the information on this variable from the respondents who had availed any loan through Kissan Credit Cards (KCC). It was found that from a sample of 390 farmers only 82 of them (21%) had availed credit. Access to credit as a determinant of technical efficiency has, unexpectedly, shown a negative and a significant relation in our study. Moreover, the relation is quite strong as indicated by the size elasticity of this variable. Further examination of this relation by conducting single factor ANOVA revealed that variation between these two groups was not significant, however.

6. Percentage area under saffron, calculated as area under saffron land with respect to total cultivable land holdings, showed an inverse and a highly significant and strong relationship with technical efficiency as demonstrated by the size of the coefficient. This result is in contradiction to the notion that higher proportion of the crop in the overall crop-mix of a farmer must receive higher level of attention resulting into higher efficiency (Rao, *et.,al.* 2003 and 1997). To study this relationship in detail, the farmers were categorized into three distinct groups viz., farmers having percentage of saffron land below 33 per cent, 33 - 66 per cent, 66 per cent and above. ANOVA results indicate that technical efficiency levels did not vary too much between the first two groups, but witnessed a sharp decline by seven percentage points in case of the farmers having proportion of saffron land more than 66 per cent, and these farms accounted for more than 38 per cent of the sampled farmers. Moreover difference in efficiency across groups was also significant at 1 per cent.

7. One of the surprising results of our study is a tendency for the efficiency to increase with the increase in the fragmentation level, although statistically insignificant. To study this phenomenon little bit deeper we categorized the sample farms into three distinct groups with less than 4 plots, between 4 - 7 plots and 7 & above. Our further investigation revealed that technical efficiency initially declined from 60 per cent to 58 per cent as the number of plots increased from 4 to 7, but it increased back to 60 per cent with the further increase in the division of land. Analysis of variance, however,

revealed that this variation in technical efficiency was not significant across the groups. This is a phenomenon which further needs to be investigated. These results are in contradiction to the studies carried out by Tzouvelekas *et al*. (1997); Pantzios *et al*., (2002); Reddy and Sen (2004); Kumar *et al.,* (2005) who argue that highly fragmented land inhibits the use of improved technologies.

Concluding Observations and Recommendations

The analysis indicates existence of wide variations in technical efficiency among the farmers. And, even though it is possible to increase overall saffron production by more than 40 per cent without incurring any additional cost through efficient use of existing technology, it cannot be regarded as major breakthrough as the productivity already is very low. Therefore, the argument in favor of making efficient use of existing technology to be more cost effective, as against replacing it with a still better technology that may significantly improve productivity, does not seem to be strong. Still, in order to achieve this, certain areas of concern need to be addressed like:

i. The practice of indiscriminate application of fertilizers without any knowledge of soil chemistry and lack of irrigation facilities have adversely affected crop productivity. The concerned extension agencies are required to extend the soil testing facility and encourage the farmers to maintain the proper soil health cards

ii. Plant protection measures required to control corm rot disease and rodent menace do not seem to be working effectively as reported by the farmers and expectedly, in our model, expenditure incurred on this input did not have a significant influence on the output of saffron.

iii. Since the saffron farming is mostly rain-fed activity and is affected by vagaries of weather, it is very important to install drip irrigation facilities, otherwise any biological package provided becomes unworkable.

iv. The farmers need to be encouraged to make use of organic fertilizers like farm yard manure and vermin-compost for better yield, as supported by empirical results of our model.

v. The saffron farming being predominantly in the hands of old aged farmers associated with very low level of schooling resulting into low level of human capital; as such young, educated and unemployed youth should be motivated to adopt saffron farming as full time venture.

vi. For higher production and productivity (yield) of saffron, the role of government in providing cheap credit facilities to the targeted low income farmers along with ensuring the role of extension agencies in maintaining close contacts, training and educating the farmers on regular basis, doubling of efforts to get rest of about 50 per cent farmers under their ambit is very crucial.

vii. Finally, the observation that farmers with higher proportion of saffron land being technically less efficient the direct implication of which is that such farmers might attempt to diversify their resources by allocating their land between different crops to ward-off themselves from the risks associated with inappropriate climatic conditions

affecting the saffron crop adversely. However, there is a caveat to it, due to legal restrictions preventing the conversion of saffron land into any other activity and as such it has resulted into a fundamental structural problem and the appropriateness of such policy is debatable. Any such policy that constitutes the barrier to exit without taking measures for significant improvement in productivity has, in fact, lead to the serious supply side shocks like abandonment of farming practice and lack of effort- a major cause for declining acreage and productivity of the saffron crop.

References

Ali, M. & Byerlee, D. (1991), "Economic Efficiency of Small Farmers in a Changing World: A Survey of Recent Evidence", *Journal of International Development*, Vol.3, pp.1–27.

Belbase, Krishna and Richard Grabowski (1985),"Technical Efficiency in Nepalese Agriculture", The Journal of Developing Areas, Vol.19, No.4, pp.515-526.

Bravo-Ureta, B.E.; A.E. Pinherio(1993), "Efficiency Analysis of Developing Country Agriculture: A Review of Frontier Function Literature", *Agricultural and Resource Economics Review*, Vol.22, pp.88-101.

Dey, M.M.; Paraguas, F.J.; Bimbao, G.B. & Regaspi, P.B. (2000), "Technical Efficiency of Tilapia Growout Pond Operations in the Philippines. *Aquaculture Economics and Management* ,4(1&2), pp.4963.

Dey, M.M.; Ferdinand J. P. ; Nartaya Srichantuk; Yuan Xinhua; Ramachandra Bhatta & Le Thi Chau Dung(2005), "Technical Efficiency of Freshwater Pond Polyculture Production in Selected Asian Countries: Estimation and Implication" *Aquaculture Economics & Management,* Vol.9:pp.39–63.

Fan, S.(1991), "Effects of Technological Change and Institutional Reform on Production Growth in Chinese Agriculture", *American Journal of Agricultural Economics,* Vol.73, pp. 266-275

Kalirajan, K.P.; M.B. Obwona and S.Zhao (1996), "A Decomposition of Total Factor Productivity Growth: The Case of Chinese Agriculture Growth Before and After Reforms", *American Journal of Agricultural Economics*, Vol.78, pp.331-338.

Kaur, Manjeet and M.K. Sekhon (2005), "Input Growth, Total Factor Productivity and Its Components in Punjab Agriculture: District-wise Analysis", *Indian Journal of Agriculture Economics*, Vol.60, No.3, July-Sept., pp.473-482.

Kumar, Anjani; Pratap. S. Birthal and Badruddin (2004), "Technical Efficiency in Shrimp Farming in India:Estimation and Implications", *Indian Journal of Agriculture Economics*,Vol.59, No.3, July-Sept., pp. 413-420.

Mittal. S. and P.Kumar (2000), "Literacy, Technology Adaption, Factor Demand and Productivity: An Econometric Analysis", *Indian Journal of Agricultural Economics*, Vol.55, No.3, July-September, pp.490-499.

Pantzios, Christos; Stelios Rozakis; Vangelis Tzouvelekas (2002), "Assessing the Perspectives of EU Cotton Farming: Technical and Scale Efficiencies of Greek Cotton Growers", Paper prepared for presentation at the Xth EAAE Congress 'Exploring Diversity in the European Agri -Food System', Zaragoza (Spain).

Rao, Rama C. A.; M.S. Rao and Y.V.R.Reddy(1997), "Predicting Adoption of Plant Protection Measures by Farmers Using a Logit Model", *International Journal of Pest Management*, Vol.43, pp.299-302.

Rao,Rama C.A.,K.R. Chowdry;Y.V.R. Reddy and G.V. Krishna Rao (2003), "Measuring and Explaining Technical Efficiency in Crop Production in Andhra Pradesh", *Indian Journal of Agricultural Economics*, 58(4), 768-780.

Reddy, A.R. and C. Sen (2004), "Technical Inefficiency in Rice Production and its Relationship with Farm-Specific Socio-Economic Characteristics", *Indian Journal of Agricultural Economics,*Vol.59, No.2, April-June, pp.259-267.

Shapiro, Keneth H.(1976), "Efficiency Differentials in Peasant Agriculture and Their Implications for Development Policies", *Centre for Research on Economic Development, The University of Michigan,* Discussion paper No. 52.

Tzouvelekas, Vangelis M; Konstantinos Giannakas; Peter Midmore and Konstantinos Mattas (1997), "Technical Efficiency Measures for Olive-Growing Farms in Crete, Greece", *International Advances in Economic Research*, Springer, Vol.3, No.2, May, pp.154-169.

Purchasing Intentions of Luxury Brands Among Indian Consumers

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Introduction

Luxury refers to products or services of a very high standard (Wiedmann et al., 2009). There is general agreement with respect to luxury goods being a means of pleasure and comfort to people, means of self-esteem and functional utility and something rare to acquire or obtain (Shukla, 2011). In the last one century the process of conspicuous consumption and materialism has penetrated into the eastern societies as well (Eng and Bogaert, 2010). China and India are the latest entrants in the luxury market brigade. As suggested by the " Asia Pacific Report' made by Merrill Lynch and Capgemini (2015) much of the growth is expected to come from emerging Asia, consisting of China, India, Indonesia, and Thailand. As per TNS's Global Affluent Investor study, many European countries are taken over by the emerging economies of India and China.

India, is being heralded as holding much future potential in the luxury goods market and there is a positive sentiment towards global brands. An annual sector trends report from the Confederation of Indian Industry (CII) and research agency Kantar reported that between 2015 and 2016, the Indian luxury market upped from USD 14.7 billion to US$18.6 billion, which was a growth rate of 25 percent (Strong Growth Prospects for Luxury Market Investors in India, 2017). According to a study conducted by Assocham, India's luxury market is expected to grow to USD 30 billion up from USD 23.8 billion by end of 2018. Assocham has estimated the Indian luxury market to reach more than 100 Billion USD in the next 7-8 years.

Literature Review

Luxury Purchase Intentions

While the Indian luxury goods industry has spurred a lot of interest from branding practitioners and academicians in the recent years, not many studies have been conducted in the Indian context. With dearth of literature in India, researchers have called for further research with focus on development of empirical models on luxury brand consumption (Tsai, 2005). The present study tries to empirically find the impact of various antecedents of luxury brand purchase intentions on the intention to purchase luxury brands. Purchase intention is defined as the situation in which a customer is willing to enter into a transaction with the retailer. Purchase intention can be considered as a measure of the possibility of a consumer to buy a particular product.

Antecedents of Luxury Purchase Intentions

Several studies have been conducted that have empirically and conceptually examined the factors influencing consumers' purchase intentions towards luxury brands. Among the various

antecedents of luxury purchase intentions that have been identified in the literature, this paper specifically focuses on three psychological antecedents: fashion consciousness, susceptibility to interpersonal influences and status consumption.

Interpersonal Influences & Impact On Purchase Intentions

Bearden et al (1989) defines consumer susceptibility as: one's need to identify with the more affluent and to improve ones' public image in the eyes' of more significant people, such as family members or close friends. Shukla (2010) observed significant impact of normative interpersonal influences on luxury purchase intentions across UK and India. Bagheri(2014) argued that normative susceptibility is a significant predictor of purchase intentions for loud brands. Phauand Teah, (2009) showed that normative susceptibility influences consumer attitudes towards counterfeits and purchase intentions. Zhan and He (2011) found that SNI positively related to brand attitudes and purchase intentions towards the best-known luxury brands. Phau, Teah&Chuah (2015) reported that no relationship exists between interpersonal influences and purchase intentions.

Status Consumption & Impact on Purchase Intentions

Status consumption is defined as: "'the motivational process by which individuals strive to improve their social standing through the conspicuous consumption of consumer products that confer and symbolize status both for the individual and surrounding significant others" (Eastman, Goldsmith, & Flynn, 1999, p. 42). Phau and Teah (2009) found that status consumption is one of the strongest contributors of purchase intentions of counterfeits of luxury brands reflecting that status consumers are most likely to purchase counterfeits of luxury brands. Status consumption mostly manifests only with publically visible products (Lertwannawi and Mandhachitara, 2011). Bagheri (2014) found that status consumption did not seem to have a relationship with purchase intention of both loud and quiet brands. Phau, Teah&Chuah (2015) argue that status consumption is insignificant in influencing purchase intention towards luxury fashion apparel made in sweatshops.

Fashion Consciousness & Impact on Purchase Intentions

Fashion consciousness or fashion involvement, is the desire for and adoption of up-to-date styles to maintain one's status in a social network (Shim &Gehrt, 1996; Walsh, Mitchell, &Hennig-Thurau, 2001; Wells &Tigert, 1971). Summers, Belleau and Xu (2006) found that fashion involvement emerged as a significant factor in predicting consumers' purchase intention. Husic and Cicic(2009) found that fashion is an important influencing factor of luxury consumption. Li,LiandKambele (2011) indicated that practicality fashion lifestyle has significant impact on willingness to pay for luxury brands.

Purpose of the Study

Past research studies has made it imperative to study the significance for luxury marketers to understand the needs, preferences, and beliefs of Asian consumers towards luxury goods. There is a growing need to have insights that shall enable them to target the new consumer segments in India. Responding to this, the present intended study aims to indicate clearly as

to how far the influence of antecedents of luxury brand consumer behaviour in west hold true in the Indian context.

Objectives of the Study

The present study has been conducted with the following objective

1. To review the extant literature related to luxury brand consumption behavior, luxury purchasing intentions and its antecedents.
2. To empirically investigate the impact of identified antecedents on Indian consumers' luxury purchase intentions
3. To prioritize these antecedents in accordance to the power of influence (based on their magnitude and significance level) on the purchase intentions

Hypotheses of the Study

The following hypotheses are proposed to be examined and tested in the present study for empirical evidence.

H1: Susceptibility to interpersonal influences has a significant and positive impact on purchase intentions for luxury brands.

H2: Status Consumption has a significant and positive impact on purchase intentions for luxury brands.

H3: Fashion consciousness has a significant and positive impact on purchase intentions for luxury brands.

Methodology

A cross sectional descriptive study using survey methodology was carried out using convenience sampling. Data for the study was collected in Delhi and NCR using online as well as offline procedures. The online method included preparing an online questionnaire. In the offline mode, self administered survey questionnaires were given to respondents at shopping mall exits; five star hotels and fine dine restaurants (mostly located in high end shopping malls). The respondents were intercepted while exiting the malls and the survey questionnaire using a face-to-face approach was handed over to them. The responses from the respondents for each item were measured using a 5- point Likert scale (ranging from 1→ strongly disagree; 2→ disagree; 3→ neutral; 4→ agree; 5→ strongly agree).

Research Instrument

The survey measurement items for each variable are presented below and were specifically generated for this study based on descriptions and measures of related constructs in the literature.

Susceptibility to Interpersonal Influences

In order to measure susceptibility to Interpersonal Influences, the scale is borrowed from Bearden et al. (1989) that comprises of 9 items. The scale used in the study consists of only 6 items as a result of scale purification process.

Status Consumption

The scale of status consumption (STA) is originally developed by Eastman, Goldsmith, and Flynn (1999). All three items of this scale were used in the study.

Fashion Consciousness

The scale of fashion consciousness (FAS) is developed by Shim and Gehrt (1996), which consists of three items. All three items of this scale were used in the study.

Sample Characteristics

The sample of this study consists of 110 luxury buyers living in Delhi, which is the capital city of India. The population of respondents for this study consists of consumers who have are real and existing users of luxury brands.

As seen below in Table 1, the sample consisted of 42 percent males (n=46) and 64 percent females (n=64). Majority of the sample, around 66 % (n=73) belongs to the age group of 25-40 years. The working class (professionals or business) comprises74 % of the entire sample. Most of the respondents that were interviewed are postgraduates (71%). The income group that constitutes majority of the sample of Rs 100,001 and above (77%). Also it has been noted that most of the respondents, around 68 %, are married.

Table 1. Demographics of the Sample

No.	Respondent Characteristic's	Frequency	Percentage
1	**Age Group**		
	Upto 25 years	14	13
	25-40	73	66
	40-60	21	19
	Above 60	2	2
2	**Gender**		
	Male	46	42
	Female	64	58
3	**Occupation**		
	Working/professional/Business	82	74
	Student in college/university	16	15
	Housewife	12	11
4	**Monthly Income (Household)**		
	UptoRs 50,000	7	6
	Rs 50,001 to 100,000	18	17
	Rs 100001 & above	85	77

5	**Education (Highest level)**		
	Undergraduate	10	9
	Graduate	22	20
	Postgraduate	78	71
6	**Marital Status**		
	Married	75	68
	Unmarried	35	32

Data Analysis

Validity and Reliability Analysis

The content validity of the research instrument (questionnaire) was ensured as the all the variables were identified from the literature. Reliability of the factors has been confirmed by performing reliability analysis using cronbach's alpha. The value of Cronbach's alpha is 0.916, which indicates a high level of consistency for the scale. The value of cronbach's alpha for the independent variables of: susceptibility to interpersonal influences (SUS mean score), status consumption (SC mean score) and fashion consciousness (FC mean score) is .786, .647 and.771 respectively which are satisfactory. Cronbach's alpha value for purchase intention (PI mean score) is .810 which is highly reliable. The value of cronbach's alpha for all items of the three independent variables (susceptibility to interpersonal influence, status consumption and fashion consciousness) is shown in Table 2 below.

Table 2.Cronbach's Alpha Item Wise

	Variable	Cronbach's Alpha
	SUS (Susceptibility)	
1	It is important that others like the luxury products and brands I buy	.911
2	When buying luxury brand products, I generally purchase those brands that I think others will approve of	.912
3	If other people can see me using a luxury brand product, I often purchase the brand they expect me to buy	.909
4	If I want to be like someone, I often try to buy the same brands that they buy	.910
5	To make sure I buy the right luxury product or brand, I often observe what others are buying or using	.910
6	I frequently gather information from friends or family about a luxury product before I buy	.909
	SC (Status Consumption)	
7	I would buy a product just because it has status	.910
8	The status of a product is relevant to me	.903
9	The status of a product is relevant to me	.905

	FC (Fashion Consciousness)	
10	I usually have one or more outfits of the newest style	.906
11	I keep my wardrobe up-to-date with the changing fashions	.905
12	Fashionable, attractive styling is very important to me	.907
	PI (Purchase Intention)	
1	I would consider buying a luxury brand within the next 12 months	.912
2	If I were shopping, the likelihood that I would purchase a luxury brand within the next 12 months is high	.917
3	My willingness to buy a luxury brand within the next 12 months is high	.910

Descriptive Analysis

Table 3 has the mean score for each of the statements of the three independent variables (SUS, SC,FC) and dependent variable (PI). Independent variables like susceptibility to interpersonal influences is measured by statements SUS1 through SUS 6; status consumption is measured by statements SC1 through SC3; fashion consciousness is measured by statements FC1 through FC3 and dependent variables of purchase intention is measured by statements PI1 through PI3. Higher mean score for each statement (for positive statements) is interpreted to mean stronger agreement with the statement. Higher mean score for each statement (for negative statements) is interpreted to mean stronger disagreement with the statement. From the table 3 we can infer that the highest mean score (that is highest agreement) is for all the statements of fashion consciousness. This similar result was revealed in the overall mean score for FC (3.58). Results indicate low mean score (indicating overall disagreement) for all items of SUS with the lowest mean score (2.39) for SUS4: "If I want to be like someone, I often try to buy the same brands that they buy". While the respondents are mostly neutral in their opinion towards SC, they disagree with the statement that they would buy luxury products only for status (SC1).

Table 3. Item Statements with their means and standard deviations

Name	Items	Mean	SD
SUS1	It is important that others like the luxury products and brands I buy	2.70	1.267
SUS2	When buying luxury brand products, I generally purchase those brands that I think others will approve of	2.58	1.281
SUS3	If other people can see me using a luxury brand product, I often purchase the brand they expect me to buy	2.45	1.231
SUS4	If I want to be like someone, I often try to buy the same brands that they buy	**2.39**	1.227
SUS5	To make sure I buy the right luxury product or brand, I often observe what others are buying or using	3.10	1.234
SUS6	I frequently gather information from friends or family about a luxury product before I buy	3.26	1.217

SC1	I would buy a product just because it has status	**2.42**	1.222
SC2	The status of a product is relevant to me	3.30	1.310
SC3	The status of a product is relevant to me	3.04	1.313
FC1	I usually have one or more outfits of the newest style	**3.75**	1.079
FC2	I keep my wardrobe up-to-date with the changing fashions	**3.49**	1.254
FC3	Fashionable, attractive styling is very important to me	**3.64**	1.187
PI1	I would consider buying a luxury brand within the next 12 months	3.65	.971
PI2	If I were shopping, the likelihood that I would purchase a luxury brand within the next 12 months is high	3.59	1.034
PI3	My willingness to buy a luxury brand within the next 12 months is high	3.65	1.053

Factor Analysis

Factor analysis was performed on the 12 items that comprise the three independent variables. A principal components technique with varimax rotation was used as it was assumed that the observed variables could be better explained in terms of smaller number of underlying perceptual dimensions. Table 6 shows that the value of KMO statistic is very high (.870) and Bartlett's Test of Sphericity is significant (sig=. 000). This indicates the appropriateness of the data for factor analysis.

Table 4. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.870
Bartlett's Test of Sphericity	Approx. Chi-Square	1252.140
	Df	105
	Sig.	.000

The factor analysis (Total Variance Explained) revealed that 72.498 percent of the variance is contributed by three factors.

Table 5. Results of Exploratory Factor Analysis

Variable	Measurement Items	Factor Loadings*
Purchase Intention	Strongly Agree(1) Strongly Disagree(5)	
	I would consider buying a luxury brand within the next 12 months	.881
	If I were shopping, the likelihood that I would purchase a luxury brand within the next 12 months is high	.919
	My willingness to buy a luxury brand within the next 12 months is high	.899
Susceptibility	Strongly Agree(1) Strongly Disagree(5)	
	It is important that others like the luxury products and brands I buy	.889

	When buying luxury brand products, I generally purchase those brands that I think others will approve of	.855
	If other people can see me using a luxury brand product, I often purchase the brand they expect me to buy	.785
	If I want to be like someone, I often try to buy the same brands that they buy	.686
	To make sure I buy the right luxury product or brand, I often observe what others are buying or using	.768
	I frequently gather information from friends or family about a luxury product before I buy	.783
Status Consumption	Strongly Agree(1) Strongly Disagree(5)	
	I would buy a product just because it has status	.563
	The status of a product is relevant to me	.613
	The status of a product is relevant to me	.559
Fashion Consciousness	Strongly Agree(1) Strongly Disagree(5)	
	I usually have one or more outfits of the newest style	.675
	I keep my wardrobe up-to-date with the changing fashions	.644
	Fashionable, attractive styling is very important to me	.586

Regression Analysis

A linear multiple regression analysis was performed to predict the relationship between the three independent variables (SUS, SC and FC) and purchase intention.. To identify the relative importance of the determinant variables on purchasing intentions included in this study, a multiple regression analysis was conducted using purchasing intention as a dependent variable. All the variables explained 23 percent of the variance in purchasing intention and are significant (p value=.000) in predicting behavior. We can therefore conclude that the regression model is good fit of the data. With respect to the impact of on purchase intention, fashion consciousness showed the largest standardized regression coefficient (β= .283, $p < 0.05$) followed by status consumption (β= .236, $p < 0.001$) and susceptibility to interpersonal influences (β= .192, $p < 0.001$).

Table 6. Impact of SUS, SC and FC on Purchase Intention

Independent variable	**Purchase Intention (PI)**
Susceptibility (SUS)	.192*
Status Consumption (SC)	.236*
Fashion Consciousness (FC)	.283**
R^2	.23

Conclusions and Discussion

The results show that the influence of all three antecedents of susceptibility to interpersonal influences, status consumption and fashion consciousness on Indian consumers purchase intentions towards luxury brands was positive and significant. Fashion consciousness is the most significant factor for Indian luxury consumers' purchase intentions. Fashion consciousness has been found as a strong predictor for purchase intentions in the past (Summers, Belleau and Xu (2006); Husic and Cicic (2009) and Li, Li and Kambele (2011). This suggests that consumers who assign a higher priority to the practical aspects of fashion, such as comfort and necessity, demonstrate a greater willingness to pay for luxury brands. Status consumption emerged as the second strongest contributor of luxury purchase intentions for Indian consumers. Several researchers have found status consumption as an important determinant of purchase intentions for luxury brands. Status of a brand is regarded as a prime motivation in shopping for luxury goods. Shukla (2010) had observed significant impact of interpersonal influences (normative and informational) on luxury purchase intentions in India. The results of this study are in line with the finding of Shukla (2010). This reflects the influence of collectivist psyche on consumer purchase intentions. Indian consumers being collectivist, increasingly look for fitting in behavior and therefore their consumption will be highly dependent on social acceptance. Indian consumers perceive luxury goods as highly valuable possessions, and they primarily purchase luxury goods to conform to the social expectations of important reference groups. These consumers may be motivated more by the social than by the functional benefits of luxury goods. Consumption of luxury goods may be viewed as essential possessions that fit their owners into important social groups and help their users behave appropriately in various social situations.

References

Assocham (Associated Chambers of Commerce and Industry of India) Yes Bank study.(2012).Retrievedfromhttp://timesofindia.indiatimes.com/business/india business/Indian-luxury-market-may-touch-USD-15bn-in-next-2-years-Assocham/articleshow/18352772.cms

Bearden, W. O., &Etzel, M. J. (1982).Reference group influence on product and brand purchase decisions.*Journal of consumer research*, 183-194.

Belk, R. W. (1984). Three scales to measure constructs related to materialism: Reliability, validity, and relationships to measures of happiness. *Advances inconsumeresearch*, *11*(1), 291-297.

Berthon, P. R., Parent, M., &Berthon, J. P. (2009). Aesthetics and Ephemerality: Observing and Preserving the Luxury Brand. *California Management Review,* 52(1), 45-66

Bian, Q., & Forsythe, S. (2012). Purchase intention for luxury brands: A cross cultural comparison. *Journal of Business Research*, *65*(10), 1443-1451.

Chaudhuri, H. R., & Majumdar, S. (2006). Of diamonds and desires: understanding conspicuous consumption from a contemporary marketing perspective. *Academy of Marketing Science Review*, *11*(2/3), 2-18.

Dholakia, U. M. (1997).An investigation of the relationship between perceived risk and product involvement.*Advances in Consumer Research*, *24*, 159-167.

Dholakia, U. M., &Talukdar, D. (2004). How social influence affects consumption trends in emerging markets: An empirical investigation of the consumption convergence hypothesis. *Psychology & Marketing*, *21*(10), 775-797.

Eng, T. Y., &Bogaert, J. (2010). Psychological and cultural insights into consumption of luxury western brands in India. *Journal of Customer Behaviour*, *9*(1), 55-75.

Engel, J. F., & Roger, D. Blackwell (1982).*Consumer behavior*, *4*.

Fournier, S., &Richins, M. L. (1991).Some theoretical and popular notions concerning materialism. *Journal of Social Behavior & Personality.*

Fullerton, G. (2005). The impact of brand commitment on loyalty to retail service brands. *Canadian Journal of Administrative Sciences/Revue Canadiennedes Sciences de l'Administration*, *22*(2), 97-110.

Gao, L., Norton, M. J., Zhang, Z. M., & Kin-man To, C. (2009). Potential niche markets for luxury fashion goods in China. *Journal of Fashion Marketing and Management: An International Journal*, *13*(4), 514-526.

Heine, K. (2012). *The Identity of Luxury Brands* (Doctoral dissertation, Doctoral dissertation, Kassel University, Germany).

Hung, K. P., Huiling Chen, A., Peng, N., Hackley, C., Amy Tiwsakul, R., & Chou, C. L. (2011). Antecedents of luxury brand purchase intention. *Journal of Product & Brand Management*, *20*(6), 457-467.

Kapferer, J. N. (1997). Managing luxury brands. *Journal of brand management*, *4*(4), 251-259.

Kemp, S. (1998).Perceiving luxury and necessity. *Journal of Economic Psychology*, *19*(5), 591-606.

Leibenstein, H. (1950). Bandwagon, snob, and Veblen effects in the theory of consumers' demand.*The Quarterly Journal of Economics*, 183-207.

New York: St Martin's Press.

Netemeyer, R. G., Burton, S., & Lichtenstein, D. R. (1995). Trait aspects of vanity: Measurement and relevance to consumer behavior. *Journal of consumer research*, 612-626.

Nueno, J. L., &Quelch, J. A. (1998).The mass marketing of luxury. *Business Horizons*, *41*(6), 61-68.

Ogba, I. E., & Tan, Z. (2009). Exploring the impact of brand image on customer loyalty and commitment in China. *Journal of Technology Management in China*, *4*(2), 132-144.

Okonkwo, U. (2009). The luxury brand strategy challenge. *Journal of brand management*, *16*(5), 287-289.

Park, H. J., Rabolt, N. J., & SookJeon, K. (2008). Purchasing global luxury brands among young Korean consumers. *Journal of Fashion Marketing and Management: An International Journal*, *12*(2), 244-259.

Price Water Coopers.(2012), "Market Vision Luxury : Challenges and opportunities in the new luxury world: winners and strategic drivers". Retrieved from http://www.pwc.com/it/it/publications/assets/docs/marketvision - luxury-

Richins, M. L., & Dawson, S. (1992). A consumer values orientation for materialism and its measurement: Scale development and validation. *Journal of consumer research*. Richins, M. L. (1994). Special possessions and the expression of material values. *Journal of consumer research*, 522-533.

Sedikides, C., Gregg, A. P., Cisek, S., & Hart, C. M. (2007). The I that buys: Narcissists as consumers. *Journal of Consumer Psychology*, *17*(4), 254-257.

Seringhaus, FH Rolf. "Cross-cultural exploration of global brands and the internet."*18th Annual IMP Conference*. 2002.

Shimp, T. A., & Sharma, S. (1987). Consumer ethnocentrism: construction and validation of the CETSCALE. *Journal of marketing research*, 280-289.

Sharma, S., Shimp, T. A., & Shin, J. (1995). Consumer ethnocentrism: a test of antecedents and moderators. *Journal of the academy of marketing science*, *23*(1), 26-37.

Shukla, P. (2011). Impact of interpersonal influences, brand origin and brand image on luxury purchase intentions: Measuring interfunctional interactions and a cross-national comparison. *Journal of world business*, *46*(2), 242-252.

Sweeney, J. C., &Soutar, G. N. (2001). Consumer perceived value: The development of a multiple item scale. *Journal of retailing*, *77*(2), 203-220.

Tian, K. T., Bearden, W. O., & Hunter, G. L. (2001). Consumers' need for uniqueness: Scale development and validation. *Journal of consumer research*, *28*(1), 50-66.

Truong, Y., McColl, R., & Kitchen, P. J. (2010).Uncovering the relationships between aspirations and luxury brand preference. *Journal of Product & Brand Management*, *19*(5), 346-355.

Tsai, S. P. (2005). Impact of personal orientation on luxury-brand purchase value. *International Journal of Market Research*, *47*(4), 429-454.

Veblen, T. (1899).*The Theory of the Leisure Class*. Boston: Houghton Mifflin.

Vigneron, F., & Johnson, L. W. (1999).A review and a conceptual framework of prestige-seeking consumer behavior. *Academy of Marketing Science Review*, *1*(1), 1-15.

Vigneron, F., & Johnson, L. W. (2004).Measuring perceptions of brand luxury.*The Journal of Brand Management*, *11*(6), 484-506.

Wang, P. Z., & Waller, D. S. (2006).Measuring consumer vanity: A cross-cultural validation. *Psychology & Marketing*, *23*(8), 665-687.

Wiedmann, K. P., Hennigs, N., & Siebels, A. (2007).Measuring consumers' luxury value perception: A cross-cultural framework. *Academy of Marketing Science Review*, *7*(7), 333-361.

Wiedmann, K. P., Hennigs, N., & Siebels, A. (2009).Value-based segmentation of luxury consumption behavior. *Psychology & Marketing*, *26*(7), 625-651.

Wong, N. Y. (1997). Suppose you own the world and no one knows? Conspicuous consumption, materialism and self. *Advances in consumer research*, *24*(1), 197-203.

Wong, N. Y., &Ahuvia, A. C. (1998). Personal taste and family face: Luxury consumption in Confucian and Western societies. *Psychology and Marketing*, *15*(5), 423-441.

Nutrient Management in Alfalfa

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Abstract

Alfalfa (*Medicago sativa L.*) the queen of fodder is the most important fodder crop grown in Ladakh region of Jammu and Kashmir. It is cultivated in an area of 4000 ha with a forage yield of 42.5 q /ha .Successful alfalfa production requires effective nutrient management including the identification of deficiencies and excess.Proper soil fertility increases alfalfa yield, feed quality and stand life. However to maximize production and profitability it is important to adjust fertilizer rate to meet the specific nutrient need of the plant in each field.Adding sufficient NPK will help alfalfa stand persist better and produce higher yield longer then stands not receiving NPK. In this regard an experiment entitled Nutrient Management in alfalfa was conducted at High Mountain Arid Agriculture Research Institute Leh (HMAARI-LEH) with four different levels of NPK as T1 (0,30,15 kg/ha) T2 (25,40,25 kg/ha),T3 (35,60,35 kg/ha) and T4 (45,75,45 kg/ha) respectively. Treatment differences have been revealed significant for all the treatments. T4 showed significantly higher green fodder yield (ie) 271.71 kg/ha as well as dry fodder yield of 107.66 kg/ha fallowed by T3 with 260.82 kg/ha green fodder yield and 102 kg/ha dry fodder yield respectively.

Keywords: Alfalfa, yield, NPK

Macro-Mineral Profile of Pasture Plants and Sheep Grazed in Sub-Alpine Pastures of Kashmir Valley.

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Abstract

Study was carried out to evaluate the mineral profile of plants and grazing sheep of two sub-alpine pastures of Kashmir valley, viz: pasture of Mountain Research Station for Sheep and Goat, Shuhama and the pasture of Govt. Sheep Breeding Farm, Goabal in spring season. 40 plant species were identified in two pastures in spring season in which only 28 species were palatable. Sixty experimental animals, twenty each from adult (above 2 years of age), hogget (about 1 year of age) and weaner (about 6 months of age) were selected for the study. Samples of pasture grasses (individual and composite) and blood of grazing sheep were collected for estimation of their mineral content. Macro mineral content of composite pasture grasses were higher in Goabal pasture except phosphorus which was higher in Shuhama pasture. In Shuhama pasture in spring season sodium and potassium were deficient by 81.18 and 32.50% respectively in adult sheep. In Goabal pasture in spring season phosphorus, sodium and potassium were deficient by 13.33, 78.82 and 21.25% respectively in pasture grasses grazed by adult sheep. In Shuhama pasture in spring season sodium were deficient by 74.0 % in pasture grasses grazed by hogget sheep. In Goabal pasture in spring season phosphorus and sodium were deficient by 35.90 and 67.0% respectively in pasture grasses grazed by hogget sheep. In weaner sheep in Shuhama pasture in spring season sodium were deficient by 72.0% in pasture grasses grazed by weaner sheep. In Goabal pasture in spring season phosphorus and sodium were deficient by 40.03 and 63.0% respectively in pasture grasses grazed by weaner sheep. Blood mineral profile revealed that prevalence of macro mineral deficiency in experimental sheep was higher in Shuhama pasture except phosphorus than Goabal pasture. It was concluded that sheep grazing in both the pasture should be supplemented with area specific mineral mixture to overcome mineral deficiencies and to improve the production and reproduction performance of the grazing sheep in both the pasture in spring season.

Keywords: Macro-mineral profile, plant, grazing sheep, sub-alpine pasture, Kashmir valley

Chlorophyll Fluorescence Response In Wheat Varies With Growth Stage And Herbicide

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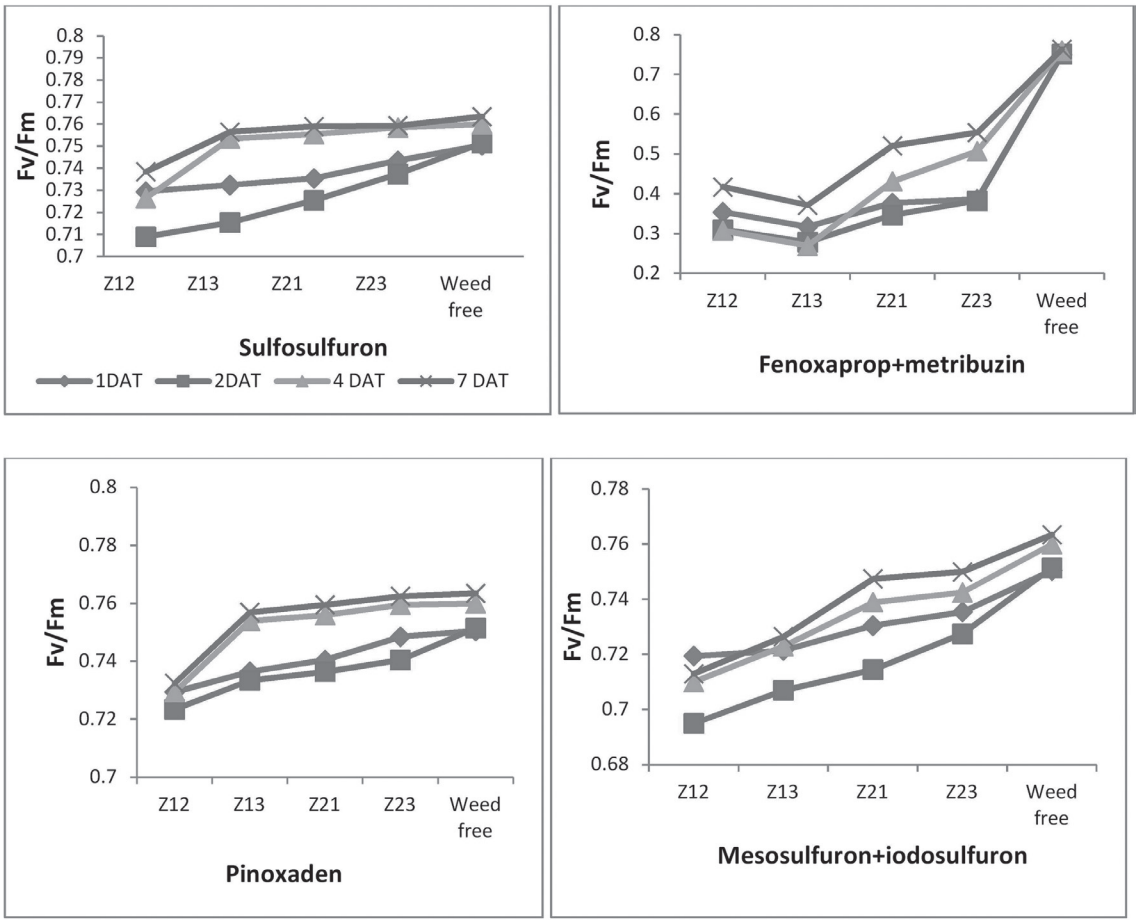
Abstract

Chlorophyll fluorescence [(Fv/Fm) (Variable fluorescence/Maximum fluorescence)] indicates the emission of photons by the radiative de-excitation of chlorophyll molecules. It is a non-invasive tool used to detect and study the effects of environmental stress on plants from the sub-cellular up to plant canopy level (Papageorgiou and Govindjee, 2004). Chlorophyll fluorescence imaging can be used for an early detection of stress, i.e.before the appearance of visual damage, as well as for tracking the plant defensereactions. For stressed or damaged plants the Fv/Fm is markedly reduced, thus it serves as an indicator of photoinhibition or other kinds of injury caused to photosystem II complexes.A field experiment was conducted at the Punjab Agricultural University, Ludhiana, India during the winter season of2013-14 and 2014-15. Wheat (cv. HD-2967) was seeded on 19 November 2013 and 12November 2014 using seed rate of 100 kg ha^{-1}, in 22.5 cm spaced rows. Sulfosulfuron 24.4 g ha^{-1}, fenoxaprop + metribuzin 275 g ha^{-1}, mesosulfuron + iodosulfuron 14.4 g $ha^{-1}$and pinoxaden 50 g ha^{-1} were applied at Zadoks 12 [Z12 (14 DAS)], Z13 (21 DAS), Z21 (30 DAS) and Z23 (45 DAS); and these herbicides were appliedat their recommended doses of application. A weed free check was also included for comparison with the herbicide treatments. The experiment was established in a randomized complete block design with three replications. All herbicides were applied using knapsack sprayer fitted with a flat fan nozzle which was calibrated to deliver 375 L of spray solution ha^{-1}. Six plants were tagged with water proof tags in each plot before the application of herbicides and the chlorophyll fluorescence (Fv/Fm) data was recorded from these plants at 1, 2, 4 and 7 DAT using chlorophyll fluorimeter.

Pre-mix of fenoxaprop plus metribuzin at all the stages of application (Z12, Z13, Z21 and Z23) reduced chlorophyll fluorescence (Fv/Fm)in wheat plants in comparison to unsprayed weed free ($p<0.05$); however the reduction was more when the application was made at Z12 and Z13 in both the cropping seasons. The Fv/Fm decreased up to 4 DAT (0.268-0.309) for Z12 and Z13 and up to 2 DAT (0.344-0.384) for Z21 and Z23 stages compared to 0.748-0.762 in weed free; at 7 DAT the Fv/Fm values increased to (0.365-0.558) compared to 0.762-0.765 in weed free ($p<0.05$). Other herbicide treatments recorded Fv/Fm statistically similar to weed free, still their Fv/Fm showed a decline up to 2 DAT (0.705-0.744) as compared to weed free ($p>0.05$) (Fig 1). The highest values of Fv/Fm (0.748-0.765) were recorded by the weed free plot at all the stages of observation. A lower value of Fv/Fm indicates that a proportion of PSII reaction centres are damaged through photo-inhibition in plants under stress conditions (Hiraki*et al.,* 2003).

Conclusion

Chlorophyll fluorescence data could help in deciding the application timing for different herbicides in wheat.



DAT-Days after treatment; Z-Zadoks stage of wheat

Fig. 1(a-d): Effect of different herbicides on chlorophyll fluorescence (Fv/Fm) of wheat

References

Hiraki M, Rensen JJSV, Vredenberg WJ, Wakabayashi K (2003) Characterization of the alterations of the chlorophyll a fluorescence induction curve after addition of photosystem II inhibiting herbicides. Photosynth Res 78: 35-46.

Papageorgiou GC, Govindjee (2004) *Chlorophyll a Fluorescence: A Signature of photosynthesis*, Springer, Dordrecht.

Effect of *Physalis Alkekenji* Herb on *In Vitro* Nutrient Degradability and Fermentation Attributes of Paddy Straw-Based Total Mixed Ration

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Abstract

The present study was carried out to assess the *in vitro* effect of *Physalis alkekenji* herb, at various levels of supplementation, on nutrient degradability and fermentation parameters in paddy straw-based total mixed ration (TMR). Three adult male sheep of 9 months of age, having approximately same weight and uniform conformation, were selected as the donors of rumen inoculum for the study. Paddy straw-based TMR was fortified with five levels of *P. alkekenji* at 1 (L_1), 2 (L_2), 3 (L_3), 4 (L_4), and 5 (L_5) percent DM while paddy straw-based TMR without supplementation of herb served as the control (L_0). The effect of herb on nutrient degradability was evaluated by *in vitro* dry matter digestibility (IVDMD), *in vitro* true dry matter digestibility (IV true DMD), and *in vitro* organic matter digestibility (IVOMD) while as effect on the fermentation attributes was determined by pH, Total Volatile Fatty Acid (TVFA), Ammonia nitrogen (NH_3-N), total nitrogen, Trichloroacetic acid precipitable nitrogen (TCA-pptN), and non-protein nitrogen (NPN) concentrations. The IVDMD, IV true DM, and IVOMD digestibility of paddy straw-based TMR was significantly higher ($P<0.05$) at L_4 level of supplementation of *P.alkekenji.* Among the *in vitro* fermentation parameters, pH and NH_3-N were significantly lower ($P<0.05$) while others were significantly higher ($P<0.05$) at the L_4 level of supplementation. It was concluded that *P.alkekenji* improved the nutrient degradability and fermentation characteristics of paddy straw-based TMR, with 4% supplementation being the optimum level for the herb to be incorporated as feed additive.

Keywords: Digestibility, paddy straw, TMR, herb

Pre and Post Emergence Application of Imazthapyr on N Uptake, Nodulation And Microbial Population of Chickpea Sown After Rice in Vertisols of C.G.

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Abstract

The present study was under taken to assess the pre and post emergence emergence application of imazthapyr on n uptake, nodulation and microbial population of chickpea sown after rice in vertisols of c.g. Incorporation of tillage and weed management practices considerably improved the yield of chickpea interms of N uptake, number of nodules per plant and microbial activities of rice rhizosphere.

Results shows that of experiment, indicated that, among the tillage management practices, higher N uptake, number of nodules and microbial activities were obtained with conventional tillage (T_1) which was followed by minimum tillage (T_2) and zero tillage (T_3). Among the various weed management practices, N uptake and number of nodules were maximum under one hand weeding at 20 DAS (W_8), followed by the treatments of POE application of imazethapyr @ 90 g ha^{-1} (W_7) and POE imazethapyr @ 80 g ha^{-1} (W_6), respectively. The minimum values of above characters were observed under weedy check plot (W_9). Whereas, microbial population, basal soil respiration and dehydrogenase enzyme activity of experimental field was significantly higher under weedy check plot (W_9), followed by one hand weeding at 20 DAS (W_8) and POE application of imazethapyr @ 90 g ha^{-1} (W_7) during both the years. Use of tillage practices, hand weeding and application of pre and post emergence of imazethapyr on chickpea crop should be carried out for enhancing the production and productivity of winter season chickpea sown after the harvest of rice crop.

Role of Bioinformatics in Modeling Biological Processes at Molecular Level

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Abstract

Biological research is the most fundamental research to understand complete mechanism of living system. Bioinformatics is an interdisciplinary field mainly involving molecular biology and genetics, computer science, mathematics, and statistics. Data intensive, large-scale biological problems are addressed from a computational point of view. The most common problems are modeling biological processes at the molecular level and making inferences from collected data. A bioinformatics solution usually involves many steps like Collect statistics from biological data, build a computational model, solve a computational modeling problem, test and evaluate a computational algorithm. Analyses in bioinformatics predominantly focus on three types of large datasets available in molecular biology which include macromolecular structures, genome sequences, and the results of functional genomics experiments (e.g. expression data). In recent decades, bioinformatics methods, with the use of knowledge accumulated in public databases such as NCBI, Pubmed and other databases, make it possible to systematically dissect large gene lists in an attempt to assemble a summary of the most enriched result in current biology , which is able to provide a huge contribution to biological research. In the same contrast, bioinformatics scanning approaches are emerging as alternative technologies that allow investigators to simultaneously measure the changes and regulation of genome-wide genes under certain biological conditions. Additional information includes the text of scientific papers and "relationship data" from metabolic pathways, taxonomy trees, and protein-protein interaction networks. Bioinformatics employs a wide range of computational techniques including sequence and structural alignment, database design and data mining, macromolecular geometry, phylogenetic tree construction, prediction of protein structure and function, gene finding, and expression data clustering. The emphasis is on approaches integrating a variety of computational methods and heterogeneous data sources.

Recent Advances in Molecular Breeding in Citrus- A Review

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Abstract

Citrus is evergreen fruit tree which is mainly grown in subtropical climate, belongs to Rutaceae family. Citrus fruits are rich source of vitamin C, which is useful to curing breast cancer. Now a days, Isozymes are mainly used in citrus more than other fruits. For determination of genetic diversity, identification of nucellar, zygoticseedlings and hybrids. It is studied that more than 20 Isozymes loci have been genetically characterized in citrus. In various Isozymes, DNA markers like random amplified polymorphic DNA (RAPD), simple sequence repeat (SSR), Single nucleotide protein (SNP), SRAP (sequence-related amplified polymorphism) and Sequenced tagged microsatellites (STMs)markers are mostly used.

It is studied that these were mainly used to measure to genetic diversity and to understand the genetic origin of cultivars and RAPD was used to evaluate polymorphism and genetic similarity between mandarin cultivars. STMs markers are ideal for genome mapping within citrus, which contains high levels of genetic variability. It is also studied that to assess the genetic value of for STMs analysis within the Citrus **plant species, two example STMs were isolated from an** intergeneric cross between rangpur lime (*Citrus* × *limonia* Osbeck) and trifoliate orange [*Poncirustrifoliata* **(L.)** Raf.]. It had been reviewed that twelve new dominant RAPD fragments associated with a single dominant gene for resistance to citrus tristeza virus (CTV) were identified using bulked segregant analysis of an intergeneric backcross family. SSR and SRAP molecular marker were usedgenetic relationships and diversity of sour orange. New marker SNP is used in citrus mainly for breeding for parent of alternaria brown spot resistant parent and helps in selection of cultivar at diploid level.

Keywords: Isozyme, RAPD, Marker. Nucleotide, Dominant

Climate and Soil Formation

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Abstract

Climate is a dominant factor in soil formation, mainly because of the effects of precipitation and temperature. Some direct effects of climate on soil formation include; retention of lime at shallow depths in areas having low rainfall, because calcium carbonate and bicarbonate are not leached out due to limited amount of water moving through the soil. Such soils are usually alkaline; formation of acidic soils in the humid areas is due to intense weathering and pronounced leaching of basic cations; erosion of soils on sloping lands constantly removes developing soils and weathering, leaching and erosion are more intense and of longer duration in the warm and humid regions where the soil does not freeze. The reverse is true in cold climates, as in the central, Himalayas. Water plays a key role in the soil formation. A soil is said to be developed when it has detectable layers, such as of accumulated clays, organic colloids, carbonates or soluble salts that have been moved downward by water. The extent of colloid movement and the depth of their deposition are determined partly by the amount and pattern of precipitation, which produce the leaching action. Climate influences the formation of soils through its influence on different soil forming processes, namely clay illuviation, formation o calcium carbonate and development of soil sodicity. Climate influences the soil formation indirectly as well through its action on vegetation. Semi-arid climates support scattered shrubs and grasses. Arid climates supply only enough moisture for sparse, short grasses or shrubs, which may not be dense enough to protect the soil against wind and water erosions.

Combined Effects of Co_2, Temperature and Nitrogen on Fruit Quality

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Abstract

The negative effect of CO_2, temperature and nitrogen on fruit yield and fruit quality of plants. Due high temperature effect more than 40% on fruit yield .The fewer inflorescences and smaller umbel size during flower induction caused the reduction of fruit yield at elevated CO_2 and high temperature. Interestingly, nitrogen application has no beneficial effect on fruit yield, and this may be because of decreased sucrose export to the shoot apical meristem at floral transition. Moreover, elevated CO_2increased the levels of dry matter-content, fructose, glucose, total sugar and sweetness index per dry matter, but decreased fruit nitrogen content, total antioxidant capacity and all antioxidant compounds. The reduction of fruit nitrogen content and antioxidant activity was mainly caused by the dilution effect of accumulated non-structural carbohydrates sourced from the increased net photosynthetic rate at elevated CO_2. Thus, the quality of fruit would increase because of the increased sweetness and the similar amount of fruit nitrogen content, antioxidant activity per fresh matter at elevated CO_2. Overall, we found that elevated CO_2 improved the production (including yield and quality) at low temperature, but decreased it at high temperature. The dramatic fluctuation in yield between low and high temperature at elevated CO_2 implies that more attention should be paid to the process of flower induction under climate change, especially in fruits that require winter chilling for reproductive growth.

Keywords: Temperature, fruit yield, photosynthetic rate, fruit quality and climate change.

Proximate composition and protein fractionation of Niger and Sunflower seeds

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Abstract

An *in vitro* study was undertaken to estimate the proximate composition and protein fractions of Niger seeds (NS) in comparison to Sunflower seeds (SS). Samples were obtained from the local market, oven dried and then ground in a Wiley mill through a 2 mm screen. Protein fractions were expressed as instantaneously degradable (A), rapidly degradable (B1), intermediately degradable (B2), slowly degradable (B3) and undegradable (C). Proximate components of both the seeds were highly comparable. Crude protein (CP) content of NS was 21% (dry matter basis) whereas that of SS was 19%. Non protein nitrogen and neutral detergent insoluble crude protein proportions were significantly (≤ 0.05) higher in SS as compared to NS. Protein fraction A (as % CP) was higher in SS in contrast to NS, whereas B1 and B2 fractions (as % CP) were significantly (≤ 0.05) higher in NS. The high rumen degradability of these oilseed proteins may impart them a little rumen escape value. Therefore, sunflower and Niger seeds may be used as protein sources in formulating ruminant rations, however, for better results such rations might be augmented with ruminally inert protein ingredients.

Development and Storage Stability of Chocolate Coated Chhana Confection at Refrigeration (4±1ºc) and Room Temperature (30±3ºc).

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Abstract

Chhana is a well-known traditional dairy product obtained by acid coagulation of hot milk. Chhana is used as a base for production of wide variety of traditional Indian dairy sweets but limited shelf life of chhana (three days at 24°C, six days at 10°C and 1 day at ambient tenperature) and chhana based sweets is the major hurdle in their industrial production. The present investigation was designed to develop a chhana based confection with good nutritional properties and storage stability. Therefore chocolate coated chhana confection has been developed by preparing chhana base with incorporation of mango, grape and pineapple powder @ 4%, milk powder @ 5% replacing chhana in the formulation followed by cooking at 60° Brix sugar syrup concentration for 10 minutes. After the preparation of chhana base, it is coated with chocolate containing cranberry extract @1%. Storage stability of the chocolate coated chhana confection was further studied after wrapping in aluminum foil and packing aerobically in low density polyethylene (LDPE) pouches. The different physico-chemical, proximate, microbiological and sensory properties of cranberry treated samples and control samples were monitored at 0, 15, 30, 45 and 60 day of refrigeration storage (4±1ºC) and 0, 6, 12, 18 and 24 day of room temperature storage (30±3ºC). Refrigeration and room storage studies showed a significant decrease in pH and water activity and increase in titratable acidity at progressive storage intervals. Mean TBA and FFA values for all the treated samples were significantly ($P<0.05$) lower at 45 and 60 day of refrigeration storage whereas at room storage mean TBA values of all the treatments were significantly ($p<0.05$) lower on day 18 as compared to control samples. Mean Y&M counts for all the treatments were significantly ($p<0.05$) lower as compared to control at day 45 of refrigeration and 18 of room storage. Phenolic and flavonoid counts decreased significantly ($p<0.05$) with increase in storage period and the mean values of phenols and flavonoids in case of treatments were comparable to control at refrigeration and room temperature storage. Sensory scores decreased significantly ($p<0.05$) with increase in storage period. Thus, chocolate coated chhana confection can be manufactured at industrial level with good nutritional properties and storage stability up to 60 days at refrigeration temperature (4±1ºC) and 18 days at room temperature (30±3ºC).

Development of Chocolate Coated Chhana Confection with its Physicochemical and Sensory Characterization

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The study was designed to develop a protein rich chhana (traditional dairy product obtained by acid coagulation of hot milk) based confection by incorporating different levels of fruit powders (mango, grape and pineapple) @ 2%, 4% and 6% separately in the formulation of chhana base (95g chhana+ 5g whole milk powder) replacing chhana proportionately in formulation which was further cooked at 60° Brix Sugar syrup concentration (10 min) followed by coating with chocolate using silicon moulds. The following treatments (95g chhana+ 5g milk powder(C), 93g chhana+ 5g milk powder+ 2g fruit powder(T1), 91g chhana+ 5g milk powder+ 4g fruit powder(T2), 89g chhana+ 5g milk powder+ 6g fruit powder(T3), were assessed for proximate, physico-chemical and sensory parameters. Moisture and ash content of the treatments increased significantly ($p<0.05$) with incorporation of mango and grape powder at 6% level and pineapple powder at 4% and 6% level as compared to control samples. Cooking yield showed a significantly ($p<0.05$) increase with incorporation of mango and grape powder at 4% and 6% level as compared to control. pH decreased significantly ($p<0.05$) at 4% and 6% level of mango, grape and pineapple powder incorporation, however, Titratable acidity was significantly ($p<0.05$) higher with incorporation of pineapple powder at 6% level and mango powder at 4% and 6% level as compared to control. Coating loss was found to be significantly higher ($p<0.05$) in treated samples at 6% level of mango and grape powder incorporation as compared to control samples. No significant difference ($p>0.05$) was observed in lactose content, cholesterol content, mean thickness and weight of chocolate coating in control and treated products. Colour analysis for all the samples were done and L* value showed a significant ($p<0.05$) increase at 4% and 6% level and b* value increased at all levels of mango powder incorporation. Pineapple powder incorporation at 4% and 6% level significantly ($p<0.05$) increased b* colour values of treated samples as compared to control samples. Chhana confection exhibited superior sensory characteristics at 4% level of mango, grape and pineapple powder addition as compared to control samples. Thus, chocolate coated chhana confection can be prepared by incorporating fruit powders (mango, grape and pineapple) at level of 4% in chhana base containing chhana and milk powder. Such confection is expected to increase nutritional profile of market candies and confection.

Traditional Methods of Storing Vegetables: Exploring Indigenous Technical Knowledge from the Cold Desert of Ladakh, India

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Abstract

Situated between 32 ^{O} N to 36 ^{O} S latitude and 75° E to 80° E longitude in the trans-Himalaya and surrounded spectacularly by arid mountains, the cold desert of Ladakh is unique in its own ways. One of the most sparsely populated region of Jammu and Kashmir (J&K) state with a population of 274289 (according to 2011 census), the people of Ladakh are close to their roots.

In order to get acquainted with the indigenous technical knowledge (ITK) of storing vegetables, extensive surveys in the villages of Stakmo, Ranbirpur, Thiksey, Saboo, Naang, Phey, Umla of Leh district were conducted.The methodology was to meet the elderly and experienced farmers of these villages and record the information related to the storing of vegetables during the harsh winters when temperature dips to minus in this region.

The ITK recorded during the survey included *Tsothbang* (vegetable cellar) which is a rectangular structure prepared in the ground with a dimensions of 12 × 10 × 6 m^3(L × W × H). The cellar has a small outdoor entrance and a ventilator and is used to store cabbage and root crops like potato, radish, carrot, turnip etc. during winter. The *tsotbang* helps to keep vegetables fresh for 5 to 6 months. Another ITK recorded was *Chulta*which is a traditional onion seed production practice. Here in onion bulbs along with the greens are harvested during the month of Septemberand stored in *charches*until the first week of May when the temperature is conducive for the onion to sprout again and develop seeds.

The study pressed upon the fact that the ITKof farmers has to be integrated with scientific knowledge and technological advancements of today in order for farmers to improve their traditional ways of doing things.

Keywords: Indigenous Technical Knowledge, Ladakh, Traditional, Vegetables.

Detection and Pathotyping of Newcastle Disease Virus from Poultry in Kashmir

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Abstract

Newcastle disease (ND) caused by virulent strain of avian paramyxovirus-1(vAPMV-1) is a highly contagious disease of poultry. ND remains a major problem in existing or developing poultry industries. There are different pathotypes of NDV in chickens: velogenic (high virulence), mesogenic (moderate virulence), and lentogenic (low virulence).The present study was carried out on 5 suspected outbreaks to detect and pathotype the Newcastle disease virus from poultry in Kashmir. The detection was carried out by amplification of 121 bp of matrix protein gene by RT-PCR. All the 5 suspected outbreaks were positive for ND. Pathotyping of ND was done by amplification of 356 bp of hypervariable region of fusion protein gene including F0 cleavage site which is regarded as a major determinant of pathogenicity.. Restriction digestion by *Alu*I of the amplified PCR product yielded ~284bp and ~72bp products in all the outbreaks. The pathern of digestion was similar to that of mesogenic R2B strain indicating the pathotype of circulating virus in Kashmir. The technique of RT-PCR followed by restriction enzyme digestion can been exploited to pathotype NDV.

Keywords: Fusion Protein Gene; Reverse Transcriptase PCR; Newcastle Disease Virus; Restriction Digestion

Effect of Non-Genetic Factors on First Lactation Production and Reproduction Traits in Frieswal Cattle.

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Abstract

The present study was undertaken on first lactation production and reproduction records of 1470 Frieswal cows maintained over a period of 10 years (2003-2012) two military farms viz Meerut and Ambala at CIRC , Meerut. To study the effect of non-genetic factors, the data were classified according to Farm, season, period, and age group. The overall least squares means of AFC, FL305DMY,FLMY, FLL, FSP, FDP and FCI were 921.35 ± 05.17 days, 2658.57± 42.59 kg, 2718.28 ± 44.40 days, 304.15 ± 1.4 days, 163.19± 24.75 days, 114.20 ± 5.94 days and 459 ± 8.06 days, respectively. Period had highly significant effect (P<0.01) on AFC, FL305YP, FLMY, and FLL, while it had non-significant effect on FSP, FDP and FCI. The least squares analysis of variance revealed that the age at first calving of Frieswal cows maintained in Ambala and Meerut farms did not differ significantly. The effect of season of birth on AFC was found to be statistically non-significant. The average FL305DMY for Meerut farm was found to be 2879.13 ± 41.28 kg while the corresponding estimate for Ambala farm was 2438.02 ± 61.79 kg and the difference was found to be statistically highly significant (P<0.01). The analysis on the effect of season on FL305DMY revealed that the cows calved in summer season had the maximum FL305DMY of 2700.61 ± 57.02 kg followed by the winter (2639.75±50.38 kg) and rainy calvers (2635.37±65.81 kg). The study also revealed that the differences between different seasons were not statistically significant. The least squares analysis revealed that the AFC group had highly significant (P<0.01) effect on the FL305DMY.

Keywords: First Lactation Traits of Cross breed, Frieswal cattle non -genetics factors**.**

Delignification of Rice Straw with Ligninolytic Enzyme from Consortium of *Phanerochaete Chrysosporium* and *Pleurotus Ostreatus*

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Abstract

Lignin biodegradation is an attractive approach for producing value-added products, produced by processing and refining of abundantly available lignocellulosic biomass such as rice straw. A set of ligninolytic enzymes including lignin peroxidase (LiP), manganese-dependent peroxidase (MnP), and laccase (Lacc) were produced from consortium of *Phanerochaete chrysosporium* and *Pleurotus ostreatus* under pre-optimized solid state fermentation conditions. The pretreatment of rice straw with ligninolytic enzyme (Lacc, LiP and MnP activities of 2.40, 37.92 and 62.50 nkat/gds, respectively) resulted in maximum delignification of 80.9% in 72 h. The results were corroborated by scanning electron micrographs of pretreated rice straw which revealed deformation of epidermal surface as well as exposure of cellulose fibrils to the surface. The delignification process renders the lignocellulosic biomass to be used as a substrate for the production of biofuels, enzymes and other industrially important products.

Keywords: Rice straw, Delignification, ***Phanerochaete chrysosporium, Pleurotus ostreatus,*** Lignin peroxidase, Manganese-dependent peroxidase, Laccase

Effect of Plant-Microbe Interactions on Growth and Pigment Accumulation in Saffron (*Crocus sativus* L.)

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Abstract

Plant-microbe interactions which are symbiotic in nature have immense potential in enhancing plant growth and development. The present study was carried out to study the effect of organic cultural practices/microbial inoculations on the growth and development of saffron crop. The effect of plant-microbe interactions was also studied with respect to pigment accumulation in this plant. Average shoot height ranged from 13.10 cm to 22.47 cm, the average shoot biomass ranged between 0.86 g and 2.18 g, average root depth ranged from 12.60 cm to 30.33 cm, average root biomass ranged between 0.90 g and 2.10 g, average stigma yield per plant ranged from 0.02 g to 0.03 g. VAM +PSB+KSB was found to be the best treatment which showed maximum stigma yield per plant (0.03 g). In saffron, protein content ranged from 0.17 mg g-1 to 1.23 mg g^{-1}, average proline content ranged from 0.30 µg ml^{-1} to 0.75 µg ml^{-1}, average phenolic content was found to be between 1.78 mg $100g^{-1}$ and 5.22 mg $100g^{-1}$, average chlorophyll content ranged between 3.41 mg g-1 and 3.86 mg g^{-1}, average carotenoid content ranged from 55.99 µg g^{-1} to 82.82 µg g^{-1}. The value of average crocin content in the saffron stigma was found to be between 260.24 mg g^{-1} and 325.46 mg g^{-1}, the value of average picrocrocin content in the saffron stigma was found to be between 139.11 mg g^{-1} and 215.13 mg g^{-1} and the value of average safranal content in the dried saffron stigma was found to be between 24.13 mg g^{-1} and 55.49 mg g^{-1}. The maximum carotenoid as well as apocarotenoid content was found in VAM+PSB+KSB.

Fish and Parasites as Bioindicators of Water Pollution and Environmental Change in Freshwater Ecosystems

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Abstract

Fish are used for the evaluation of the quality of aquatic environment and as such serve as bioindicators of environmental pollution. Fishes fall prey to the infection of parasites which cause apparent damage in fish populations, and may also become causative agents of diseases in fishes, leading to pathological and behavioral changes, decrease of fitness or reduction of the market value of fish. Parasitism may decrease if definitive or intermediate host density declines or parasites suffer elevated mortality directly (eg. from toxic effects on parasites) or indirectly (infected hosts suffer differentially high mortality). There are a variety of ways that environmental changes affect parasites, suggesting that information on parasites can indicate anthropogenic impacts. A study of two water systems one lentic (Dal) and other lotic (Vehaw) was carried out to know the status of anthropogenic activity. Helminth parasites belonging to the different genera as *Pomphorhynchus sp., Adenoscolex sp., Bothriocephalus sp., Diplozoon sp., Clinostomum sp.,* were isolated from the fishes. During the study along the pollution gradient, parasitic load showed an immense distinction in occurrence which can be contributed to pollution level existing around the collection sites.

Keywords: *Schizothorax*, *Adenoscolex sp., Bothriocephalus sp., Diplozoon, Pomphorhynchus sp., Clinostomum sp.*

Nephro-Protective activity of Aged garlic extract on Hypomagnesemia Induced Nephropathy in Rat Model

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Background: Clinical trials have shown that hypomagnesaemia result in renal failure in both experimentally induced animal models and naturally occurring clinical cases of hypomagnesaemia. Further it has been reported that aged garlic extract (AGE) is effective in ameliorating the renal damage. However, the pathogenesis and role of aged garlic extract (AGE) remain to be elucidated.

Purpose: The aim of the present study was to investigate Nephro-protective activity of aged garlic extract on hypomagnesaemia induced nephropathy in rat model and elucidate the pathogenesis and ameliorative role of aged garlic extract.

Methods: The Nephro-Protective effect was evaluated in experimental rats. Experimental rats were divided into three groups, Group I in which complete laboratory ration was fed adlib. Group II in which magnesium deficient laboratory ration was fed adlib. Group III in which magnesium deficient laboratory ration was fed adlib and aged garlic extract (AGE) @ 150 mg/kg body wt. The sampling of experimental rats was performed on 15th day of trail and rats were scarified on 35th day of experimental trail.

Results: in present study, Blood Urea Nitrogen (BUN), Creatinine, Calcium, Gamma Glutamyltransferase (GGT) Lipid Peroxidation (LPO) were increased significantly ($P<0.05$) while as Catalase (CAT) and Superoxide Dismutase (SOD) were decreased significantly in magnesium deficient group. Similarly it was found that Aged Garlic Extract (group III) significantly decreased markers of renal failure in group III, Blood urea nitrogen (BUN), Creatinine, Calcium, gamma glutamyltransferase (GGT) and Lipid Peroxidation (LPO) were decreased significantly ($P<0.05$) while as catalase (CAT) and superoxide dismutase (SOD) were increased significantly. Histopathlogically, magnesium deficiency was found to cause degeneration of nephrocytes and accumulation of calcium in renal tissues which was ameliorated by aged garlic extract (AGE) supplementation.

Conclusion: Magnesium deficiency induced the concentration dependent elevation in markers of renal failure. Moreover, aged garlic extract (AGE) treatment significantly decreased markers of renal failure in group. So it can be concluded that magnesium deficiency induced oxidative damage and calcification play important role in renal tissue damage which was ameliorated by aged garlic extract (AGE).

Keywords: Aged Garlic Extract (AGE), Renal Failure, Magnesium and Markers.

Performance of Narmada Nidhi and Kadaknath Birds in Extensive System of Farming

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Abstract

Mandla is a tribal district situated in the east-central part of Madhya Pradesh. The district lies almost entirely in the catchments of river Narmada & its tributaries. Birds native to our country are very colorful, easy to manage as backyard flocks and are disease resistant. Their meat as well as eggs are in good demand and also fetch good price. Kadaknath, which is reared by most of the tribes as backyard system of farming without any vaccination and hygiene and offered only kitchen waste and small amount of grains, therefore its growth rate is very low and mortality rate is high. Narmada Nidhi Bird is developed by Nanaji Deshmukh Veterinary Science University, Jabalpur for rural and tribal poultry keeping.

The experiment was conducted to know the Performance of Kadaknath and Narmada Nidhi Birds reared as backyard system of farming in Mandla District of M.P. (India) at KVK, Mandla. Day old twenty female with five male chicks of Kadaknath and Narmada Nidhi chicks for each farmers (Total Two hundred and twenty five each breed) were randomly distributed reared as backyard system of farming. The birds were vaccinated against Ranikhet disease (F_1-strain) and Gumboro disease. From the experiment it was concluded that body weight gain was significantly higher in Narmada Nidhi Birds birds as compare to Kadaknath birds, similarly egg production was also significantly higher in the Narmada Nidhi Birds but age at 1st laying, hatchability and mortality data were non significant among each other. The egg selling rate was same for both the breeds but meat of Kadaknath bird fetch high price due to its medicinal uses.

Keywords: Body weight gain, egg production, Kadaknath, , Mortality, Narmada Nidhi Birds

Effect of Inm on Growth and Yield of Sprouting Broccoli (*Brassica Oleracea* (L) var. Italic Planck)

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Abstract

The field experiment was conducted at horticulture farm SKN college of Agriculture, Jobner (Jaipur) during Rabi session 2016-17 and 2017-18. The experiment consisted of seven treatments of INM i.e. (1) 100% RDF through inorganic fertilizer, (2) 75% RDF through inorganic fertilizer + 25% through FYM (3) 50 % RDF through inorganic fertilizer + 50% through FYM (4)100% RDF through FYM (5)75% RDF through inorganic fertilizer + 25% through Vermi Compost (6)50% RDF through inorganic fertilizer + 50% through VC (7) 100% RDF through FYM with three replications. The application of 50 % RDF through inorganic fertilizer + 50% through VC was found significant effective and recorded maximum plant height, number of leaves per plant, leaf area. Chlorophyll content in leaves (2096 mg/g), leaf area duration, weight of primary curd (222.51 mg,) number of secondary curds per plant (6.58),weight of secondary curd (154.05 g, volume of curd (119.78cc) , diameter of curd (13.10 cm) yield per plant (384.56 g , yield per plot (7.69kg) yield per ha (189.90q) biological yield per ha. (1081.85q.) this treatment was also recorded minimum days taken to curd formulation. It was statistically at par with 75% RDF application through inorganic fertilizer + 25% through Vermi Compost.

Keywords: Growth, Yield, Organic, Inorganic, Vermicompost and sprouting broccoli.

Genetic Analysis and Stability of Yield and its Components Under Different Environments In Lathyrus (*Lathyrus Sativus* L.)

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Abstract

The present investigation was conducted during the *Rabi* 2007-08 at Instructional and Research Farm, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh. Sixteen lathyrus genotypes were grown under four environments, which were created through combination of irrigation and date of sowing *viz.* irrigated and timely sown environment (E1), non-irrigated and timely sown environment (E2), non-irrigated with late sown environment (E3) and irrigated with late sown environment (E4).

Finally, data of seven characters *viz.* days to 50 % flowering, days to maturity, plant height, number of branches plant-1, number of seeds pod-1, number of pods plant-1 and seed yield plot-1 were subjected to statistical and biometrical analysis namely, genetic variability, heritability, genetic advance, correlation coefficient, path analysis and stability analysis.

The analysis of variance and genotypic correlation coefficient of variation revealed the presence of considerable amount of genetic variability for the characters studied over pooled. The heritability in broad sense and genetic advance as percent of mean was highest for seed yield plot-1 and lowest for plant height.

In correlation coefficient studies, the seed yield plot-1 had significant positive correlation with pods plant-1, plant height and seeds pod-1 while negative correlation with days to maturity and days to 50 % flowering. The characters plant height and pods plant-1 had positive direct effect and significant positive correlation with seed yield plot-1, indicating true relationship and therefore, selection would be rewarding for these traits.

The stability performance for seed yield of genotypes was studied for six yield contributing characters using the method suggested by Eberhart and Russel (1966). Variation due to genotype, environment and genotype x environment interaction were highly significant and large portion of these interactions were due to linear regression. Highly significant means squares were observed for linear as well as non linear components. E1 was considered as wide range over environment, E2 and E4 as normal range of environment and E3 as poor environment though; there was negligible difference in the parallel environments. The stability analysis for seed yield showed that the genotype WBK-1 was found stable under the normal range of environments (E2 and E4), whereas Prateek, WBK-13-1, WBK-14-7, RLS-3009 were suitable for timely sown with irrigated (E1) environment and Ratan, RLS-3006 and RLS-3004 were found stable under late sown with no irrigation (E3) environment.

Integerated Management of Stemphylium Blight of Onion (*Stemphylium vesicarium*) in Kashmir Valley

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A field experiment on integrated management of the stemphylium blight of onion was conducted at research farm of Division of Plant Pathology, Faculty of Agriculture, Wadura, SKUAST-Kashmir, during 2015-2016 and 2016-2017 cropping season. A factorial experiment was laid in randomized completely block design (RCBD) consisting of 16 treatments, each replicated thrice. The treatment compromises of four soil amendments which included FYM@ 20t ha^{-1} , Vermicompost @ 2t ha^{-1} , *Trichoderma harzianum* formulation on grinded maize grains @ 5 kg ha^{-1} and No soil amendment and foliar prays of Difenaconazole 25EC@ 0.04%, Mancozeb 75WP @ 0.3% , Prophylactic spray of Mancozeb75WP @ 0.3% followed by two post inflectional sprays of difenoconazole 25EC @ 0.04% and Sterile distilled water. It was observed that all the treatments, individually or in combination, restrained the disease incidence and intensity to a level significantly lower than that of control and enhanced the yield appreciably in both the experimental years. The trend followed by various treatments with respect to their efficacy during the two years was also similiar. Results reveal that Pooled data of disease incidence and intensity of 2016 -2017 revealed that treatment combination of soil amendment using vermicompost @ 2 t ha^{-1} with prophylactic spray of Mancozeb75WP @ 0.3% followed by post inflectional sprays of difenoconazole 25EC @ 0.04% proved best which gave least incidence(31.32 %) and intensity (6.03%) as against the control recording the highest disease incidence and intensity of 82.86 and 57.17 per cent, respectively. Among the soil amendments, vermicompost @ 2 t h^{-1} proved to be most effective which resulted in least incidence (44.42%) and intensity (9.95%) as against the control recording the incidence and intensity of 71.67 and 27.16, respectively. Among the foliar sprays prophylactic spray of Mancozeb75WP @ 0.3% followed by post inflectional sprays of difenoconazole 25EC @ 0.04% proved to be most effective recording incidence (45.24%) and intensity(9.70%) as against the control recording the highest incidence and intensity of 74.55 and 27.65 per cent, respectively. Other treatment combination, which proved very effective, were soil amendment with Trichoderma or FYM along prophylactic spray of Mancozeb and by post inflectional sprays of difenoconazole. Highest bulb yield of 240.36 $qh^{-1}$was recorded in treatment combination of soil amendment using vermicompost @ 2 t h^{-1} with prophylactic spray of Mancozeb75WP @ 0.3% followed by post inflectional sprays of difenoconazole 25EC @ 0.04% against the control(195.90 qh^{-1}).

In Vitro Bacteriophage Mediated Disruption of *Staphylococcus Aureus* Biofilms Associated with Bovine Mastitis

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Abstract

Biofilms is an assemblage of microbial cells that is irreversibly associated with a surface and usually enclosed in a matrix of polysaccharide material. Biofilm associated diseases especially bovine mastitis of *Staphylococcus aureus*origin, results in high economic losses. The greatest challenge posed by biofilm is in its incredible ability to resist most of the currently existing antibiotics. An alternative to antibiotic treatment is the use of bacteria's natural predators, the bacteriophages. Bacteriophages are viruses that specifically target and kill bacteria irrespective of their antibiotic sensitivity and have a greater ability to target biofilms resulting in their disruption. In view of extensive role of biofilm formation in virulence of *Staphylococcus aureus* mastitis and increasing scope of phages in treatment of mastitis present study wasaimed to evaluate *in-vitro* lytic abilities of *Staphylococcus aureus* bacteriophages against *Staphylococcus aureus* biofilms and their potential for therapeutic use in future.Out of 150 mastitis milk samples collected from veterinary clinics F.V.Sc & A.H., Shuhama and local villages, 80(53.33%) isolates of *Staphylococcus aureus* were obtained. All the isolates were tested for presence of biofilm forming genes *ica B* and *ica D.* Biofilm formation and *in-vitro* bacteriophage mediated disruption of these *Staphylococcus aureus* biofilms were visualized by Fluorescent microscopy which revealed a marked decrease in live bacteria (green spots) after addition of SSP phage in comparison to MSP phage. Thus phage SSP exhibited a greater lytic potential in disrupting *S. aureus* biofilms in comparison to phage MSP. These phages present a promising potential for use as therapeutic agent against *S. aureus* mastitis.

Keywords : Biofilm, Bacteriophage, Mastitis, Fluorescent microscopy.

Genetic Dissection for Key Traits in Cowpea (*Vigna unguiculata*–L.Walp.) Grown in North-western Himalayas of State Jammu and Kashmir

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Abstract

Cowpea (*Vigna unguiculata* (L.) Walp.) is one of the most important grain legume crops in the world belonging to family *Fabaceae*. This crop is grown throughout the world especially in tropical and the sub-tropical regions of the world including Africa, Asia, South America, parts of Southern Europe and the United States. Characterization and evaluation of available cowpea germplasm is a necessary first step to facilitate breeding efforts. Therefore, efforts have been made during the present study to characterize a set of 343 cowpea lines belonging to International Institute of Tropical Agriculture (IITA), Nigeria and some ~50 local lines from Kashmir valley for several qualitative and quantitative traits. Huge variation was recorded for all morphological, phenological, growth, yield and yield related traits. The analysis of data led to the identification of several promising genotypes for extra early maturity, disease resistance and high yield. The promising lines will be released as next generation varieties and used in cowpea breeding programs for developing Kashmir region-specific cowpea varieties. The genotyping data already available plus the data that will be generated in future will be used with trait data for the identification of QTLs/genes for important morphological, phenological, growth, yield and yield related traits. The genes/QTLs once identified will be used in cowpea molecular breeding programs aimed at enhancing quality, disease resistance and yield.

Keywords: Cowpea; Trait; phenotyping for Key traits; QTLs/genes, Molecular Breeding

Seasonal Water Quality Characterization And Suggested Management Strategies for Lake Mansar, J&K (India)

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Abstract

Lakes, the dynamic ecosystem are the planet's most fertile, diverse and unique water bodies reflecting many characteristics of watershed, variation in climate and biological components. These are most important fresh water resources and life supporting systems providing water for drinking purpose, irrigation, recreation and tourism as well as serve as an important freshwater habitat for flora and fauna of a region. The present investigation was carried out to determine the seasonal variation in the water quality parameters of lake Mansar (J&K) for a period of one year viz. October 2014 to September 2015. The various physicochemical parameters such as air temperature, water temperature, electrical conductivity, total dissolved solids, turbidity, salinity, pH, free carbon dioxide, carbonate, bicarbonate, dissolved oxygen, biological oxygen demand, chloride, calcium, magnesium, total hardness, sodium, potassium, phosphate, nitrate, silicate and sulphate were analyzed. The results revealed that the lake is receiving pollution load from the surrounding areas due to domestic discharge, agricultural activities, habitation encroachment, bathing and washing, tourist activities, deforestation, siltation, waste from wildlife sanctuary and other anthropogenic activities. Regular monitoring and proper assessment of lake water quality is very important for proper conservation and management purposes. The present paper attempts to suggest various conservation measures and management strategies for minimising pollution load in the lake.

Keywords: *Lake Mansar, water quality parameters, pH, Salinity, Turbidity.*

Evaluation of Wheat (T. Aestivum L.) Genotypes Under Organic Conditions

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Abstract

The yield of cereal crops are increased at the cost of quality due to the development of chemical fertilizer responsive varieties. Organic products now a days are getting interest of people due to enhanced or natural indigenous better quality and perhaps more awareness about ill effects of chemical fertilizers. The more use of chemical fertilizers put fertile soils into vulnerability to losing fertility and other physical properties. Keeping in view the importance of organic products the present experiment comprising 15 elite wheat genotypes was conducted in the Organic Research Farm at SKUAST-J Chatha to evaluate the performance of these genotypes agro-morphologically. The experiment laid in RBD with three replications. No chemical fertilizer was applied during the entire growth period and no pesticide or herbicide was applied. Only FYM and neem seed cake was applied as per standard dose. Data was recorded on 12 agro-morphological traits *viz*. days to 50% flowering no. of tillers per plant, flag leaf length(cm), flag leaf area (cm^2), spike length (cm), plant height (cm), no. of spikelet per spike, no. of seed per spike, spike weight (gms), test weight, biological yield(kg), seed yield per plant, root biomass yield (gms). Data was statistically analysed. Mean performance of genotypes showed that PBW-650 and WH 1405 have been found early in days to 50% flowering, PBW-677 and PBW-658 showed higher no of tillers per plant, in grain test weight the genotypes WHD-943, PBW-175 and PBW-725 recorded highest values, in case of grain yield genotypes PBW-644 and PBW-677 recorded highest yield among all genotypes. Genotypes WHD-943and WH-1105 also recorded high root biomass besides good yield and high test weight indicating that these genotypes should be given priority under organic conditions to get desirable yield.

Keywords: organic, wheat, agromorphological

Effect of Habitat Overlap on Transmission of Parasites

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Abstract

Majority of the society is directly or indirectly dependent on the valuable products from domestic animals like meat, milk, wool and skin which plays a crucial role for the economic development of the state. Besides these domestic animals there are some endangered wild animals of great importance which are harboring some protected areas of Kashmir. Naturally, wild animals and livestock share habitat and resources of the habitat. Occurrence of these hosts in the same habitat results in shearing of disease causing pathogens. Helminths have been found to have adverse effect on the wellbeing of both wild and domestic animals. In livestock they cause huge economic loses. Helminth parasites have been found to have negative effect on the population of wild animals as they cause general weakness and death in severe cases thus decreasing there population. It is therefore important to understand which factors govern the transmission of parasites between wild and domestic animals.As such understanding different factors that result in thetransmission of parasites could provide us information for suggesting the remedial measures to be takento control and prevent transmission. Most studies have focused on the pattern of infection confined to the single host species, but nature presents a different story were in different hosts co-occur (habitat overlap) and interact with numerous pathogenic and non-pathogenic parasites. Co-occurrence of hosts (habitat overlap) have been found to have a profound effect on the intensity and severity of parasitic infection. Thus, habitat overlap is likely to have effect on the pattern and composition of parasite communities as it brings together hosts and parasites of different types.

Keywords: *Helminthes Parasites, transmission, habitat overlap, pathogenic.*

Effect of Different Organic Sources of Nutrients on Quality Parameters of Aromatic Rice Cultivars

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Abstract

A field experiment was conducted during *kharif* season of 2011 on '*Vertisols*' (*Kanhar)* to study Impact of different organic sources of nutrients on quality parameters of aromatic rice cultivars. The experiment consisted of four aromatic rice varieties as main plot *viz.* Jeeraphool, Kasturi, Badshah Bhog, Sugandhamati and six treatment of organic nutrient management *viz.* T_1 (CDM + CCR + Vermicompost), T_2 (T_1 + BGA + PSB + *Azospirillum*), T_3 (T_1 + Rock Phosphate), T_4 (T_1 + Panchgavya), T_5 (T_2 + Rock Phosphate + Panchgavya) and T_6 (T_1 + Neemastra) thereby making twenty four treatment combinations tested in split plot design with three replications. Results indicated for quality production of scented rice varieties, the application of Cow dung manure, Compost crop residue, Vermicompost, Blue Green algae, PSB, *Azospirillum,* rock phosphate and Panchgavya (T_5) was found superior than other organic nutrient management treatments.

Phytochemical and Bioevaluation Studies of Chemical Constituents Isolated From *Artemisia Moorcroftiana Wall.*

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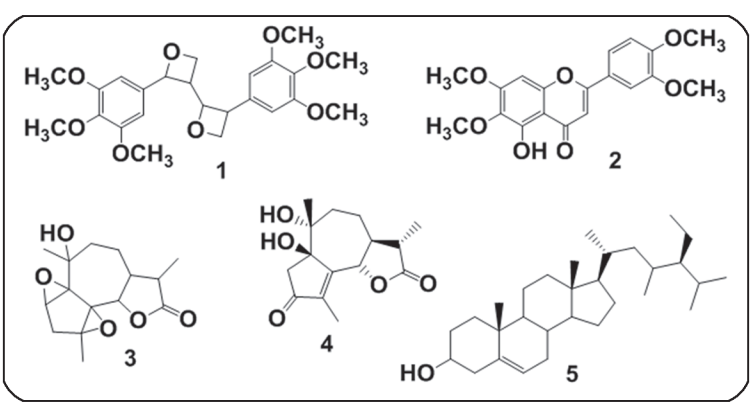
Abstract

For years *Artemisia* species have been traditionally used by various populations for the treatment of diseases such as malaria, hepatitis, cancer, inflammation and infections by fungi, bacteria and viruses. The genusis a reservoir of so many bioactive compounds like artemisinin which is not only the current drug of choice for treatment of brain cerebral malaria but also exhibits profound cytotoxicity against tumour cells. *A. moorcroftiana* wallis used in folk medicine for the treatment of malaria in northern areas of Pakistan. LC-MS guided technique was applied for the detection and target isolation of one new; 2,2'-bis(3,4,5-trimethoxyphenyl)-3,3'-bioxetane(**1**) together with four known compounds viz;, Vitexicarpin (**2**), Artabsinolide Diepoxide (**3**) 1**β**, 10α Dihydroxy-1,10,deoxy gorgonolide (**4**) and ***β***-Sitosterol (**5**) from the aerial parts of *Artemisia moorcroftiana* Wall collected from Nobra Valley Ladakh. The constituents were identified using spectral and analytical techniques in the light of literature. MTT cytotoxicity screening of the isolated constituents was carried out against panel of four human cancer cell lines including lung (A-549), leukaemia (THP-1), prostate (PC-3) and colon (HCT-116) cell lines. **2** displayed highest cytotoxic activity against prostrate (pc-3), lung (A549), leukaemia (THP-1) and colon (HCT-116) cell lines with IC_{50} value of 17.61, 18.80, 19.50, and 22.30 μM respectively. Further all the isolates were subjected to antimicrobial evaluation against five different clinical bacterial and fungal strains.**3** showed highest activity against *Klebsiella pneumonia* with MIC value of 0.4 mg/ml and 0.53 mg/ml each against *Pseudomonas aeuroginosa* and *Staphylococcus aureus* cell lines respectively. All the compounds were reported for the first time from this plant species.



Structures of the isolated constituents from *Artemisia moorcroftiana* wall.

Evaluation of Front Line Demonstration Trials on Yield and Economics of Pigeon Pea in Trial Area of Mandla District of Madhya Pradesh

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Abstract

The study was carried out in *Kharif* season in trial area of Mandla District of Madhya Pradesh during 2014-15 for TJT 501 variety and 2015-16 for ICPL-88039 variety of pigeon pea. Frontline demonstrations were conducted on pigeon pea with active participation of farmers with the objective to demonstrate the improved production technologies of pigeon pea. The improved technologies consisting of replacement of old variety with promising high yielding improved variety, seed treatment with trichoderma viridae, *Rhizobium* arhar and PSB culture, balanced fertilizer application (soil test based) and integrated pest and disease management. To increase the production, productivity and quality of agricultural produce, frontline demonstrations are being conducted at various farmer's field. All recommended practices were provided to selected farmers.

Result of present study revealed that FLD recorded higher yield as compared to farmer's local practices. In frontline demonstration of pigeon pea an average yield was recorded 10.8 q/ha under demonstration plots as compared to farmer's practice 7.9 q/ha for variety TJT-501 and average yield was recorded 8.56 q/ha under demonstration plots as compared to farmer's practice 4.87 q/ha for variety ICPL-88039. The percentage increase in the yield over farmer's practice was 26.85% for TJT-501 variety and 43.10% for ICPL – 88039 variety of pigeon pea. The improved technology gave higher gross return, net return with higher benefit cost ratio as compared to farmer's practices.

Keywords: Pigeon pea, Frontline Demonstration, Yield and Economics

Response of Fodder Oats to Fertility Levels and Cutting Management at Different Sowing Dates

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Abstract

A field experiment was conducted at the Experimental Farm of Division of Agronomy, Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir, Shalimar, Srinagar during *Rabi* 2009-10 and 2010-11 on silty clay loam soil low in available nitrogen, medium in available phosphorus and potassium and sufficient in available calcium with neutral pH. The experiment was laid out in randomized block design replicated thrice with three sowing dates (September, 20, September, 30 and October, 10), three fertility levels (150 : 70 : 40, 125 : 60 : 30 and 100 : 50 : 20 kg N:P_2O_5:K_2O ha^{-1}) and two cutting levels (single cut and double cut). The study revealed that the crop sown on September, 20 recorded significantly higher plant height, number of tillers m^{-2}, leaf area index and dry matter production upto 120 DAS. However, at harvest September, 30 and October, 10 sown crops at par with one another recorded significantly higher plant height, number of tillers m^{-2}, leaf area index and dry matter production than September, 20 sown crop. October, 10 sown crop recorded significantly higher leaf stem ratio upto 150 DAS, however, at 180 DAS and at harvest leaf stem ratio remained similar under different sowing dates. Both total green and dry fodder yields (1st + 2nd cut) recorded with September, 30 and September, 20 sown crops were at par but significantly higher than October, 10 sown crop. Similar trend was also noticed in case of pooled data over two years. At first cutting September, 30 sown crop recorded higher nitrogen, phosphorus, potassium and calcium uptake whereas at second cutting October, 10 sown crop at par with September, 30 sown crop recorded significantly higher nitrogen, phosphorus and potassium uptake. Crude protein content was higher and crude fibre and ash content were lower in October, 10 sown crop compared to other sowing dates. The results also indicate that the plant height, number of tillers m^{-2}, leaf area index, dry matter production, leaf stem ratio were significantly higher with fertility level 150 : 70 : 40 kg N:P_2O_5:K_2O ha^{-1}. The said treatment also recorded significantly higher total green and dry fodder yield (1st + 2nd cut) than other fertility levels. The fertility level 150 : 70 : 40 kg N:P_2O_5:K_2O ha^{-1} recorded significantly higher nitrogen, phosphorus and potassium uptake while calcium uptake was significantly higher with fertility level 125 : 60 : 30 kg N:P_2O_5:K_2O ha^{-1}. Crude protein and ash content remained significantly higher at highest fertility level whereas crude fibre content was not significantly affected. The results also indicate that the single cut crop recorded significantly higher plant height, number of tillers m^{-2}, leaf area index and dry matter production than double cut (excluding 1st cut) crop at different growth intervals, however, leaf stem ratio at 90, 120 and 150 DAS was significantly higher in double cut crop. The double cut crop recorded significantly higher total green and dry fodder yield (1st + 2nd cut) than single cut crop. Nitrogen, phosphorus, potassium and calcium uptake recorded under single cut crop was significantly higher than double cut crop (excluding 1st cut). The double cut crop recorded higher crude protein content but significantly lower crude fibre and ash content than single cut crop. The study revealed that the oats crop sown on September, 30 fertilized with 150 : 70 : 40 kg N:P_2O_5:K_2O ha^{-1} and cut twice viz., December, 15 and 50 per cent flowering proved to be most economic in terms of benefit cost ratio, net and gross returns.

Keywords : Oat, sowing date, fertility levels, cutting management

Parasitic Zoonoses in Jammu and Kashmir: A review

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Abstract

Parasitic zoonoses are diseases caused by parasites, naturally exchanged between animal hosts and humans. Most parasitic zoonoses are neglected diseases despite affecting almost half of the human population around the globe and the vast majority of livestock worldwide. Some of the important parasitic zoonoses caused by helminth and protozoan parasites include Fasciolosis, Trichinellosis, Cysticercosis, Echinococcosis, Cryptosporidiosis, Giardiasis etc. A review of available literature indicates that a number of such parasitic zoonoses are endemic in neighbouring states of Jammu and Kashmir. However, the information on this aspect is very limited in Jammu and Kashmir. So the aim of this review is to present a comprehensive picture of the zoonotic parasitic diseases prevalent in Jammu and Kashmir with main focus on their current status, modes of transmission and control. There is a clear need of such information inorder to put forth the cost effective intervention strategies.

Keywords: Zoonosis, Fasciolosis, Echinococcosis, Jammu Kashmir

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Effect of Exogenous Auxin Application on Fruit Cracking In Litchi (*Litchi Chinensis Sonn.*) Cv. Dehradun Under Field Conditions of Jammu Province J&K 182311

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Abstract

Litchi *(Litchi chinenisi Sonn.)* an arillate fruit species possessed a unique structure compromising thin and leathery pericarp that enclosed the aril as its edible part, Fruit cracking is a serious physiological disorder in litchi that occurs in litchi coincides with a period characterised by high day temperature (35-40° C) and low relative humidity .Besides climatic effects abnormal development of skin during early fruit growth promotes the disorder.in this context experiment was carried out at three locations of district Reasi and auxins viz different concentrations (20,30 and 40 ppm) were sprayed on dates at farmers orchards on anthesis and pea stage respectively. Study revealed that different concentrations of NAA 40ppm has shown variation in effect on percentage of fruits carried to maturity. NAA controlled (7.75%) fruit cracking followed by 30ppm ppm(7.05%) significantly higher than control (14.91). Data revealed that 20ppm NAA concentration was at par and minimum fruit cracking (10.58%) was recorded significantly higher over control. .Number of days from fruit set to maturity indicated that NAA had a significant effect in reducing fruit cracking when compared to control.

Keywords: *Auxins , Litchi and Cracking,Maturity.*

Comparative Phytochemical Analysis and Antibacterial Efficacy of Two Species of *Artemisia* L.

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Abstract

Medicinal plants are known to play an important role in the lives of local people by providing easy remedies for several disorders. Many of these plants are not only used as herbal medicines but also as natural ingredients for the cosmetic industry (Joshi *et al*., 2016). Among the diversity of such medicinally important plants, *Artemisia* is one (Valecha *et al*.1994, Chanphen *et al*.1998). It is among the most important genera of family Asteraceae and is distributed worldwide mainly across the temperate zones of the Northern Himalayas. In the present study two species of *Artemisia* namely *Artemisia maritima* L. and *Artemisia nilagirica* (C.B.Clarke) Pamp. forming populations in Jammu province of J&K state, India were screened for various phytochemicals and for their antioxidant and antimicrobial properties. The extracts were subjected to various phytochemical tests which revealed the presence of various secondary metabolites. They were also tested against both Gram positive and Gram negative bacterial strains for their antibacterial activity. All the extracts showed good antibacterial activity. The presentation will elaborate on qualitative and quantitaive phytochemical analysis and biological activity of both the plants.

Keywords: *Artemisia*, phytochemical, medicinal, antibacterial, antioxidant.

Biodiversity and Abundance of Insect Community in Cultivated Land areas at Corbett City (Ramnagar), Uttarakhand

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Abstract

Insect diversity plays significant ecological function, and control of agriculture and natural resources. Insects plays crucial role in establizing ecosystems by influencing the relationship between flora and fauna. Insect diversity is essential for valuable services such as scavenger and pollination. Insects have immense capacity of adaptation to extreme environments than any other animal groups. They are always outfitted with very suitable defensive and attacking devices and are adapted to feed on a variety of resources. They have great aesthetic value and many species are much sought after because of their marvelous appearance. The immature and adult stages of butterflies depend entirely on plants and hence are economically and ecologically important. Ramnagar the gateway of Oldest National Park "Corbett" is located at foothills of Himalayan region and has an elevation of 345 meters. Due to its unique geographical location covered with mixed forests, it allured high insect diversity. However in recent years human migration and anthropogenic activities have augmented in this place. However as a result of inhabitants growth and rapid expansion of agriculture, urbanization, pollution and tourism the insect diversity is influenced with habitat degradation, species extinction, and a decline in the natural enemies of harmful pests. They are important pollinators of several wild and domesticated plant species and depletion of their population could adversely affect the regeneration of plants they pollinate. This study aimed on measuring the insect diversity, abundance and biomass of cultivated land of this area to effectively control their harmful aspects and Periodic record of climatic factors will be done which influences insect activity. The results show that Lepidoptera Order were the most dominant order in the Cultivated Land, followed by Orthoptera, Odonata, Hymenoptera and Mantodae. The rarest insect order were Diptera, Coleoptera and Hemiptera in the Ramnagar (Uttarakhand). This work is also focused on identifying the major pollinators for different crops, these efforts work towards the goal of insect diversity conservation in this particular site.

Keywords: Abundance, Biodiversity, Hymenoptera, Lepidoptera, Orthoptera, Terrestrial Ecosystem.

Effect of Row Spacing on Growth and Yield of Barley Varieties

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Abstract

A field experiment was conducted at Rajasthan College of Agriculture, MPUAT, Udaipur (Rajasthan) during *rabi* season of 2015-16 and 2016-17 to study the response of different varieties of barley (*Hordeum vulgare* L.) under varying row spacing. The experiment results revealed that 20 cm row spacing enhancing the growth parameters *viz.* plant population, plant height and number of tillers over 22.5 and 25 cm row spacing. Amongst different barley varieties, RD 2786 recorded maximum plant population at 15 days after sowing and plant height at harvest, but maximum number of tillers was found in BD 959. However, different barley varieties failed to observe significant difference in numbers of days taken to flowering and maturity. Sowing of crop at wider row spacing (25 cm) resulted in highest test weight which was statistically at par with row spacing of 22.5 cm. whereas, non significant difference found in number of grains ear^{-1} under different row spacing. Highest number of grains ear^{-1} was found in variety BH 959 but different varieties failed to record perceptible variation in test weight. Sowing of barley at 20 cm row spacing results in significantly higher grain and biological yield over 22.5 and 25 cm row spacing. Amongst different barley varieties, BH 959 recorded highest grain and biological yield followed by RD 2786. Highest net return and B-C ratio was obtained when barley sown at spacing of 20 cm as compared to 22.5 and 25 cm row spacing. In case of different varieties, BH 959 obtained highest net return and B-C ratio followed by RD 2786.

Keywords: row spacing, varieties, net return and B-C ratio

Impact of Vocational Training Programmes on Income of The Rural Youths of Hilly Areas of Jammu & Kashmir, India

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Abstract

Krishi Vigyan Kendra (KVK) imparts need-based and skill oriented training to increase the agricultural production and to create the employment for the rural youths. The rural youths not only required knowledge of the technologies but also skills in various agricultural and allied operations to increase their knowledge. The training programmes are designed to impart the latest knowledge to the farmers through work experience. The KVK provides the trainings not only in agriculture and allied vocations but also in other income-generating activities that increase the income of farm families. The present study was conducted in hilly district Reasi of Jammu and Kashmir which was selected purposively as the KVK is catering the needs of the farmers of the district.264 trained rural youths were selected for the study purpose. Impact analysis was done to find out the knowledge gained and increased income of the participants. Study revealed that vocational training programmes had a positive impact on the knowledge gained by the rural youths and there was increase in the income of the respondents after training. Rural youths responded that vocational trainings played an important role in developing their skills and also benefitted for their income generation.

Keywords: Vocational trainings, hilly areas, rural youths, knowledge.

Increase Microbial Enzyme Activity in soil through Conservation Tillage System

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Abstract

Zero tillage (ZT) and permanent bed (PB) systems are well-known management tools for reducing soil erosion and improving soil fertility. ZT and PB may improve the environmental and economic performance of organic farming over conventional tillage systems. Soil enzymes catalyze several biochemical reactions which result in the transformation of organic matter, and the release of inorganic nutrients for plant growth and nutrient cycling. Soil enzyme activities are useful biological soil quality indicators since they are operationally practical, very sensitive, integrative, easy to measure and more responsive to soil tillage and structure than other soil variables. There are several enzymes in soil, but those involved in hydrolases and the degradation of main litter components are used most often for evaluating soil quality. This paper evaluate the roles of soil enzymes such as acid and alkaline phosphatase and dehydrogenease , as well as the implications of their activities for soil sustaining the soil health.

Keywords: soil enzyme activity, phosphatase, dehydrogenease, organic matter, zero tillage and permanent bed.

Participatory Plant Breeding in Rajmash (*Phaseolus vulgaris* L.) with stability analysis under temperate conditions of Kashmir

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Abstract

Present investigation was undertaken during 2012-2014 to generate information on the farmers' perception and preferences about the variety, evaluation of the set of material at the farmers' field along with the farmers' variety as a check through participatory varietal selection. Based on PRA 54 genotypes belong to pole and bush types were selected. Trials were laid at various locations of the valley summing to a total of six mother trials with grand mother trial at the research station. The yield and yield attributing traits of all genotypes was taken on ten competitive plants of both grand mother and mother trial. The participatory varietal selection was carried out at farmers field through farm walk at pod development stage in order to assess the genotype through preferential scoring. The genotypes WB-83, WB-185, WB-195, WB- 966, WB-258 and SR-1 were selected and preferred by the farmers across locations. The genotypes were evaluated for stability analysis and show divergence across locations. The mean squares of all the traits were significant reflecting that the material was generally divergent. The pooled deviation was significant and the variance due to variety × environment was significant for various traits indicating that the variation in the performance of the genotypes is both unpredictable and predictable. Most of the genotypes were having higher mean than the average, b_i less than unity indicating that the varieties were more specifically adapted to the unfavourable environments than favourable ones. Some of the genotypes having higher mean yield, bi > 1 and S^2di tending to zero were specifically adapted to favourable environments. Out of the 54 genotypes 6 were selected by paired comparison through baby trial evaluation system. The genotypes were laid with the farmers' variety to make an easy comparison of the important yield and yield attributing traits. The comparison of the test varieties was made on the basis of same, more, less and compared to farmers' variety regarding various traits.

Keyword: Common Bean, PRA, PVS, Stability, Mother Trial, Baby Trial.

Effect of Feeding Fibrolytic Enzymes Treated Paddy Straw Based Complete Ration on Performance of Lambs

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Abstract

A growth trial of 90 days was conducted on 12 male Corriedale lambs lambs (3-4 months old, 9.25-11.00 kg) divided in two groups of six lambs in each group. A complete feed was prepared containing paddy straw 50 parts and concentrate mixture 50 parts on DM basis. Paddy straw as roughage was treated with fibrolytic enzyme mix (cellulase, amylase, protease, pectinase, β-gluconase, lipase, phytase, mannase and xylanase) @ 9 g/kg as per the invitro studies and was incorporated in complete feed, while complete feed without enzymes served as control. Weighed quantities of the respective rations were offered to animals individually every morning. Left over was quantified daily and discarded. Growth parameters viz. body weight and physical biometrics (body length, girth and height) was recorded before feeding and watering in the morning at fortnightly intervals. A standard protocol was adopted for metabolism trail, collection and preservation of feed, faeces and urine samples. The samples collected were analyzed for proximate composition, fibre fractions, calcium and phosphorus. The data was collected and analyzed statistically. During *in vivo* study, highly significant ($P<0.01$) improvement in periodical live weight, ADG and height were observed due to effect of supplementation of fibrolytic enzyme. The mean values of body length and chest girth showed non-significant differences. Intake of dry matter and organic matter revealed highly significant ($P<0.01$) effect of supplementation of enzyme mix in terms of g/d and % kg b. wt with non-significant ($P<0.05$) effect in terms of g/kg $W^{0.75}$. Regarding digestibility of dry matter, gross nutrients and various fibre fractions highly significant ($P<0.01$) effect of supplementation of enzyme mix on digestibility of DM, OM, CP, NFE, CF, NDF, ADF, HC and cellulose were observed. All the animals were found to be in positive nitrogen, calcium and phosphorus balances. Significantly ($P<0.01$) higher values of %DCP, %TDN, DDMI, DOMI, DCPI and TDNI were observed in feed additive supplemented group (T_1) in comparison with control (T_0). From the results of study undertaken it could be concluded that the utilization of paddy straw at 50 per cent level, in the complete feed supplemented with fibrolytic enzyme mix @ 9 g/kg level for growing lambs is a viable proposition.

Key words: Corriedale lambs, fibrolytic enzyme mix, Performance, Nutrient digestibility

Calf scour - an obstacle in successful dairying.

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Abstract

The success of any dairy enterprise and its future depends on the survival of the calf crop. Calf scour has been regarded as the most common cause of neonatal morbidity and mortality. Infectious agents i.e. *Rotavirus, Coronavirus, Salmonella species, Clostridium* species, enteropathogenic *Escherichia coli*, *Cryptosporidium* and *Coccidia* species are mostly attributed to calf scour. Other potent non-infectious causes of calf scour include herd size, unhygienic housing, colostrum deprivation, unprompt treatment of clinical cases, vaccination deprivation of the dam, and faulty management conditions. The diarrheic calves suffer from the electrolyte imbalance causing mortality of the calves. Holistic restraint of clinical diarrheic cases can be achieved through prompt fluid and antimicrobial administration, hygienic housing, adequate colostrum feeding and prepartum vaccination of the dam.

Key words: calf diarrhea, infectious agents, noninfectious agents.

Mitigating winter vagaries in dairy animals

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Abstract

Productivity of dairy animals gets compromised with adversity in thermo-neutral zone. Maintaining animals between lower and upper critical temperature of thermo-neutral zone optimizes production. Optimum health and production of dairy animal mandates adequate management. Acclimatization to cold stress thrusts on increase in voluntary food intake, rise in resting metabolic rate, augments metabolic capacity, increase in hair coat thickness, hair length and density, shivering and non-shivering thermogenesis accompanied with adrenal hormonal rush as cold exposure advances. Mitigation of cold stress can be achieved through increasing barn temperature, reducing humidity, ensuring better ventilation, bedding to protect from cold floor, lukewarm water for drinking purpose, hay and concentrate provision for more heat generation and energy balance, dry teats to protect from frostbite, heat lamps, calf jackets and warm blankets.

Key words: Cold, thermo-neutral zone, mitigation, dairy animals.

Effect of feeding fibrolytic enzyme treated paddy straw based complete diet on haemato-biochemical parameters in Corriedale Lambs

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Abstract

A growth trial of 90 days was conducted on 12 male Corriedale lambs of 3-4 months old, divided in two groups of six lambs in each group, to study the effect of feeding of paddy straw based complete feed without or with supplementation of fibrolytic enzyme mix. A complete feed was prepared containing paddy straw 50 parts and concentrate mixture 50 parts on DM basis supplemented with fibrolytic enzyme mix (cellulase, amylase, protease, pectinase, β-gluconase, lipase, phytase, mannase and xylanase) @ 9 g/kg as per the *in vitro* studies carried to arrive at optimum level of incorporation of enzyme mix to paddy straw based complete feed for efficient utilization in ruminant system, while complete feed without enzyme mix served as control. Regarding haemato-biochemical parameters of blood, Erythrocyte parameters (haemoglobin, PCV, RBC), Leucocyte parameters (WBC, lymphocytes, eiosinophill, monocyte, neutrophill count) and biochemical parameters (blood glucose, total serum protein, albumin, globulin, blood urea nitrogen, serum creatinine, cholesterol, triglycerides and serum enzymes (AKP,AST,ALT,CK) were well within the normal range. PCV, lymphocytes, eiosinophill, monocyte and serum enzymes had non-significant differences among the treatment groups. However, significant ($P<0.01$) improvement was observed in terms of haemoglobin, RBCs, WBCs, lymphocytes, neutrophills, blood glucose, total serum protein, albumin, globulin, blood urea nitrogen, serum creatinine, cholesterol and triglycerides among the treatment groups.

Keywords: Fibrolytic enzymes, haemato-biochemical parameters, Corriedale Lambs, paddy straw

Quantification Of Rumen Microflora and Fermentation Pattern in Sheep Fed Fibrolytic Enzymes Treated Paddy Straw Based Complete Feed

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Abstract

The study was undertaken to evaluate effect of feeding fibrolytic enzymes treated paddy straw based complete feed on rumen microbies, rumen enzymes and fermentation parameters. A feeding trail of 90 days was carried on twelve male Corriedale lambs (3-4 months old, 9.25-11.00 kg) divided in two groups of six lambs each, to study the effect of feeding a complete feed containing paddy straw 50 parts and concentrate mixture 50 parts on DM basis. Paddy straw as roughage was treated with fibrolytic enzyme mix (cellulase, amylase, protease, pectinase, β-gluconase, lipase, phytase, mannase and xylanase) @ 9 g/kg as per the invitro studies and was incorporated in complete feed, while complete feed without enzymes served as control. At the end of trail, rumen liquor samples were collected from the experimental lambs at 0, 2, 4, 8, and 12 h post feeding for rumen microbial quantification by real-time PCR and fermentation parameters along with rumen enzymes. The data were analyzed statistically.

The mean value for total bacterial and fibrolytic bacteria (*Fibrobacter succinogenes*), per ml rumen fluid were found significantly higher ($P<0.01$) in enzyme mix supplemented group than in unsupplemented group. But there was no significant effect of enzymes supplementation on methanogens. Mean values for total fungal count and total protozoal counts, were also found significantly ($P<0.01$) higher in enzyme mix supplemented animals than unsupplemented group. Enzyme mix supplementation significantly ($P<0.01$) increased the mean values of TVFA, total nitrogen and TCA-ppt.N, however nonsignificant difference was observed in terms of rumen pH, lactic acid concentration, rumen NH_3-N and NPN concentration between enzyme mix supplemented and unsupplemented group.

Keywords: Corriedale lambs, fibrolytic enzymes, rumen microbes, fermentation parameters.

An evolutionary drift assuring reproductive success: Case study in Fumaria indica (Hauskn.) Pugsley

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Abstract

Limited studies available on the pollination biology of weed species relying heavily on sexual reproduction indicate a shift in their breeding system from outbreeding to selfing particularly in invasive species. Benefits of selfing should be balanced by its cost at equilibrium that ultimately leads to evolution of selfing. Present study is based on a weed species that form recurrent natural populations on barren lands and fields in the area of study i.e. Jammu district of Jammu and Kashmir, India i.e. *Fumaria indica.* Based on floral morphology these species invests heavily in beautifully colored, nectar rich flowers with sticky pollen but achieves full seed set in absence of pollinators by following strict autogamy. Autogamy/selfing in these weed species seems to have evolved over a period of time to ensure reproductive assurance. Inspite of them being strictly autogamous and high fruit setter, seed set/fruit is low. Selfing seems strongly disadvantageous as the species undergoes ovule abortion, indicating prevalence of inbreeding depression. This shift in breeding system towards selfing ensures reproductive assurance in these species which ultimately makes them better colonizers albeit at the cost of low seed set because of inbreeding depression.

Keywords: Autogamy, ovule abortion, reproductive assurance, inbreeding depression.

Identification of resistant maize genotypes and their antibiotic effect on larvae of stem borer (*Chilo partellus*) under laboratory conditions

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Abstract

Spotted stem borer, *Chilo partellus* (Swinhoe) is the most important pest of maize in Kashmir and host plant resistance is an important component for controlling this pest under subsistence farming conditions. Therefore, a study was carried out to identify sources of resistance in various locally used genotypes maize for resistance and to determine antibiotic influence (mortality percentage) of identified resistant genotypes on larvae of stem borer in maize under laboratory conditions. Twenty four maize genotypes were screened against maize stem borer (*C. partellus)* and entire screening was based on Leaf Damage Score (LDS), dead heart formation and tunnel length. Among all the genotypes screened CM- 133 and CM-123 were highly resistant, KDM-895A, KDM-381A, KDM-362B and KDM-402 were found resistant. KDM-340A, KDM-361 and KDM-935A were highly susceptible and Basi-local was observed extremely susceptible. Larval mortality was observed highest in genotypes CM-133 and CM-123 as compared to KDM-895A, KDM-381, KDM-362B and KDM-402. However, least larval per cent mortality was observed in highly susceptible check Basi-local. Field screening and Per cent larval mortality in laborarory indicated that there is considerable diversity in maize genotypes for antibiosis component of resistance to *C. partellus*. Genotypes placed in different groups, and showing antibiosis to *C. partellus* can be used in resistance breeding programs to diversify the basis of resistance to this pest.

Keywords: *Chilo partellus*, Maize, Field screening, Percent larval mortality

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Screening of Onion Genotypes against Purple Blotch in Cold Arid Region of Ladakh.

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Abstract

An experiment was conducted to identify promising varieties of onion suited for cultivation under cold arid conditions of Leh, Ladakh. Five varieties were evaluated at High Mountain Arid Agriculture Research Institute Leh, Ladakh SKUAST-K during the year 2017. The study revealed that under natural epiphytotic conditions only one genotype i.e., red coral exhibited resistant reaction. Local genotype of Ladakh showed moderately resistant reaction. Three genotypes, viz., yellow globe, brown Spanish and liberty were moderately susceptible to purple blotch of onion.

Keywords: Purple blotch, genotypes, resistant, screening, onion.

Disease modifying activity of methanolic extract of *Colchicum luteum* against experimental gout in broiler chicken.

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Abstract

Colchicum luteum, a Himalayan herb has been found associated with the immense pharmaceutical properties. The present study was aimed to study the protective effect of methanolic extract of *Colchicum luteum* against the hemato-biochemical alterations due sodium bicarbonate induced gout in broiler chicken. For this purpose, a total of 72 day old broiler chicks were divided into 6 groups (I to VI, *n*12). Group I served as vehicle-treated control and was given drinking water by oral gavage. Group II and III were given Sodium Bicarbonate @ 2.5% and 5% respectively in drinking water. Group IV and V were provided with 2.5% and 5% Sodium Bicarbonate along with *Colchicum luteum* extract @ 50mg/kg body weight respectively. Group VI served as treatment control and was given *Colchicum luteum* extract @ 50mg/kg body weight alone. Hematological and biochemical analysis revealed a significant increase in hematological parameters (Hb, PCV, TEC, TLC and Heterophil) and biochemical parameters (AST, ALT, Uric acid, BUN, Creatinine, Total protein and Albumin) in Sodium bicarbonate intoxicated groups. All these parameters however, were comparatively reduced in the birds given *Colchicum luteum* extract. Also heterophil and monocyte counts were decreased significantly in group VI birds, supplemented with *Colchicum luteum* extract only with no adverse effect on health of birds. The data from the present study establish the protective role of CLE against Sodium bicarbonate induced hematological and biochemical alterations.

Keywords: Gout, Sodium bicarbonate, *Colchicum luteum*, hematology, biochemical analysis.

Sex Expression and Phenology of *Zanthoxylum Armatum*: An Important Medicinal Plant

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Abstract

Zanthoxylum armatum, commonly called as Timur or toothache tree is an important medicinal plant as its various plant parts are used as a source of pharmaceutical and cosmetic raw material. Fruits of the species in particular are highly priced as spice. The plant forms natural strands in some regions of Jammu, J&K state (India). It is found to be dioecious in all the populations studied. While the sex expression and events of floral phenology were uniform across different populations studied, in two of the populations i.e. Dhanaal of district Udhampur and Sukrala of district Kathua, an altered sex expression (in the form of andromonoecious individuals) was also found. The plants are apparent males which bear some hermaphrodite flowers co-occuring with the male flowers in the same inflorescence i.e. panicle. Present paper will emphasize on the morphological and phenological differences between the andromonoecious plants and that of the male and the female plants.

Keywords: *Zanthoxylum*, sex expression, phenology, inflorescence, hermaphrodite

Scenario of insect pests under changing climatic situations

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Abstract

Climate change refers to a change of climate that is attributed directly or indirectly by human activity that alters the composition of the global atmosphere and climate variability observed over comparable time period. Over past hundred years, the global temperature has increased by 0.80 °C and is expected to reach 1.1-5.4 ^{0}C by the end of next century. On the other hand, CO_2 concentration in the atmosphere has increased drastically from 280 ppm to 370 ppm and is likely to be doubled in 2100 This change is attributed mainly to the overexploitation and misuse of natural resources for various anthropogenic developmental activities such as increased urbanization, deforestation and industrialization resulting in aberrant weather events like changes in rainfall patterns, frequent droughts and floods, increased intensity and frequency of heat and cold waves Climate change has been found to bring a number of changes in the insect phenology, distribution, species interactions, biodiversity (Menendez, 2007). Other effects caused by climate change on insects include increase in number of generations, changes in crop pest synchrony, increased over wintering, invasion by migrants, decreasing effectiveness of pest management strategies The impact of climate change can be positive, negative or neutral, since these changes can decrease, increase or have no impact on insect pests, depending on specific location of each region or period. Temperature affects the larval developmental time, larval survival and adult reproduction depending on the combination of mean temperature and magnitude of fluctuations (Carrington *et al* 2013). Elevated CO_2 concentration increases carbon content, decreases nitogen content, widens C:N ratio in plants, increase developmental time, decrease survival rate and fecundity in insects. Therefore, there is a need to generate information on the likely effects of climate change on insect pests to develop robust technologies that will be effective in future under global warming and climate change.

Key words: Climate change, Insects, Temperature, CO_2 Concentration, Plants.

Elicitation of fenugreek (*Trigonella foenum-graecum*) sprouts using phenolic elicitors for improving their bioactive potential for better management of diabetes

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Abstract

Plant Secondary metabolites are being recognized as excellent anti-hyperglycemic agents and can be increased in plants by different food based elicitor treatments. Therefore, enhancing such bioactive constituents in plants and determining their antidiabetic mechanism of action under *in vitro* and *in vivo* conditions is a need of hour. The prime objective of this research was to improve the phenolic-linked antioxidant and anti-diabetic properties of fenugreek sprouts through elicited sprouting and inter-relate these findings with their metabolite profile.In the current study, vitamin C, folic acid and lactoferrin were used as natural phenolic elicitors in germinating fenugreek sprouts. The genotype showing the maximum increase in phenolic compounds and antidiabetic potential under *in vitro* conditions was selected and revalidated for its antidiabetic potential under *in vivo* conditions.The current Investigation revealed thatt vitamin C treatment elicited the maximum phenol content as well as anti hyperglycaemic activity via inhibiting **α**-amylase, **α-** glucosidase and invertase activities under *in vitro* conditions. Further, diosgenin and trigonelline content of elicited sprouts was found to decrease as germination proceeds and ranged between 0.130% to 0.050 %(w/w) and 0.387% to 0.083 % (w/w), respectively. In contrast to this, highest quercetin content was observed in the elicited sprouts on 4th day of germination, and ranged between 0.1375% to 0.000247 % (w/w) correlating to high phenolics and antioxidant activity. A direct correlation was also found between increase in quercetin content and hypoglycemic activity, thereby, providing a strong evidence for confirmation of phenolic enriched fenugreek sprouts as antidiabetic remedy under *invitro* conditions. Under *in vivo* conditions, the effect of aqueous sprout extract on various biochemical markers showed encouraging results in streptozotocin-induced diabetic rats. Additionally, combination therapy of aqueous extract (300mg/kg bw) with voglibiose (1mg/kg bw) demonstrated synergistic anti-hyperglycemic effect. Our findings clearly reveal that the phenolic enriched fenugreek sprouts alone or in combination can be used as potential candidate for diabetes management. The present study clearly reveals the interrelationship between the metabolite profile and the possible antidiabetic mechanism of action of Vitamin C elicited fenugreek sprouts for their use as an economical antidiabetic agent.

Keywords: Diosgenin, Quercetin, Trigonelline, Diabetes, Antioxidant

Studies on breeding and meiotic sytems of two sexually receding *Artemisia* L. species.

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Abstract

Genus *Artemisia,* with Central Asia as its centre of origin and diversification, is represented by about 500 species worldwide. It is a genus with high economic value, being used medicinally throughout the world in Europe, in Middle East Countries, Afghanistan, Pakistan, India, China, Korea etc. Youyou Tu from China shared the Noble Prize 2015 in Physiology and Medicine for her work on Artemisinin – an antimalarial drug extracted from species of *Artemisia.* Other range of biological activities of this taxa includes being cytotoxic, antihepatotoxic, antibacterial, antifungal and antioxidant.

Present study has its focus on genetic system of 2 species of *Artemisia* namely *A. vestita* Wall. and *Artemisia glauca* Pall. ex Willd. *Artemisia vestita* Wall., a traditional Tibetan medicine, has wide clinical application for inflammatory diseases. Hispidulin, an active component from this species suppresses the angiogenesis and growth of human pancreatic cancer (He *et al*.,2010). Whereas *A. glauca* has its usage as a spice, flavouring for salads and in manufacture of tarragon vinegar. More than 60 oil components consisting of 99.0 - 99.7% of the total volatile components have been identified in it. These species are seen growing on the lower reaches of Pir Panjal mountain ranges, Kishtwar Himalayas and Kashmir Himalayas. Both the species investigated propagate through perennial root stock. They have varied sex expressions which is gynomonoecy in *A. vestita* and functional monoecy in *A. glauca.* While *A. vestita* is stable cytologically, 4 populations of *A. glauca* investigated presently depict the occurrence of distinct chromosome races. Though some cytological and biochemical data is available for these species, they stands neglected for their reproductive details which are crucial for cultivation as well as conservation. Presentation will elaborate on the details of these observations.

Keywords: *Artemisia,* anti-inflammatory, hispidulin, genetic system

Cultivation escapes in Urban Green Spaces: a case study of Srinagar city in Kashmir Himalaya

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Abstract

Cities provide an ideal natural experimental system to study the patterns of alien plant diversity, which can offer novel insights in understanding and managing the plant naturalisation in urban landscapes. Cultivated alien plants have been widely known to escape from cultivation and establish sustainable populations, therefore having far-reaching ecological and economic consequences. In this context, this study aimed to unravel the taxonomic, biogeographic and ecological patterns of cultivation escapes in alien flora of Srinagar city – one of the largest urban centres in the entire Himalayan region. A total of 61 plant species corresponding to 27 families were reported to have escaped into wild in the Urban Green Spaces (UGS) in Srinagar city. Besides this, there were 136 non-escapes which belong to 56 families. Among the escapes, Asteraceae (12 species) was the largest family in terms of number. In terms of habitat, plant dumping sites in the UGS constituted the most dominant habitat for cultivation escapes. Furthermore, abundance of the escapes in PGS showed a significant correlation with residence time. The comparison of the proportion of aliens under cultivation (escapes and non-escapes) in terms of native distribution range did not reveal any significant variation. However, comparison in terms of growth form revealed that the species with herbaceous growth form (47.1%) have largely escaped from cultivation. In terms of life span, plants with annual life span showed high rates of escape from cultivation (60.8%) compared to species with biennial and perennial life span which displayed 33.3% and 20.9% escape rates respectively. Furthermore with an increase in residence time of plant species, the percentage of escapes increased. Out of total aliens under cultivation, 56.2 % of species with residence time between 51 to 60 years. At the other extreme only 10.2 % of species with residence time 1 to 10 years had escaped from cultivation. The study emphasizes the ecological management of plant cultivation escapes and provides policy-relevant insights regarding naturalisation and spread of cultivation escapes in Srinagar city, which can facilitate the scientifically-informed decision making and management of plant invasions in the region.

Short term low temperature stress elicits changes in osmolyte accumulation, antioxidant gene expression and trehalose metabolism in Cold Tolerant maize (*Zea mays* L.) from Kashmir Himalaya

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Abstract

The present study reports the response of low temperature tolerant maize (*Zea mays* L.) genotype from Kashmir Himalayan region subjected to short term low temperature stress (6 ℃). The seeds were sown and allowed to grow at 24±2 ℃, 70% humidity and 16h light/8h dark photoperiod. After two weeks growth, at three-leaf seedling stage, plants were subjected to short-term LT stress for 12h and the samples harvested after every 2h interval were processed for various assays. We observed that LT stress enhanced production of stress markers like H_2O_2 and MDA (Malondialdehyde) and also modulated transcript profiles of antioxidant enzymes. Moreover, plants survive low temperatures by fine adjustments of vital osmoprotectants like trehalose, proline, soluble sugars, glycine betaine, phenolics and protein, besides altering plant pigment composition like anthocyanin, total cholorophyll and carotenoids. Relative gene expression using qRT-PCR of some selected antioxidant enzymes including ascorbate peroxidase (APX), monodehydroascorbate reductase (MDHAR), dehydroascorbate reductase (DHAR), glutathione reductase (GR), superoxide dismutase (SOD), peroxidase (POD) and catalase (CAT) revealed that significant changes occur in the transcripts levels of these antioxidant enzymes in response to LT stress. The present study also revealed that enzymes trehalose-6- phosphate synthetase (TPS) and trehalose-6-phosphate phosphatase (TPP) involved in trehalose biosynthesis show differential expression pattern in response to LT stress in maize. Hence, robust osmolyte accumulation and elevated antioxidant gene expression help the plant to survive in low temperatures, though elaborated mechanisms need to be unravelled further for better understanding of low temperature acclimation.

Keywords: Low temperature, maize, osmolyte, q RT-PCR, trehalose

Molecular Markers Based Identification of Fertility Restoring Genes in Rice

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Abstract

Rice is globally the most important food crop. About half of the world's population and two third of Indians depend on rice for their survival. Being the main staple food of Kashmir valley, the major focus of plant breeders in the state is on enhancement of yield to meet the food requirements of ever increasing population. Exploitation of heterosis in the form of hybrid rice technology can serve as the major approach to increase the productivity of this crop. Identification of elite fertility restorers has been the major limiting factor for hybrid development in Kashmir valley. Molecular marker based identification of R*f*3 and R*f*4 fertility restoration genes can enhance the selection of restorer lines. In the present study, 38 breeding lines were screened with the help of molecular markers linked to R*f*3 and R*f*4 genes. The SSR marker RM6100 linked to R*f*4 gene on chromosome 10 and DDRM-RF3-10, RM1 and RM3148 markers linked to R*f*3 gene on chromosome 1 were used for identification of restorer lines. SKUA-494, PS-3, RL-2, RL-5, RL-6, RL-7, RL-8, RL-9, RL-10, RL-11 and RL-14 lines revealed the presence of both R*f*3 and R*f*4 genes. These lines can serve as potential restorers for obtaining heterotic rice hybrids. Moreover, the markers used can serve as a useful tools for screening large number of breeding lines to know their fertility restoration behaviour in a short period of time.

Keywords: Hybrid rice, Restorer lines, R*f*3, R*f*4, Molecular markers

Taxonomic identification and biological attributes of Apple leaf roller, *Rhopobota naevana* (Hubner) Lepidoptera: Tortricidae

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Abstract

During survey of apple orchards in Kashmir valley, the terminals of current season twigs were found severely skeletonised by larvae of a lepidopteran moth. These larvae were collected from the field, brought to laboratory and reared at an ambient temperature (25 ± 5°C) and relative humidity (70 ± 5%) and adult after emergence has been taxonomically identified as Blackheaded fireworm; *Rhopobota naevana* (Hubner) belonging to tribe Eucosimini of family Tortricidae. The studies on biological attributes and number of larval instars of *Rhopobota naevana* (Hubner) revealed that incubation period ranged from 3.78-4.59 days in different generations. Total larval development period ranged from 18.94-22.17 days in different generations, while as pupal period on an average lasted for 8.41±1.21 days. Male and female showed an average longevity of 5.41±0.73 and 7.22±0.80 days respectively and fecundity per female ranged from 66.12-92.50 eggs in different generations. Thus whole life cycle completed in 38.29 - 47.80 days in different generations. Results also emphasised that development took place through holometamorphosis and close proximity between the mean, observed and calculated widths of head capsule and increase in widths of head capsules of different larval instars categorised them into five well defined instars. The mean geometric growth ratio of 1.54 using the head capsule width in successive larval instars as a parameter was obtained and it conformed well to Dyar's law

Keywords: Apple, Dyer's law, Kashmir, Larvae, Pest, Tortricid Moth.

Evaluation of variability for yield traits in Common bean (*Phaseolus vulgaris* L.)

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Abstract

Common bean (*Phaseolus vulgaris* L.) is considered to be one of the most important species in Fabaceae (Leguminosae) family cultivated widely in tropical, semitropical and temperate regions of the world (Liebenberg, 2000). However, the average productivity of the crop in developed countries (1,944 kg/ha) far exceeds to that of developing countries (1,035 kg/ha) making the situation more drastic in least developed areas (Gepts *et al*., 2008). In India, the crop is considered as major commercial grain legume where the germplasm grown in Himalayan region is known for its high quality and flavor and considered to be the most diverse in terms of grain morphology and agro-ecological adaptation (Zargar *et al*., 2014). In this regard, we have collected one hundred and thirty-five common bean genotypes from fifteen different regions of northern India and grown in field using randomized block design for the two consecutive years. The genotypes were evaluated morphologically for various characters namely days to bud initiation, days to 50% flowering, days to fruiting, pod length, pod width, pods/plant, seeds/plant, 100 seed weight and seed yield/plant. Observations were recorded from three tagged plants of each block in all the replications and their average mean were worked out for statistical analysis. Highly significant differences among the genotypes for all the traits and considerably high values for genetic variability parameters such as heritability, genetic advance and genetic gain for 100 seed weight and seeds/plant traits were observed. Heritability was high for the traits which is a desired characteristic that suggest direct selection of lines for improvement. Overall a substantial amount of divergence indicated considerable scope for improvement of the aforementioned characters in the common bean germplasm. The lines with desirable traits such as early maturity and high yield can be used for the purpose of enhancement of yield performance. These lines may also be used for the development of biparental populations and in back cross breeding programs leading to reduction of yield limiting factors and enhancement of the nutritional potential of the crop with high agronomic merit for alleviating hidden hunger with little recurring costs. Improved bean cultivars can be developed by utilizing genetic variability among the germplasm cultivated all across the world.

Keywords: Common bean, yield traits, divergence, heritability

Histopathological Alterations in Adrenal Gland in Various Concurrent Infections of Poultry of Kashmir Valley.

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Abstract

The present study was undertaken to evaluate the adrenal gland affections in various concurrent infections of Poultry of Kashmir Valley. The birds belonged to various poultry farms in Srinagar and Ganderbal districts of Kashmir valley (Jammu and Kashmir, India). A total of 82 disease outbreaks were recorded over a period of one year out of which 2 outbreaks of concurrent infections of Colibacillosis and caecal coccidiosis and concurrent infections of Colibacillosis and Infectious Bursal Disease were noted. On post mortem examination the adrenal glands were properly collected from the carcasses of the birds and preserved in 10% neutral buffered formalin for fixation. The tissue samples were processed for routine paraffin embedding technique and 5 micron thin tissue sections were stained with Haris' Haematoxylin and Eosin. On histopathological examination, severe vascular congestion of the adrenal gland was evident in both the outbreaks while as vacuolation of both the interrenal and medullary cells was visible in case of concurrent infections of Colibacillosis and caecal Coccidiosis.

Keywords: Adrenal gland, Colibacillosis, Congestion, Histopathology

Characterization of antibiotic resistant *Staphylococcus aureus* molecular types associated with community and food of animal origin in Ludhiana, Punjab

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Abstract

Four Hundred and Thirty one *Staphylococcus aureus* isolates from community, meat, milk were used for the molecular characterization and typing. Antibiotic susceptibility testing was performed. Isolates were resistant to penicillin, erythromycin, ciprofloxacin, clindamycin, tetracycline, oxacillin, gentamicin, trimethoprim - sulfamethoxazole (TSH) and chloramphenicol. Out of the 431 isolates, 104 Multidrug resistant isolates were categorized into 6 groups based on *spa* gene band size followed by selection of 51 representative isolates from those groups on the basis of their source and antibiotic resistance profile for *spa* typing. Typing revealed 12 *spa* types; t442, t13078, t3473, t693, t4678, t005, t127, t037, t2958, t008, t091, t7867 [t442, t13078, t3473, t693, t005, t4678 associated with community environment (faucet, butcher hand swab, telephone, door handle, door lock); *spa* types t442, t005 and t127 with meat (chicken, chevon and pork); *spa* type t037, t127, t2958, t008, t091, t005, t7867 with milk]. To our knowledge, *spa* type's t3473, t693, t2958, t4678 and t13078 were reported for the first time in India. *spa* type t442 from chicken and chevon and t127 from pork were reported for the first time in India. Our results demonstrated presence of MDR, MRSA and MSSA in community settings and in food of animal origin indicating food of animal origin and community environment acting as reservoirs of *S. aureus* isolates with threat of possible transmission from food of animal origin to humans and vice-versa, representing a threat to public health and a potential serious therapeutic challenge.

Keywords: *S. aureus*, Antibiotic resistance, MSSA, MRSA, *spa* types.

Effect of Fertility Levels, Biofertilizers and Organic Manure on Nutrient uptake by Sorghum Fodder and Its Residual Effect on Barley

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Abstract

A field experiment was conducted on clay loam soil at Instructional Farm, Rajasthan College of Agriculture, Udaipur during two consecutive *kharif* season of 2014 & 2015 and *rabi* seasons of 2014-15 & 2015-16. The objectives were to assess effect of fertility levels, biofertilizer and organic manure on yield of fodder sorghum and to evaluate the residual effect of these on succeeding barley crop. Application of 100 % RDF to fodder sorghum registered highest N, P, K uptake by dry fodder which was significantly higher over lower fertility levels. The magnitude of increases in N, P and K uptake was to the tune of 11.1, 13.5, 8.3 per cent over 75 % RDF and 27.7, 29.3, 18.8 per cent over 50 % RDF, respectively. The crop inoculated with *Azotobacter* + PSB accumulated higher quantum of N, P and K by dry fodder as compared to inoculation of PSB and *Azotobacter* alone. Application of vermicompost to sorghum registered highest N,P,K and its uptake by dry fodder over no manure. Crop under residual effect of 100% RDF also accumulated highest quantum N, P and K in dry fodder. The barley crop accumulated highest quantum of N, P and K in dry fodder.

Keywords: Nutrient uptake, sorghum, barley, residual effect, fertility levels, biofertilizer, organic manure

An overview of National Food Security Mission in Jammu and Kashmir

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Abstract

The National food Security Mission (NFSM) was launched in 2007-08 by the Ministry of Agriculture, Government of India, with the purpose of enhancing the production of rice, wheat and pulses by 10, 8 and 2 million tonnes, respectively by the end of the Eleventh Plan (2011-12). The major objective of this scheme is to increase production and productivity of wheat, rice and pulses on a sustainable basis so as to ensure food security of the country. Accordingly, like other States in India, NFSM-rice was launched in Jammu and Kashmir (J&K) in 2011-12 in eight districts, NFSM-wheat in 2012-13 in eight districts and coarse cereals and pulses in 2014-15 covering all the districts of the state. The objectives of the scheme were- i) Increasing production of rice through increase in area and productivity ii) Restoring soil fertility and productivity at individual farm level iii) Enhancing farm level economy to restore confidence among the farmers and iv) Creation of employment opportunities. Mission would adopt following strategies: i. Focus on low productivity and high potential districts including cultivation of food grain crops in rain fed areas. ii. Implementation of cropping system centric interventions in a Mission mode approach through active engagement of all the stakeholders at various levels. iii. Agro-climatic zone wise planning and cluster approach for crop productivity enhancement. v. Focus on pulse production through utilization of rice fallow, rice bunds and intercropping of pulses with coarse cereals, oilseeds and commercial crops (sugarcane, cotton, jute). vi. Promotion and extension of improved technologies i.e., seed, integrated nutrient management (INM) including micronutrients, soil amendments, integrated pest. According to the guidelines of NFSM, there are seven interventions which are provided under the scheme by Ministry of Agriculture (MOA), Government of India (GOI) for the beneficiary farmer's and these are: demonstration, supply of seeds of improved varieties (HYVs/Hybrid), distribution of micro-nutrients, liming material and gypsum, plant protection measures (plant protection chemicals), supply of farm implements, supply of irrigation devices and participation in Farmers' Field School. Same interventions were also provided by Department of Agriculture in Jammu and Kashmir under NFSM programme. Studies revealed that seed of improved rice varieties, demonstration, irrigation devices, micro-nutrient (ZnSO4), farm implements, plant protection chemical (Butachlor) and Farmers Field School were provided to the farmers in J&K state.

Keywords: NFSM; Productivity; Interventions; Farmers' Field School

Wheat (*Triticum aestivum* L.) Germplasm Characterization for Nutritional, Yield and Yield Contributing Traits

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Abstract

The present study was undertaken to evaluate a set of sixty three diverse bread wheat lines for nutritional traits like grain Fe and Zn content at research farm of the Division of Genetics and Plant Breeding, Faculty of Agriculture (FoA), SKUAST-Kashmir, Wadura. The germplasm was procured from Borlaug Institute for South Asia (BISA), Ludhiana/Indian Institute of Wheat and Barley Research (IIWBR) Haryana/Indian Institute of Wheat and Barley Research, Regional station, Shimla/three lines (SW1, SW2 and HS 240) used as check from SKUAST-K. The whole set of wheat lines was also evaluated for yield and yield contributing traits like days to flowering, days-to maturity, plant height, number of tillers per plant, spike length, number of spikelets per spike, number of grains per spike, 1000 grain weight and grain yield. The lines were also subjected to molecular characterization using 21 random and 12 gene specific (linked to QTLs/genes for seed Zn and seed Fe SSR markers. The marker data was used for the study of genetic diversity, allelic diversity, cluster analysis, dendrogram construction, PCA, genetic dissimilarity matrix etc. The results of trait evaluation showed significant variation for all the traits recorded like the concentration of grain Fe varied from 28.9 to 67.4 ppm with an average value of 39.18 ppm and grain Zn from 26.3 to 56.6 ppm with an average value of 38.29 ppm. The days to maturity ranged from 210 to 245 days with an average value of 227.43 days. The grain yield ranged from 2120 kg/ha to 4950 kg/ha with an average value of 4143.13 kg/ha. Suitable lines based on trait data and genetic diversity were selected for crossing program to develop multiple mapping populations for nutritional traits combined with earliness, higher yield, and disease resistance. The F_1 seeds were grown in pots in poly-house in the off- season to develop into F_2 seeds which in turn were sown in the main season in field to develop into F_2 mapping populations.

Key words: Bread wheat; phenotyping, grain zinc and iron; SSRs, molecular characterization, mapping population.

Who Cares about Ethics of Organized Animal Farming?

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Abstract

It is strange that in the Indian subcontinent, the debate on ethics, costs and sustainability of factory farming of animals has hardly made a presence in the sense great modern philosophers, environmentalists and biologists have been participating in the debate. I wish to question this absence wedded to ignorance or complicity or complacence of major stake holders including the veterinary professionals. Given it has been established beyond any doubt that livestock industry has been a significant source of pollution and stressful to environment in multiple ways and ethics has been generally relegated to background and we find animals denied fulfillment of natural instincts, right of freedom, right to painless life, right to bask in the sun and enjoy normal rhythms of life, it is extremely urgent to revisit the current scenario and call for a critique of factory farming in Indian subcontinent in general and J & K in particular. As such it is attempted to present review current apathy towards right/ethics based perspective and call for informed debate amongst the veterinary professionals to help evolve policy interventions at various levels to redress the issues.

Keywords Organized farming, ethics, animal rights, environmentalism

Recent Advances in Packaging and Edible Coating for Shelf Life Enhancement in Fruit Crops

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Abstract

In today's competitive world, packaging and edible coating play a crucial role in creating value added consumer friendly products for marketing. Packaging is a mean or system by which a fresh produce or processed product will reach from the production centre to ultimate consumer in safe & sound condition at an affordable price. Packaging materials includes: moisture resistant materials Polythene films, Polyester films, Polyvinyl films, Aluminium foils, Laminations, Cellulose film (coated), Rubber hydrochloride, Cellulose acetate, Glass containers, CFB boxes pallet, pallet bins, Wire-Bound Crates etc. Term edible coating is the application of thin layers of edible materials applied onto food surface. The edible coatings are mainly divided into three classes, Hydrocolloids (polysaccharides, proteins and alginate), Lipids (fatty acids, acryl glycerides and waxes), Composite (protein/protein, polysaccharides/ protein, lipid/polysaccharides). By these two means the shelf life of fruits are enhanced by improving the mechanical strength or handling of fruits. This technological strategies are helpful to retard the changes in gases, moisture content, volatile aromas, and transport of solutes from the fruits. In the horticultural sector of the world, India is the largest producer of fruits (46 million tones) with a global share of over 10%. Inspite of all these achievements, about 20 to 30% of the produce is lost annually due to lack of adequate infrastructure and less use of modern post harvest technologies. Fresh fruits produce has limited shelf life ranging from a few hours to few weeks at ambient conditions. Packaging and edible coating is required not only for fruits preservation and protection but also for safe transportation of products during storage, handling and export.

Keywords: Packaging, edible coating, shelf life enhancement, storage, export

An inventory of Macrophytic diversity of Hokersar wetland-A Ramsar site (Kashmir Himalaya)

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Abstract

Macrophytes play an important role in structuring communities in aqautic environment. As producers, aqautic and marshy angiospermic plants are most important component in aquatic and wetland ecosystems. Keeping in view the immense importance of these plants, the present study provides an updated inventory of aquatic macrophytes of Hokersar wetland, a Ramsar site, situated in Jammu and Kashmir state. The study is based on field surveys that were carried out from March 2017 to March 2018. The study recorded a total of 65 species of aquatic flora from the wetland, which includes both aquatic and semi-aquatic plants. These species belong to 44 genera in 26 families, and of the latter, 14 families belong to dicotyledons, 10 families belong to monocotyledons and 2 families belong to pteridophytes. Out of 65 species, 35 species belong to monocots, 26 species belong to dicots and only 4 species belong to pteridophytes. The species of family Cyperaceae exhibit their dominance followed by Poaceae, Potamogetonaceae and Typhaceae with 8, 7, 4 and 4 species, respectively. The aquatic plants belong to different growth forms which include: Semi aquatic, submerged, emergents, floating, free floating, floating/emergent, emergent/submerged, mesophytes and amphibious. During the field surveys, *Nasturtium microphyllum* Rchb. was found to be new record for Jammu and Kashmir. Looking ahead, such an inventory of aqautic macrophytes will prove pivotal in scientific and sustainable management of this wetland in future.

Keywords: Macrophytes; diversity; wetland; Kashmir Himalaya; management

In-Vitro Interactions of *Trichoderma* Species and *Pleurotus Sajor-Caju.*

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Abstract

Oyster mushroom (*Pleurotus sajor-caju*), having excellent flavour and taste is found abundantly in Kashmir. *Pleurotus* spp. can be easily cultivated on different agrowastes, which do not need composting. This crop often suffers losses due to many fungal diseases. One of the fungal mycoparasite, *Trichoderma* spp, the cause of Green mold, was observed in the samples collected from Mushroom Research Training Centre (M.R.T.C) in Kashmir valley. The pathogenicity proved in accordance with the Koch's postulates both *in vitro*. The symptoms included the browning of caps and curling of margins of pileus part of mushroom. The fruiting bodies often dry and get shrinked as well. Some fruiting bodies show the symptoms of wateriness also. The *invitro* interaction between *Trichoderma* spp. and *Pleurotus sajor-caju* on PDA and MEA was performed. Maximum inhibition of *P. sajor-caju* was expressed by *T. viride* followed by *T. harzianum* and then by *T. pseudokoninjii*. All the three species of *Trichoderma* overlap the *P. sajor-caju* mycelium. No zone of inhibition was produced by any of the *Trichoderma* spp. on both media. Amylase production test of *Trichoderma* spp., *Pleurotus sajor-caju*, and *Pleurotus ostreatus* was observed negative as no zone of clearance was observed on starch agar medium. Trybutyrin hydrolysis test of *Trichoderma* spp., *Pleurotus sajor-caju* and *Pleurotus ostreatus* was positive. A transparent zone of clearance was observed on Trybutyrin agar medium.

Keywords: Composting, Mycoparasite, Pathogenicity, Browning, Fruiting bodies

Comparative Study on the effect of Immunosuppressive Diseases on the Concentration of Zinc in Lymphoid Organs of Broiler Chicken

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Abstract

The present study was conceded to evaluate the zinc concentration of lymphoid organs of broiler chicken in commonly encountered immunosuppressive diseases like Infectious Bursal Disease, Newcastle Disease, Colibacillosis and concurrent infections of IBD-ND and IBD-Coccidiosis. A total of 500 broiler chickens from each outbreak were examined, which included the diseased and dead broiler chicken. The birds examined belonged to different age groups and were assigned the group number as per the age. The outbreaks which occurred in the age groups of 18, 21, 23, 25 and 27 were selected. From each age group, for every disease, representative samples of lymphoid organs from 10 birds were collected for zinc estimation and compared with those of 10 normal birds of the same age group, having no observable gross lesions. The samples of Bursa of Fabricius, Thymus, Spleen and Caecal tonsils were analysed using Atomic Absorption Spectrophotometer (Model 4141). A positive correlation was observed between the age group and concentration of zinc in the lymphoid organs of normal broiler chicken. However, in the diseased birds the mean level of zinc in lymphoid organs of the affected birds were found increased and differ significantly ($P<0.05$) from the uninfected controls.

Keywords*:* Atomic Absorption Spectrophotometer, Broiler chickens, Immunosuppressive diseases, lymphoid organs, Zinc.

Genetic diversity of *Clostridium perfringens* Type D isolates from sheep and goats in Kashmir

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Abstract

Clostridium perfringens (*C. perfringens*), especially Type D isolates are associated with enterotoxaemia, which causes heavy economic losses. In the present study, 462 faecal samples comprising 376 (diarrhoeic-192; healthy-184) from sheep and 86 (diarrhoeic-47; healthy-39) were examined for isolation of *C. perfringens*. The isolates of *C. perfringens* were finally identified by 16S rRNA gene specific PCR and they were subjected to toxin-typing by a multiplex PCR. The Type D isolates were further genotyped by pulsed field gel electrophoresis (PFGE) to determine their genetic diversity. Out of 462 samples, *C. perfringens* was isolated from 286 samples. Toxin-typing of 286 isolates revealed 228 (79.72%) as Type A, while 58 belonged to Type D. Among the Type A isolates 31 (13.6%) also carried enterotoxin gene (*cpe*) in addition to alpha toxin (*cpa*) gene. Out of 228 *C. perfringens* Type A, 61(26.7%) and 18 (7.8) isolates were obtained from healthy adult sheep and lambs and 46(20.1%) and 58(25.4%) isolates from adult sheep and lambs with diarrhoea, respectively. Similarly, 8(3.5%) and 12(5.2%) Type A isolates were recovered from healthy adult goats and kids and the diarrhoeic samples yielded 15(6.5%) and 10(4.3%) type A isolates, respectively. Out of 58 *C. perfringens* Type D, 2(3.4%) and 9(15.5%) isolates were obtained from healthy adult sheep and lambs respectively. Similarly, 5(8.6%) and 34(58.6%) isolates from adult sheep and lambs with diarrhoea, were typed as D, respectively. Likewise, 3(5.1%) Type D isolates of *C. perfringens* were recovered from healthy kids and no type D toxinotype was found in healthy adult goat. The diarrhoeic samples yielded 2(3.4%) and 3(5.1%) Type D isolates from adult goats and kids, respectively. None of the isolates belonged to Type B, C and E. Type D isolates were higher in dairrhoeic lambs. Among these 58 isolates, 47 (81.03%) isolates gave reproducible patterns in PFGE analysis and 29 different PFGE pulsotypes (patterns) were obtained. Eleven (18.96%) isolates were found to be untypable by PFGE. Many isolates obtained from the animals of the same farm, revealed similar PFGE patterns. But in other cases, different pulsotypes were identified from the animals of the same farm also, although all the isolates produced an ~1,100-kb fragment in PFGE. Thus the difference between the banding patterns of these pulsotypes can be used as a tool in epidemiological studies.

Keywords: *Clostridium perfringens* Type D, sheep, goat, PFGE, Kashmir

Global Climate Change Issues Challenges: Fragmenting Intelligent Epistemology and Fury

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Abstract

Global warming, also referred to as climate change, is the observed century-scale rise in the average temperature of the Earth's climate system and its related effects. Multiple lines of scientific evidence show that the climate system is warming. Many of the observed changes since the 1950s are unprecedented in the instrumental temperature record, and in paleoclimate proxy records of climate change over thousands to millions of years. In 2013, the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report concluded, "It is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century." The largest human influence has been the emission of greenhouse gases such as carbon dioxide, methane, and nitrous oxide. In view of the dominant role of human activity in causing it, the phenomenon is sometimes called "anthropogenic global warming" or "anthropogenic climate change". Research has shown that the level of carbon dioxide (CO_2) released into the atmosphere has increased significantly since the beginning of the industrial era. Unless we do something to reduce the amount of CO_2 entering the atmosphere, the world will experience the effects of climate change. Long-term monitoring has shown that the increasing amount of CO_2 in the atmosphere due to human activity is causing the Earth to warm and the oceans to become more acidic. Combating climate change requires urgent action on the part of many. If we do not act now scientists predict that the temperature will continue to increase, causing the climate to change, sea levels to rise, and ocean and land environments to be adversely affected. The increase in global temperature is significantly altering our planet's climate, resulting in more extreme and unpredictable weather. For instance, heat waves are becoming more frequent and many places are experiencing record droughts followed by intense rainfalls.

Keywords: Climate change, Assessment, Environment, Temperature, Carbon dioxide, Global warming

Purchasing Intentions of Luxury Brands Among Indian Consumers

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Abstract

This paper studies the impact of *status consumption*, *susceptibility to interpersonal influences and fashion consciousness* on Indian consumers' purchase intentions. Previous research studies have called upon the need to understand the needs, preferences, and beliefs of Asian consumers towards luxury goods. However,there is now a growing need to have insights that shall enable luxury marketers to target the new consumer segments in India and highlight all the factors those make sense in shaping customer behaviour viz-a-viz luxury products.This will in turn help the luxury brand marketers to devise appropriate strategies to target luxury brand buyers in India. The paper, which is empirical in nature, employed a cross sectional survey methodology conducted among Indian luxury brand consumers. The sample comprising of 110 respondents consisted of luxury buyers living in Delhi the capital city of India.The results of the study showed that all the factors were significantly related to the purchasing of luxury brands. Amongst the three antecedents, fashion consciousness has the strongest influence on purchase intention for luxury brands. Weaker support for the role of status consumption and susceptibility to interpersonal influences was revealed. The findings of this study have highlighted relevant implications for marketers or business professionals operating in India.

Keywords: Purchase intentions, luxury brands, India, luxury consumption, antecedents

Effect of NPK fertilization on *Phytophthora* leaf blight and tuber yield of Bunda (*Calocasia esculenta var. esculenta*)

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Abstract

Bunda (*Calocasia esculenta var. esculenta*) is a tropical tuber crops for millians of people in developing countris. Leaf blight caused by *Phytophthora colocasiae* Rac. is the most destrictive of Bunda causing 25-50% losses in yield. The pathogen also caused serious post harvest decay of corn. Application of eight levels of nitrogen as Urea (0, 20, 40, 60, 80, 100, 120 and 140 kg/ha), phosphorus as single super phosphate (SSP) (0, 15, 30, 45, 60, 75, 90 and 105 kg/ha) and potassium as muriate of potash (MOP) (0, 20, 40, 60, 80, 100, 120 and 140 kg/ha) fertilizers on leaf blight of calocasia caused by *Phytophthora colocasiae* and yield of calocasia were studied on sandy loam soils of Bastar, Chhattisgarh in 2016 and 2017. Results showed that without application of any fertilizer was significantly reduced disease incidence (85%) and also tuber yield (22.45 t/ha) was decreases while maximum disease incidence (100%) was observed in application of N: P: K at 80:60:80 kg/ha. While disease severity was significantly highest (53.33%) in application of N: P: K at 20:15:20 kg/ha and minimum disease severity (30%) was observed in application of N: P: K at 140:105:140 kg/ha and also tuber yield was increased (31.59 t/ha). Appropriate management of NPK fertilizers leading to a reduction in infection of leaf blight and increase in yield is an additional tool for minimizing the use of pesticides on calocasia.

Keywords: *Calocasia esculenta*, *Phytophthora colocasiae,* fertilizer, leaf blight, tuber yield.

Complex behaviour of environmental variables towards herbaceous tracheophytes on northern face at forest-grassland ecotone in Lesser Himalaya (J&K)

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Abstract

On northern hemisphere, north face of the mountains possesses high species diversity. One of the important factors for species diversity is moist and shady conditions at north face. Other environmental variables may also influence the species diversity at northern faces of the mountain, therefore needed to be investigated in detail. Northern slopes are represented by three different sub-slopes e.g. north, north-east and north-west. During the current investigation relationship between herbaceous tracheophytes vis-à-vis four environmental variables namely pH, moisture, conductivity of soil and degree of mountain steepness was determined using Canonical Correspondence Analysis (CCA). The sampling was done at the confluence of two communities (forest and grassland) at three sites on the northern sub-slopes of Lesser stratum of NW Himalaya. During the presentation the behaviour of each environmental variable towards herbaceous tracheophytes will be discussed in detail.

Effect of Integrated Nutrient Management on Soil Fertility, Yield and Quality of Greengram [*Vignaradiata* (L.)Wilczek]

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Abstract

A field experiment was conducted at instructional Farm (Agronomy), Rajasthan College of Agriculture, Udaipur, (Rajasthan) during *kharif,* 2014 on clay loam soil to study the "Effect of integrated nutrient management on soil fertility, yield and quality of greengram [*Vignaradiata*(L.) Wilczek]".

The experiment was laid out according to factorial randomized block design with three replications. The experiment comprisedfour fertility levels (75% RDF,75% RDF+VC @ 2 t ha^{-1}, 100% RDF and 100% RDF+VC @ 2 t ha^{-1}) and four biofertiliizers levels (control, *Rhizobium*, PSB and *Rhizobium* + PSB) were applied to the greengram var. SML-668. The RDF was 20 kg N and 40 kg P_2O_5per hectare. The soil of the experimental site was clay loam in texture, slightly alkaline in reaction, medium in available nitrogen and phosphorus, while high in potassium and DTPA extractable micronutrients sufficiently above the critical limits. The main findings of investigation are summarized as:

The application of fertility level significantly increased the dry matter accumulation, number of pods per plant, number of seeds per pod, chlorophyll content, seed andhaulm yields, N, P, K, Cu, Zn, Fe and Mn content and uptake in seed and haulm, protein content in seed,number of total and effective root nodules, fresh and dry weight of root nodules, leghaemoglobin content in root nodules, and net returns upto 75% RDF+VC @ 2 t ha^{-1} however, their further increase with application of 100% RDF+VC @ 2 t ha^{-1} was non-significant. The increase in test weight was found non-significant. The organic carbon, available nitrogen, phosphorus, potassium, copper, zinc, iron and manganese in soil increased significantly with the application of fertility levels at harvest of the crop, but Ec and pH remain non-significant.

Seed inoculation with *Rhizobium* + PSB significantly increased the dry matter accumulation, number of pods per plant, number of seeds per pod, chlorophyll content, seed andhaulm yields, N, P, K, Cu, Zn, Fe and Mn content and uptake in seed and haulm, protein content in seed, number of total and effective root nodules, fresh and dry weight of root nodules, leghaemoglobin content in root nodules, and net returns and the test weight and harvest index were found non-significant. The organic carbon, available nitrogen, phosphorus, potassium, copper, zinc, iron and manganese in soil significantly increased with inoculation of *Rhizobium* + PSB at harvest stage of the crop, but EC and pH remain non-significant.

The interactive effect of fertility levels and biofertilizers significantly influenced the seed and haulmyield, N,P and K uptake by seed and net returns and maximum being with the application of100% RDF+VC @ 2 t ha^{-1} and *Rhizobium*+PSB combination, which was at par with75% RDF+VC @ 2 t ha^{-1} and *Rhizobium*+PSB combination.

Varietal Diversity in Apple – A Source for Enhancing Productivity and Economic Returns under Different Conditions

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Abstract

Apple (*Malus* x *domestica* Borkh) is found in the wild almost continuously throughout the temperate Eurasia and North America. The primary centre of diversity appears to be within a region stretching from Asia Minor to the western provinces of China. The domesticated apple which we consume and has economic importance is one of the most important fruit crops of the colder and temperate parts of the world. In temperate regions, each country has its own local cultivars, and since the apple is a long-lived tree and vegetatively propagated, cultivars known from hundreds of years ago still exist. In-spite of that, the diversity of local and well-adopted landraces has been replaced by a much narrow spectrum of cultivars that are often genetically similar. India being diverse country where apple is grown in Jammu and Kashmir, Himachal Pradesh, Uttarakhand and North Eastern States where climate varies from sub-tropical to temperate and cold arid. Therefore varietal diversity with respect to chilling is required. These regions require low chill cultivars like Mayan Anna, Michal, Tropical Beauty, Neomi etc. Also some regions having potential for apple cultivation have short summer leading to less accumulation of Growth Degree Days and therefore early maturing cultivars like Vista Bella, Mollies Delicious, Gala Mast etc are recommended. Apple varieties having potential for processing like Delicious groups, Granny Smith, Liberty, Rome Beauty, Prima, Priscilla, Sir Prise, Freedom, Redfree, Summer Red, McIntosh and Maharaji can play an important role in enhancing economic returns through value addition. Consumer preferences and market value is more for colour strains like Red Velox, Scarlet Spur, Jeromine, Top Red, Hi Red, Vance Delicious, Hardeman, Tydeman's Early Worcester etc which are replacing existing varieties on large scale. For enhancing productivity and quality of apple high density plantation with new generation canopy architecture is required preferably with spur type apple cultivars like Super Chief, Red Chief, Red Spur, Ruby Red, Hardi Spur, Well Spur, Super Red Chief, Stark Spur Red, Stark Spur Gold, Golden Spur, Spur Type Red Delicious, Bright's Early, Oregon Spur, Starkrimson. Most of the cost in apple cultivation is involved in plant protection measures particularly for scab managament; this burden can be reduced by use of scab resistant varieties like Priscilla, Sir Prize, Macfree, Freedom, Firdous, Shireen etc. Therefore varietal diversity is pre-requisite for enhancing productivity and economic returns of different regions based on different agro-ecological and other conditions prevailing in the region.

Keywords: Apple, low chill, productivity, fruit quality, early maturity, scab resistance

Fortification strategies for improving Fe content in crop plants

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Abstract

Iron (Fe) is an essential element for all living organisms because of its property of being able to catalyze oxidation/reduction reactions. Fe serves as a prosthetic group in proteins to which it is associated either directly or through a heme or an iron-sulfur cluster. It exists in two redox states, the reduced ferrous Fe2+ and the oxidized Fe3+ form and is able to loose or gain an electron, respectively, within metalloproteins (e.g. Fe-S cluster or heme-Fe proteins). Such metalloproteins are involved in fundamental biochemical reactions like the electron transfer chains of respiration and photosynthesis, the biosynthesis of DNA, lipids and other metabolites, the detoxification of reactive oxygen species. The cellular processes that involve Fe take place in distinct intracellular compartments like e.g. cytoplasm, mitochondria, plastids, cell walls, which therefore need to be provided with an adequate amount of Fe. Human health problems caused by Fe deficiency can be prevented by specific attention to food composition and by choosing a balanced diet with sufficient and bio-available Fe content. One of the best approach for increasing the iron content in crop is Bio-fortification which designates the natural enrichment of plants with nutrients and healthpromoting factors during their growth. Bio-fortification focuses on generating and breeding major staple food crops that would produce edible products enriched in bioavailable amounts of micronutrients, provitamin A carotenoids or several other known components that enhance nutrient use efficiency and are beneficial to human health. It can be achieved by Reduction of phytic acid content, Increase of ferritin content, Increase of nicotianamine content, combination of factors affecting bio-availability of Fe and Breeding for novel traits. Such bio-availability studies need to be performed routinely and also used in screening procedures to provide criteria for selection of the best plant lines. This technology seems to be a lime light as an innovative technology in crop improvement.

Marketing Potential of Floriculture in Kashmir as A Tourism Product: An Agri-Business Management Study on Tulip Garden Srinagar

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Abstract

Garden tourism or visiting gardens is a niche product segment in the tourism industry. In commodifying a garden to become a tourist attraction, there is a shift in focus from the garden to the visitor. Aspects of being a tourism attraction such as the consumer (visitor), product development, marketing, viability and sustainability need consideration. Gardens have an immense economic potential as well as an activity generating a number of economic and social benefits. Garden visiting has recognition as a tourism product **(Connell and Meyer, 2004; Sharpley, 2007)**. Garden tourism can include a wide variety of activities including garden tours, garden festivals and special garden events. The importance of garden tourism in Kashmir and particularly Srinagar has been emerging of great significance in contemporary times. Kashmir has a tremendous potential for this tourism type for the fact that that it is only region in India which has got highest number of Mughal gardens of international recognition **(Yousuf and Shah, 2014)**.

This paper addresses the need to look gardens, in addition to the economic and financial benefits, with geographical, management and sustainability prism. The prime focus of the present study is the analysis of the marketing potential, development and promotion of Garden Tourism in Srinagar, as well as analysis of perceptions & satisfaction level of the garden visitors. The present study is based on computation and analysis of both primary data as well as secondary data, in order to draw valuable inferences on how and why some gardens do a better job of hosting tourists than others. The study also examines management issues such as sustainability, financial viability, capacity and environmental threats to suggest best practice and the future for garden tourism. The study concluded that there is tremendous potential of floriculture as a Garden tourism product in Srinagar city and the authors also suggested several recommendations for better development, marketing and management of this type of tourism in Srinagar. Mainly a more widely focused market should be targeted to ensure that garden tourism is successful in fostering sustainability.

Keywords: *Floriculture, Garden tourism, Marketing Potential, Tulip Garden Srinagar, Tourist Perception & Satisfaction level*

Effect of Antifungal Activity of Rahmnolipid Biosurfactant on Growth and Pathogenicity of *Rhizoctonia solani* f.sp. *sasakii* Causing Banded Leaf & Sheath Blight in Maize

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Abstract:

Banded Leaf and Sheath Blight (BLSB) disease is prevalent in south and south-east Asian countries. The disease is caused by a soil born pathogen *Rhizoctonia solani* f. sp. *sasakii* (Kuhn) Exner. Crop damage is caused by loss of photosynthetic leaf area and stalk rot, leading to crop lodging. Maximum damage occurs when the fungus infects the ears/ cobs. Management of BLSB through chemical is having stronghold till date. Alternative management strategies are needed for management of BLSB against rising environmental, ecological and health concerns due to use of chemicals in plant disease management, for which employment of organic molecules can be a feasible substitute. Biosurfactants are a structurally diverse group of surface active molecules produced on living surfaces mostly on microbial cell surfaces or excreted extracellularly and contain hydrophobic and hydrophilic molecules that confer the ability to accumulate between fluid phases, thus reducing surface and interfacial tension. In the present investigation fungistatic activity of rahmanolipids was evaluated upto fourth generations of *R. solani* f.sp.*sasakii* in biosurfactant amended media (@ 50ppm) adopting food poison technique. The per cent inhibition in mycelial growth was increased from generation 0 to generation 3 and afterwards decreased. Maximum inhibition (73.33 %) in mycelial growth was observed in third generation followed by second generation (71.56 %) and first generation (70.22 %) while minimum inhibition in mycelial growth (69.11 %) was observed in fourth generation. Growth rate of recovered mycelium, obtained from fourth generation, in un-amended media was less than the biosurfactant un-exposed normal mycelium. The pathogenicity test was performed with fourth generation, recovered and normal mycelium of the pathogen on maize plant, cv. Vivek QPM 9. On the basis of lesion size, fourth generation mycelium was least virulent followed by recovered and normal mycelium. It indicated the effect of rahmanolipid biosurfactant persists in subsequent generations (sub-cultures) of the pathogen. However, study on the exact mechanism of action of the biosurfactant on the pathogen *sasakii* is needed. The study suggests exploration of biosurfactant in the management of *R. solani* f. sp. *sasakii* in maize and other crops.

Priority Sector Financing By Public, Private And Cooperative Banks In Karnataka –A Comparative Analysis 2016

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Abstract

Finance is the key element which almost all activities revolve around. A sound financial system is a symbol of sound economy. It performs the role of intermediary between savers and investors. Priority Sector Lending (PSL) is a scheme which is intended to give loans to the important priority sectors of the economy. For the present study, three districts Belagavi, Davanagere and Kalaburgi were selected. In order to analyze the data, tools such as Compound Growth Rate, ANNOVA, Markow Chain were employed. Priority sector financing in all the three districts from all the three different category of banks namely public, private and cooperative registered a positive growth in lending. In activity wise performance, ANNOVA analysis inferred that there was no relationship between the banks in lending towards different priority sectors. Through Markow Chain Analysis, it was observed that among the priority sectors, agriculture sector was given a prime importance which retained a major share in all the selected banks. Non-Performing Asset (NPA) Level indicated low growth rate for agriculture sector in Public sector, followed by Private and Cooperative sector banks. In case of short falls in priority sector lending, cooperative banks were the only banks which failed to achieve the targets in majority of all the sectors in all the three districts. In Public and Cooperative sector banks, the borrowers faced problem of cumbersome procedures in lending loans and delay in sanctioning of the loans. Bank officials were faced the problem of identification of right beneficiaries in all categories of banks in all the selected districts.

Nutritional status and veterinary practices for livestock in Ganderbal District

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Abstract

To study the nutritional status of livestock and socio-economic status of farmers in Ganderbal district of Kashmir valley, a survey on 125 farmer families was conducted using a standard questionnaire. It was observed that livestock rearing was an important activity of the farmers and constitutes a regular source of farmer's income to these farmers. In all 10.7% farmers of the region were found to offer feed supplements to animals, whereas majority of the farmers were supplementing the basal diet of the animals with common salt only. Paddy straw, maize stovers, oilcakes, brans, oat hay and wild grass hay were commonly fed to animals. There was no concept of the balanced diet feeding of livestock among the farmers in the district. Only 8.3% of the farmers were practicing regular deworming of animals in the surveyed area. Further it was recorded that only 41.6% of the farmers in the district were vaccinating their livestock. Only 50% of the farmers in the region had access to veterinary health care services. The common problems faced by livestock owners in the district include slow growth rate in sheep and goat, reproductive disorders, poor milk production and production diseases in cattle. Imbalanced feeding and improper mineral supplementation were the main reasons for the poor performance of the ruminant species in the district. The main health problems reported in the district were productive (milk fever and ketoses), reproductive (repeat breeding, anestrous, conception failures, retained placenta, prolapse etc), infectious diseases (mastitis, respiratory tract infections, gastrointestinal disorders), and ecto/endo parasitic infestations.

Keywords: Nutritional status, Socio-economic, Status, balanced feeding

Horti-Poultry Model of SKUAST-K, A Novel Concept For Doubling Farmers Income

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Abstract

A new concept on integerated farming, Horti-Poultry model was designed by KVK-Ganderbal under the technical guidance of Centre for Research on Poultry (CRP), FVSc&AH, SKUAST-K. 300 vanraja chicks were purchased from CRP and the trial was laid in the Kendra. The birds were incubated for one week and were put on concentrate feeding for 5 weeks. After the end of 5 weeks the birds were introduced into the apple orchard of the KVK for scavenge feeding during the day to allow birds to feed upon herbage, insects and other scavenging resources and in the evening hours were offered kitchen waste comprising of leftover rice, vegetable waste, egg shells, leftover pulses etc collected from the hostels of FVSc & AH, located in the close vicinity of the Kendra. Small amount of supplemental feeding (11 gms/bird) was also offered during the night confinement. In the first 13 weeks 16 birds died (5.3% mortality), 4 due to enteritis and two due to predators and from 13-21weeks of age another 6 birds died again due to enteritis. At 21 weeks of age male birds attain a weight of 2.2 -2.5 kg of weight while the hens acquired a weight of 1.8 to 2.3 kg. 14 active and healthy cocks were retained for mating purpose as a parent flock with male to female ratio of 1:8 (14 cocks for 111 hens). The extra male birds (153) were sold out @ Rs 200/kg live weight. The birds came to lay at 28 weeks of age and initially for the first 4 weeks 33.3% (37 eggs/day) egg production was recorded that increased to 46.8% (52 eggs/day) after another 3 weeks. Thereafter the egg production ranged between 25-49%. A portion of the eggs so collected were distributed among farmers for house hold incubation, some were sent to hatchery of CRP, SKUAST-K for hatching while some were sold @ Rs 6/egg and. The chicks so obtained from the hatchery were again distributed among the farmers. Farmers reported 70-84% hatchability while as hatchability at CRP hatchery was 65.5 %. After the birds came to lay no concentrate or any supplemental feeding was offered to the birds to avoid unnecessary fattening of parent stock and the flock was kept exclusively on scavenge feeding with little quantity of kitchen waste feeding (<10 gms/bird/day) in the evening.

The major observations of the trial at the end of 40 weeks were that the concentrate feeding was reduced by around 80% and as against 60 gms of concentrate feeds that a bird normally takes in confinement (indoor rearing) only 11.0 gms of concentrate feed was required under this model. The concept ensured resource optimization, income supplementation, deeweeding, orchard sanitation, organic fertilization, hoeing and disease control of birds as well as the orchard. Against an investment of fifty thousand {Rs. 50000/-(Rs. 6000 as cost of 300 birds @20/day old bird, Rs. 36000 as cost of feed when one bird takes around 11 gms of conc. feed upto 40 weeks of age @ Rs 40/kg of feed, Rs 5000 for low cost chicken mesh fencing of the orchard, Rs. 3000 for medication and vaccination as Rs 10/bird). The returns on

account of selling 153 no. of birds were 153x200x2.3= Rs. 70380/- and therefore the net profit from the model was output-input cost= 70380-50000= 20380/- (twenty thousand three hundred eight). The profit at the end of the trial is in addition to the parent flock (14 cocks+11 hens=125 birds) retained for laying of fertile eggs. Addng the income of parent flock, the income will increase to more than double from eggs and (or) sale of birds 15 kanals (0.75 ha) of land was found required for carrying out the said trial. That reflects from every 15 kanals of orchard we can earn the said amount over and above our normal income from apple or any fruit crop.The model attracted farmers, national and local media and ICAR. DG ICAR, ADG ICAR, Director, ATARI,ICAR visited the model and praised for its novelty and practicability at farmers field. Exploiting heterotic groups through reciprocal selection for combining ability to improve the performance of cotton hybrids (*Gossypium hirsutum* L.)

Exploiting heterotic groups through reciprocal selection for combining ability to improve the performance of cotton hybrids (*Gossypium hirsutum* L.)

Hanamaraddi Kencharaddi

Abstract

Exploitation of heterosis through hybrids has led to improvement in productivity of both self and cross pollinated crops. In cross pollinated crops, hybrid breeding program is supported by population improvement schemes aimed at improving combining ability. There are very few studies on grouping genotypes based on heterotic pattern and exploiting them in self pollinated crops. At Dharwad, efforts are made constantly to observe most potential crosses and understand the basis of complementation causing high heterosis. These efforts have led to the formation of different heterotic groups like Stay green, Robust and High RGR.

To exploit these diverse heterotic groups, attempt was made to constitute heterotic box involving two diverse single crosses from opposite heterotic groups DSMR-10 x DSG3-5 (robust and stay green group) x DRGR-24-178xDRGR-32-100 (high RGR), heterotic group based on the principle of predicted double cross performance and these two opposite base population were advanced to F4 generation. Fifty lines from each of these opposite crosses were randomly selected and utilized in assessing variability for combining ability against two reciprocal testers and one common tester (DH-2772) against both the population. An additional diverse robust tester, DR-8 (against high RGR lines) and high RGR-line DRGR-4 (against robust/stay green F4 lines) were used to assess combining ability. All these crosses (derived F1s) involving the F4 lines with opposite testers were compared with commercial checks as well as bench mark crosses.

Based on this the magnitude and variability for combining ability was assessed against different types of testers. Transgressive segregation for combining ability was assessed and these elite combiner lines of High RGR and Robust stay green group were identified. Many of the derived F1s of elite combiners were more productive than commercial check *viz.,* JK Durga Bt. Sub grouping of lines based on combining ability against different testers was done and molecular diversity was assessed among the elite lines of heterotic groups based on SSR markers.

Characterization of *Fusarium* species causing Bakanae disease of rice

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Abstract

The Bakanae disease is known to be discovered in 1828 but it was named in 1898. This disease was believed to be caused by *Fusarium moniliformin* but other species to be involved in causing this disease are also found. On the basis of translation elongation factor 1α (TEF-1α) *Fusarium spp.* were identified as *F. fujikuroi , F. proliferatum, F. verticillioides (F. moniliforme), F. sacchari, F.pseudonygami, F. thapsinum* and *F.andiyazi*. On the basis of pathogenicity test conducted on susceptible variety Pusa basmati 1121, it is confirmed that only *F. fujikuroi, F. verticillioides* and *F. proliferatum* produces disease as elongation, rotting or both types of symptoms. The pathogen of this disease enhances the production of secondary metabolites and gibberellic acid which in turn causes elongation symptom. Fusaric acid was present in all the species of *Fusarium*. Bakanae disease is one of the newly emerged increasing problems of rice, particularly with basmati rice in India. Disease incidence has been increasing considerably and low to moderate disease incidence has been reported. Conidial germination of Bakanae pathogen *F. fujikuroi* has also been studied and it has been studied that the maximum conidial germination percentage was in root suspension followed by stem, leaf and water when used as substrate at 9h of incubation. Disease has been reported as both soil as well as seed borne. Actually pathogen is reported as seed born and had a long life. Once entered in rice cultivated field it causes severe yield losses, it cannot be controlled by any other means such as chemical control.

Keywords: Bakanae, Disease incidence*, Fusarium species*, Gibberellin.

Proteomic Changes in *Calendula officinalis* L. Under Cold Stress

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Abstract

Calendula officinalis grows in Kashmir Himalayan (temperate) region and withstands low temperature stress. To gain better understanding of mechanism of cold acclimation, we investigated the proteomic changes in calendula with increasing exposure to cold stress using 2-dimensional gel electrophoresis. A total of 24 differentially expressed proteins (DEPs) were identified by mass spectrometry. The results revealed that of the 24 DEPs, 18 spots were upregulated and 6 spots were downregulated. The upregulated proteins were mainly involved in photosynthesis, stress resistance, fatty acid metabolism, antioxidant defence, plant development and signalling, transport proteins and other metabolic pathways. The downregulated proteins were found to be involved in some signalling pathways and antioxidant enzymes. Besides, some cold responsive proteins identified in *C. officinalis* are also involved in salt, heavy metal and abiotic stress, which strongly suggest their cross-tolerance to biotic and abiotic stress. Further, some proteins were found to be with unknown function and represent novel proteins. Further, this is the first report of proteomic study on *C. officinalis* under cold stress which may help in developing cold resilient commercial crops.

Cadmium toxicity-effect on different growth and development parameters of *Brassica juncea* genotypes

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Abstract.

Brassica juncea is widely cultivated for its seed which is a source of oil; but its leaves are also edible. **Young leaves** are used in salads or mixed with other salad greens. Older leaves with stems may be eaten fresh or canned and frozen. Besides these conventional uses the plant has also found its place in Phytoremediation processes. So far the largest numbers of hyperaccumulating species in the Temperate Zone belong to Brassicaceae with *Brassica juncea, Alyssum* and *Thlaspi* species as most significant. A study was carried out to find out the difference in the degree of tolerance/resistance among *Brassica. juncea* L. genotypes to Cd stress so as to find a genotype that can grow best even under altered environmental conditions. Ten-day-old seedlings of B. juncea cultivars were exposed to various levels of cadmium chloride (0.0–2.0mM) for 72h in hydroponics culture to determine its impact on their growth characteristics and pigment concentrations. Studies on growth parameters, viz. root length, shoot length, plant height, fresh weight and dry weight of root, stem and leaves and biomass accumulation per plant revealed that Cd inhibited root and shoot growth considerably in a dose and time dependent manner. This dependence was distinctly illustrated by changes that occurred as a function of the element action with time in leaves of Cd treated *Brassica juncea* L. genotypes. The effect of cadmium stress on the shoot length was less pronounced as compared to root length. The trend of plant response to $CdCl_2$ treatment in terms of plant height was almost similar to those observed for the individual growth parameters. Application of varied levels of $CdCl_2$ to 10 day old seedlings of *B. juncea* L. genotypes resulted in a decreased root and shoot fresh and dry weights. These observations revealed that cadmium treatment had resulted in an overall reduction in plant height, root and shoot fresh weights as well as dry weights in *B. juncea* L. genotypes with more pronounced decline at 2.0mM $CdCl_2$ concentration.

Pigment levels (Chlorophylls and carotenoids) were determined at 24, 48 and 72 HAT. Chlorophyll ‘a’, chlorophyll ‘b’ and total chlorophyll (a+b) decreased consistently, in all the genotypes with all the treatments, when compared with their control, although decline was more pronounced in some genotypes than others. The differences for pigment concentrations, among genotypes were statistically significant at 5% level. Similarly the carotenoid level were monitored for all genotypes and the differences obtained were statistically significant at 5% level.

Keywords: *Brassica juncea* , Cadmium,Pigments,Phytoremediation

Effect of boron supplementation on plasma minerals status in growing crossbred calves

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Abstract

The aim of the experiment was to study the effect of different levels of boron (B) supplementation on plasma mineral levels in growing crossbred calves. Twenty-four crossbred calves were distributed randomly in four groups (C, T1, T2 and T3) with six animals in each group on the basis of their average body weight (154.83) and age (7-9 month). All the four groups were fed as per ICAR (2013) feeding standard to meet their nutrient requirements except that 0, 100, 200 and 400 ppm B (in the form of boric acid) was additionally supplemented in C, T1, T2 and T3 groups, respectively for 90 days. Blood samples were collected at day 0 and thereafter at 30 days interval. The plasma was separated from blood samples by centrifugation at 1200 x g at 4°C for 20 minutes. Concentration of B and other minerals (P, Cu, Zn, Mn) were estimated by Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES) (Optima 9000, Multitype ICP Emission Spectrometer, Shimadzu, Japan). Ca and Mg were estimated by Atomic Absorption Spectrophotometer (AAS). Results showed that B supplementation increased circulatory levels of B and Ca, however, concentration of other minerals (P, Mg, Cu, Zn, Mn) remained same (Table 1). Results concluded that boron doesn't seem to have interaction with other minerals except increase plasma calcium concentration.

Phenological Shifts, A Clear Manifestation of Climate Change

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Abstract

In an era of on-going climate change, shifts in timing of biological events are among the most important responses seen in biological systems. These phenological shifts potentially impact organism reproduction, population survival, species boundaries and ecosystem services. However, despite the importance of phenological changes, data sources like satellite imaginary and experimental studies are limited. Therefore herbarium based phenological assessments have gained momentum in recent years. Most of the herbarium based phenological studies utilized a similar response variable (i.e., flowering time) and observed an early flowering response of plant species with increase in temperature, thereby reveals temperature dependent changes in flowering phenology. Historic herbarium records of *Aconitum heterophyllum* from 1848-2003 and of *Tussilago farfara* L. from 1920-2010 revealed an early flowering of 21.0 days and 3.4 days respectively with 1^0C increase in atmospheric temperature. Similarly, records of *Rhododendron* from 1884-2009 depicts early flowering of 2.3 days with1^0C increase in atmospheric temperature. These phenological shifts due to climate change are mainly associated with further ecological implications like effect on pollination, change of community composition etc.The herbarium specimens based analysis of phenological shifts can consequently predict the future ecological implications associated with climate change.

Keywords: Herbarium specimens, Climate change, Phenology, Atmospheric temperature

Assessment of Antioxidant and Antimicrobial activities of *Salvia moorcroftiana Wall ex* Benth. : An endemic plant to Kashmir Himalaya

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Abstract

Salvia moorcroftiana Wall ex Benth, the herbaceous perennial medicinal plant belonging to family Lamiaceae, is endemic to the Himalayan region of Kashmir valley. The members of family Lamiaceae, have been identified for their medicinal properties. The roots and seeds of this plant are used for their antitumor activity. *S. moorcroftiana* is also known to have strong antioxidant activity. Considering the extensive use of *S. moorcroftiana,* the current study was directed to provide the scientific basis for its use in traditional system of medicines and ascertain some new pharmacological effects of this plant. The present study was aimed to estimate the phenolic and flavonoid content of methanolic extracts of *Salvia moorcroftiana* based on soxhlet extraction method and its antioxidant potential. The total phenolic content was found highest in the ethyl acetate, followed by chloroform, methanol and hexane respectively. Total flavonoid content was highest in ethyl acetate followed by chloroform, methanol and hexane respectively. The antioxidant potential of the plant was observed through DPPH and FRAP method. The IC50 value was found to be highest in hexane, followed by ethyl acetate, chloroform and methanolic extracts respectively. The highest FRAP value was found in chloroform followed by methanol, ethyl acetate and hexane respectively. The antimicrobial and DNA damage prevention activities of methanolic extract was also carried out.

Keywords: FRAP: Ferric reducing antioxidant power, DPPH: 1, 1, diphenyl-2-picryl hydrazyl

First Report of *Pieris brassicae* Granulosis Virus in natural population of Pieris brassicae Larvae in Jammu region.

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Abstract

India is bestowed with varied agro-climate, which is highly favourable for cultivation of vegetable crops, an important component of our daily diet, which not only serves as the rich sources of nutrients, vitamins and minerals but also provide farmers with higher income per hectare than cereal, root, and tuber crops. However, Insect herbivory is one of the major factors responsible for the reduction in vegetable production and yield. Among these herbivores, cabbage white butterfly, *Pieris brassicae* (L.) (Lepidoptera: Pieridae), is one of the most destructive and cosmopolitan insect pest which can cause upto 40 % damage in India. Although, the use of chemical insecticides to manage *Pieris brassicae* is very effective, however, can be detrimental to the environment. Studies conducted were aimed to isolate and characterize the Granulosis Virus from naturally infected insects. The exploratory survey was conducted for the isolation of local strains of *P. brassicae* Granulosis virus which confirmed the presence of Granulosis virus in the natural populations of *P. brassicae.*

To determine the biological characteristics of *Pieris brassicae* Granulosis virus, bioassays were carried out against the larvae of *Pieris brassicae* under laboratory conditions. The mortality of 3rd instar *P. brassicae* at different doses varied from 23.33-100.00%, with significant differences between the doses. It was also evident from the results that median survival time (ST_{50}) increased significantly with the age of larvae. The selection of a new natural isolate with better biopesticidal properties is an important aspect in biological control programmes. In this regard, the different native geographical isolates required to be tested against insect populations as there is continuing need to discover and develop new strains/races if we are to meet the future needs of food and fibre production and concomitant reduction in the use of chemical pesticides.

Effect of Different Growth Controlling Strategies on Tree Growth and Flowering In Chinese Sand Pear

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Abstract

Pear is one of the most important temperate fruits next only in importance after apple. In the state of J & K, both types of pear Viz., *Pyrus communis* and *Pyrus pyrifolia* exists. Nakh Kashmiri is the most important cultivar of *Pyrus pyrifolia* group considering its yield potential as well as its consumer acceptability. But due to excessive vigour there is problem of reduced flower bud development, light penetration and increased incidence of insect pests and diseases. In order to stimulate flower bud formation in pear, it is imperative to control vigour of plants. Root pruning, trunk incision and pruning are considered the major growth controlling strategies which were tested in the present study. In addition, application of growth regulators (paclobutrazol and ethephon) were tested for their efficiency in controlling tree vigour and flower induction. The study was conducted on twenty-year-old Chinese Sandy pear trees in experimental orchard/ laboratory of Division of Fruit Science, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Shalimar, Srinagar (J&K) during the year 2011 and 2012. Trees of similar vigour and size were selected, marked and maintained under uniform cultural operations. The experimented trees were treated with root pruning (during dormancy upto 35 cm depth and 30 cm away from trunk), trunk incision (during dormancy upto 20% of trunk diameter on both sides at 30 cm distance), summer pruning (mid June- thinning out of most of the extension shoots from middle of canopy and 50% from upper and lower canopy), application of paclobutrazol (at full bloom-800 ppm and 15 days after full bloom-500ppm) and Ethephon (at full bloom-200 ppm and 15 days after full bloom-100 ppm). Plants treated with root pruning + paclobutrazol showed better results with minimum trunk growth, TCSA, internodal length maximum chlorophyll content, carbohydrate and C: N ratio (shoots and leaves), flower intensity, per cent bloom. The overall results showed that root pruning + paclobutrazol can be considered as best strategy for optimizing tree growth and flowering in pear orchard.

Key words: Chinese Sandy pear, growth retardants, root pruning, summer pruning, tree vigour, trunk incision.

Length - weight relationship and condition factor in different age groups of hill stream fish *Garra gotyla gotyla* (Gray) from different tributaries of river Tawi, Jammu and Kashmir.

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Abstract

Garra gotyla gotyla is one of the most important food fish as well as a potentially important ornamental fish found in the high torrential water of river Tawi. As a measure of conservation certain aspects of the length- weight relationship and condition factor have been undertaken. The present work, based on 200 specimens (ranging from 4.2 cm to 15.5 cm of Total Length and 1.50 gm to 38.98 gm of Body Weight), describes Length–Weight relationship and Condition factor in different age groups of *Garra gotyla gotyla* (Family:Cyprinidae) from tributaries of river Tawi.The value of correlation coefficient indicated a high degree of correlation between length and weight in all the age groups. It was 0.991 in 0^+ age group, 0.997 in 1^+ age group, 0.965 in 2^+ age groups 0.991 in 3^+ age group and 0.980 in 4^+ age group The parabolic equations obtained were W=1.535L0.668, W=0.963L0.812,W=1.152L20.932, W=1.144L1.0413 and W=1.228L1.464 in 0^+, 1^+, 2^+ 3^+ and 4^+ age groups respectively. The condition factor (K) was found to decrease with advancing age viz. 1.610, 1.130, 1.220, 1.250 and 1.200 in 0^+, 1^+, 2^+, 3^+ and 4^+ age groups respectively.

Keywords: River Tawi, *Garra gotyla gotyla*, Ornamental fish.

Estimation of genetic parameters of Polled Dorset Sheep under temperate climatic conditions of Kashmir.

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Abstract

The present study was conducted to evaluate the performance of Polled Dorset under temperate climatic conditions of Kashmir. The data on body weight of 240 Polled Dorset sheep spread over a period of 18 years (1999–2017) were collected from the farm of the Mountain Research Centre for Sheep and Goat (MRCSG), Shuhama. The overall birth weight (BW), weaning weight (WW), six month weight (SMW) , 12 months body weight (12BW) , Age at first lambing (AFL) and Interlambing Period (ILP) was found to be 3.48 ± 0.035, 12.25 ± 0.178 and 17.48 ± 0.229 kg ,22.52 ± 0.248 984.11 ± 0.223 and 530.35 ± 8.63 respectively. Heritability of each trait was estimated by advanced animal model (DFREML) technique after adjusting for the non-genetic factors. The heritability estimates of the traits were found as 0.11±0.1, 0.12 ±0.17, 0.14 ± 0.18, 0.01±0.03, 0.16 ±0.41 and 0.17± 0.63 for birth, weaning, six month, 12 months body weight, Age at first lambing (AFL) and Interlambing Period (ILP) respectively. The analysis showed that there is much scope of improvement of heritability by efficient management practices.

Keywords: Polled Dorset, Growth traits, Reproductive traits.

Effect of Conservation Practices on Sediment Yield and Soil Loss

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Abstract

Soil erosion is the major land degradation process in India. The increase in population and growing demand for agriculture products or intensive dry land has generated changes in land use and resulted in erosion and land degradation. Soil erosion rates are accelerated by tillage and the low vegetation cover. There are various conservation methods by which we can reduce sediment yield and soil loss. These methods mainly aim either to decrease the erosive energy of water or to decrease soil erodibility by altering surface soil characteristic and surface cover. Conservation practices involve covering the soil to prevent exposure to raindrop impact, increasing soil characteristic to reduce runoff and the stability of soil. Different vegetative covers differ in their effect of the interception of rainfall and on runoff yield. Forests not only intercept the rainfall through their canopy and reduce the direct impact of rain drops on the soil but also increase the water stable aggregates and improve the water infiltration capacity of soils. Cultivated fallow gives the maximum and most dangerous rate of runoff and soil loss. Among different vegetative barriers including Vetiver, Napier, Jatropha and Agave, Vetiver proved to be most efficient vegetative barrier in conserving soil and water. It decreased runoff by 20.3% and soil loss by 51.4% compared with the control. Mechanical soil and water conservation measures are required for controlling soil erosion, retaining maximum rainfall within the slope and safe disposal of excess runoff from the top to the foot hills of India. Mechanical methods of conservation are terracing and building structures and are often used in extreme degradation.

Impact of organic Farming on Soil Properties

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Abstract

The escalating population of the world is forcing the nations to rely on the synthetic fertilizers and chemicals which persistently pose threat not only to the human lives but create ecological imbalance. The rescue to this alarming condition is switching to the human friendly mode of production system alias organic farming. Organic farming is a holistic approach to food production which aims to promote and maintain edhapic factors, human health and ecological balance. This paper presents a brief and comprehensive review of impact of organic amendments on soil physical, chemical and biological properties. The organic amendments enhance the soil structure by enhancing aggregate stability, aggregate hydrophobicity, soil porosity and soil permeability, and reducing bulk density. The effect of the organic wastes surcharge on the chemical properties can be recognized in terms of the increased organic Carbon, macro-nutrients concentration in soil and decreased toxic concentration of the heavy metals.The organic farming helps in the improvement of soil biological health by proliferating the microbial mass and activity. However, the application of organic amendments should follow recommendations in order to get the desirable results.

Keywords: Organic farming, Soil Health, Soil properties.

Status of House sparrow*, (Passer domesticus)*: A Review

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Abstract

Worldover, house sparrow belonging to the genus Passer comprises of 25 species, with *Passer domesticus domesticus* as the nominate species across Europe to northern Asia. An estimation of the British trust of Ornithology has shown a decline of 71% of sparrow population between 1994 and 2004 in London alone. Similar cases of decline have been reported from other areas of globe viz. Hamburg, Berlin, Glasgow, Edinburg and Dublin. Although the house sparrow has an extremely large range and population, and also assessed least concern by IUCN, but in India its population decline has also been reported and the decline is attributed to loss of nesting sites, food sources, predation and pollution. In the valley of Kashmir, the decline in the population of the sub species of house sparrow Passer domesticus parkini in the urban areas is hinting towards the shifting of this vital population to rural areas due to habitat loss by concretization and also due to irradiation from mobile towers.

Key words: Passer domesticus, Ornithology, IUCN, decline, concretization, irradiation.

Evaluation of Winter Rearing of Broiler Chicken Production With Special Emphasis on Effect of Cold on Performance and Suitable Remedies to Mitigate Effect of Cold on Performance of Broiler Chicken.

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Abstract

A biological trial was conducted on commercial chicks during the winter months (December and January). Day-old commercial meat type chicks (273) were procured from a reputed source. Cold conditioning (2^0C to 8^0C) at 3rd and 4th day of age for 3-4 hours was provided to 78 birds. These early cold conditioned birds were kept separate until distributed into respective treatment groups (fifth and sixth). On 14th day (end of second week), the chicks were individually weighed, distributed into 7 treatment groups of 3 replicates with 13 chicks in each replicate. Cold challenge @ 2^0C to 8^0C for 8 hours was provided from 3rd week of age to 6th week of their age for all treatment groups except first and fifth treatment groups. The broiler birds in the treatment groups T_1 and T_5 were reared under normal temperature conditions @25^0C. Treatment group first (T_1) was kept as control group. Antioxidant Vitamin E @ 250 mg per kg of feed was supplemented to the basal diet in the third treatment group. Chromium @ 0.1 gram per kg of feed was supplemented to the basal diet in the 4th treatment group. Chromium @ 0.2 gram per kg of feed was supplemented to the basal diet in the 7th treatment group. The data on individual body weight of the experimental birds and the cumulative feed consumption and feed conversion ratio on group basis were recorded at weekly intervals. Deaths were recorded daily and all dead birds were necropsied to identify ascites syndrome. There was no significant ($p<0.05$) difference in the average body weight and body weight gain among various treatment groups throughout the experiment period. The cumulative feed consumption showed significant ($p<0.05$) difference among various treatment groups throughout the experiment period. Highest feed consumption ($p<0.05$) was observed in broiler chickens reared under cold conditions when compared with broiler birds reared under normal temperature conditions. Among the cold challenge treatment groups (T_2, T_3, T_4, T_6 & T_7), there was significant ($p<0.05$) improvement in feed conversion ratio (FCR) in the treatment groups T_6 (early cold conditioning birds exposed to cold stress) and T_7 (supplementation of chromium@0.2 g/ kg of feed to birds exposed to cold stress). Among different treatment groups in general best FCR was observed

in treatment group T_5 (early cold conditioning group reared under normal conditions) followed by T_1 (control group reared under normal conditions). At the end of the biological trial ascites linked mortalities showed significant ($p<0.05$) difference among various treatment groups. There was no mortality reported in treatment groups kept under normal temperature conditions (T_1 & T_5). Highest ascites related mortality (28.20%) was observed in treatment group in which cold stress was provided and no measures were taken to alleviate the effect of cold stress on broiler birds (T_2). The Vitamin E supplementation in the diet of broiler birds reared under cold stress (T_3) showed significant ($p<0.05$) reduction in ascites related mortality (12.82%).

Keywords: Ascites, Broiler chicken, Early cold conditioning, Chromium, Cold stress, Performance, Vitamin E

Characterisation of Various Maize (*Zea mays*. L) Genotypes for Water Stress (Drought) related traits.

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Abstract

The present study was undertaken to assess the natural variation for Agro- morphological, Yield and Water Stress related traits in Maize (*Zea mays* L.) genotypes. A set of 10 genotypes comprising of released composites in white and yellow group along with derived lines were evaluated in the present study at two locations, DARS- Budgam and Faculty of Agriculture in Field, Greenhouse and laboratory conditions. The study was done at two levels well watered and water stress. Data has been collected at different growth stages and analysis of data showed wide variation for various traits and the study was conducted to quantify the effects of water deficit stress on maize root and shoot biomass. Root biomass varied from 27.5-100 g in irrigated and 12.50 – 44 g in water stress genotypes and root length varies from 68 -115 cm in irrigated and 42-137.5 cm in water stress in various genotypes of maize and shoot biomass varied from 134-315 g in irrigated and 45-123 g in water stress genotypes. Similarly, difference was recorded in various biochemical parameters such as chlorophyll content, response to PEG, seminal root angle. The maize genotypes were characterized for physiological, biochemical and morphological traits and thus, the variations in root architecture and biomass partitioning were analysed and many lines showed good response to water stress conditions and comparison of maize lines were analysed at well watered and water stress conditions.

Keywords: Water stress, Maize, Root biomass, Shoot biomass, Well watered.

Chromatographic Analysis to Study Metabolic Variation of Lignan and Fatty Acids in the Oilseed Crop *Sesamum Indicum* L.

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Abstract

Information on quantification and metabolic variation of lignans and fatty acids in the oilseed crop of *Sesamum indicum* L. is limited. This study presents and discusses the composition, quantity, and variability available for the two traits in the sesame germplasm grown in diverse agro climatic regions of India. HPLC and GC analysis of sesame seeds harvested over a period of three crop seasons revealed a considerable amount of variability in these two important nutritional compounds. The antioxidant lignans sesamol, sesamin and sesamolin were reported in the range of 0.16 to 3.24, 2.10 to 5.98 and 1.52 to 3.76 mg/gram of seed, respectively. Similarly oleic and linoleic acids ranged from 34.71% to 45.61% and 38.49% to 49.60%, respectively. The black sesame seeds were found rich in sesamin, sesamolin, total lignan content and oleic acid and are thus identified nutritionally and pharmaceutically more important than white and brown seeds. Pearson statistics showed a high correlation between the components within a particular trait but no correlation was found between the traits. The study recorded promising cultivars for use in sesame breeding aimed at improving lignan and fatty acid contents, and those that can be of direct use in human foods, nutrition, health and welfare.

Keywords: *Sesamum indicum* L. Seed coat colour. Lignans. Fatty acids. HPLC. GC. Pearson correlation

Apricot Specific-Urea Molasses Blocks an Alternative Supplement for Cross Bred Cattle in the Cold Arid Kargil Region of J& K State

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Abstract

A study was carried out in a village at Kargil taking lactating crossbred cows, maintained under a smallholder mixed farming system to assess the response of wild apricot fortified-urea molasses mineral block (UMMB) supplementation on milk yield and cost effectiveness during the unavailability of the fodder season. Forty adult crossbred cows were selected, 20 cows were given free access to Apricot-UMMB in addition to their normal ration and the other 20 cows served as a control group. It was studied that crossbred cows given apricot-UMMB supplementation showed significant increase in feed intake, milk yield, fertility rate and maintained live weight. The health condition of Group I, supplemented with apricot specific UMMB after 4rd week proved to be improving ($p<0.05$) than the Group II dairy cattle. Further owners stated that there was improvement of dry hay intake and overall health condition in such cows. Further apricot-UMMB supplementation is cost effective method to utilize locally available feed resource for enhanced animal productivity during extreme winter and feed scarcity seasons in cold arid regions of Kargil area.

Keywords: Apricot, UMMB, Kargil, crossbred cattle, milk yield

Studies on Physico-chemical Characteristics of Newly Introduced Exotic Apple Varieties on M9T337 Rootstock Under High Density Plantation in North-West Himalayan Region

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Abstract

Apple is the most important fruit of temperate region and is considered as the king of temperate fruits. But with the use of old commercial varieties productivity in India is far less than other apple growing countries, so it's important to shift to high density plantation and evaluate varieties for their various characteristics. The aim of this study was to investigate the performance of four exotic apple varieties grafted on M9T337 under high density conditions. The four varieties under study were: Super Chief Sandidge, Gala Red Lum, Fuji Zehn Aztec and Golden Clone B. The physical characteristics of fruits (fruit weight, fruit length, fruit diameter, L/D ratio, fruit firmness, specific gravity and no. of seeds) and chemical characteristics (TSS, total titratable acidity, TSS/acid ratio, ascorbic acid, total sugars and juice yield) were followed during study. The results showed statistically significant difference among the different varieties. The fruit weight, flesh firmness and specific gravity were within the range of 157.62-193.99 g, 7.16-8.85Kg/cm^2, and 1.7-1.37 respectively. Similarly some of the chemical characteristics like TSS, titrable acidity and total sugars ranged from 11.37-14.12 °Brix, 0.20-0.38%, 9.25-11.37% respectively. The overall results indicate that all the introduced apple varieties are characterized with different quality characteristics.

Keywords: Apple, varieties, high density, quality, M9T337

Carbon Sequestration Potential and Economics of *Dalbergia sissoo*-Paddy Based Agroforestry System in Central India

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Abstract

The present investigation was taken up with 17 years old agrisilviculture system (*Dalbergia sissoo*+Paddy-Wheat) during *rabi* season of 2015-16 under AICRP on Agroforestry, Department of Forestry, JNKVV, Jabalpur, M.P. The planting geometry of *Dalbergia sissoo* was 5× 5 m. The treatment combinations involved five treatments viz., four pruning intensities (viz., no pruning, 25% pruning, 50% pruning and 75% pruning) and one open (without tree) in main plot and three levels of fertilizer and seed rate of wheat variety GW-173 viz., T_1- recommended dose of fertilizer and seed rate, T_2- (T_{1+}25% more nitrogen than recommended dose) and T_{3-} - (T_{1+}25% more seed rate than recommended dose), in sub plot replicated five times.

The result revealed that wheat crop under open condition recorded significantly higher fresh wt. (103.6 gm), dry wt. (43.10 gm), fixed carbon (33.1%) and carbon sequestration (6.0 t ha^{-1}) as compared to no pruning which recorded the lowest fresh wt. (87.89 gm), dry wt. (30.39 gm), fixed carbon (30.1%) and carbon sequestration (4.7 t ha^{-1}). In different levels of fertilizer and seed rate maximum fresh wt., dry wt., fixed carbon and carbon sequestration was significantly higher under T_2- (T_{1+}25% more nitrogen than recommended dose) as compared to T_1 treatment. Wheat + Shisham 25% pruning (agroforestry system) recorded significantly higher carbon sequestration (101.42 t ha^{-1}) as compared to other pruning treatments and no pruning (91.7 t ha^{-1}), tree alone (74.3 t ha^{-1}) and crop alone (6.0 t ha^{-1}). Different levels of fertilizer and seed rate showed no significant effect on carbon sequestration.

Significantly higher grain yield of wheat (34.88 q ha^{-1}) was recorded under open condition i.e. crop grown without tree, whereas in the crop grown with tree under no pruning recorded significantly lowest grain yield of wheat (18.81 q ha^{-1}). Among different pruning treatments, 75% pruning recorded higher grain yield in wheat (30.57 q ha^{-1}) and was significantly superior to other pruning treatments. The percent reduction in grain yield under no pruning, 25% pruning, 50% pruning and 75% pruning as compared to open was 47.3%, 38.2%, 18.4% and 10.90% in wheat, respectively. The net monetary return was significantly higher in the crop under 50% pruning (Rs. 74091 ha^{-1}) and minimum in open. Managed agroforestry system (i.e. pruning treatment) recorded higher monetary return (Rs. 69088 ha^{-1}) as compared to crop alone (Rs. 40,813ha^{-1}) and tree alone (Rs. 39,490 ha^{-1}).

Keywords: Carbon sequestration, Paddy, Economic, Agroforesty system

Niche dynamics and the potential global distribution of invasive *Acacia auriculiformis* (Earleaf acacia) under climate change

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Abstract

Global climate change is rapidly affecting the worldwide distribution of invasive species. Predictions based on species distributional modelling suggest that the impacts are expected to be more severe in future. In addition, invasive species undergo considerable alteration in their niches during the invasion process. This so called "double jeopardy" of climate change and biological invasion is expected to exacerbate the ill impacts of biological invasions on global biodiversity. Therefore, testing climatic niche conservatism and modelling habitat suitability under the climate change scenarios become necessary to develop long term scientific management strategies. The present study is the first attempt to model the potential global distribution of invasive *Acacia auriculiformis* for present and future (RCP's 2.6 and 8.5 covering 2050 and 2070) using *MaxEnt* software. Also, for the first time, we tested the hypothesis of niche conservatism for this species by comparing its native climatic niche in Australia to the niches in introduced regions across the world using the *Ecospat* package in R. The model obtained had AUC = 0.96, thus indicating robustness of the model in predicting the distribution of this species. The modelling results revealed that about 2,77,310 km^2 (3.1 %) of the total area across the globe is suitable for this species under current climatic conditions. The model predicted a global increase in overall habitat suitability for this species under future climate change. This increase in the future habitat suitability ranges between 85,810 km^2 (31 %) under RCP 2.6 2050 to 1,24,870 km^2 (45 %) under RCP 8.5 2070 when compared to current habitat suitability. The results suggested that precipitation of wettest month (BIO13), isothermality (BIO3), annual mean temperature (BIO1) and annual precipitation (BIO12) are the most important environmental variables in determining the geographic distribution of *A. auriculiformis.* Furthermore. the results showed niche conservatism for Africa, but contrastingly niche shift for Asia, North America, Oceania and South America. The niche shift was an outcome of niche expansion for Asia and Oceania; and niche unfilling for North and South. The global distribution modelling of invasive *A. auriculiformis* has immediate implications in mitigating its invasion impacts under climate change, as well as in predicting the future invasion hotspots, implementation of early detection and rapid response system, and development of scientific invasion management strategies. Interestingly, the contrasting niche shift patterns shown by this invasive plant species provide novel insights towards disentangling the different operative mechanisms underlying the process of biological invasions at the global scale.

Keywords: Biological invasion; Climate change; Habitat suitability; Niche shift; Species distribution modelling

Agriculture Extension Communication and the role of Media –A comparative case study of Print and Electronic Media in Kashmir

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Abstract

Modern agricultural practices work far differently than those a few decades ago, which has been possible primarily because of advancements in technology, which includes the use of sophisticated devices, machines, and better communication technology. Another important factor responsible for such a rapid development is the use of Agricultural Extension Communication, which is the application of scientific research and new knowledge to agricultural practices through farmer education. It is a series of embedded communicative interventions that are meant, among other goals, to develop and/or induce innovations which help to resolve various agriculturally related problematic situations, which is enabling change in individuals, communities and industries involved in the agricultural sector. One of the key and important actor's responsible for the success of agriculture extension communication is the use of mass media. Media as one of the pillars of democracy plays a constructive role in the national development, which has been recognized in the Third World countries because information dissemination plays a key role in bringing social change among the receivers. Whether print or electronic, media in its appeal is massive and profound. In a vast and developing country like India, where majority of the population is associated with agricultural and related field's, media can be the most important tool in educating masses about the benefits and knowledge of the latest technological advances, and in a volatile place like Kashmir, where the whole scene is dominated by politics, media can be all pervasive. In the backdrop of this, the current research study will attempt to study the role played by the selected media(both print and electronic) in agricultural extension communication in Kashmir, by analyzing their coverage regarding the various issues related to the agriculture, its development and the various technological advances taking place in it. For that agriculture related news coverage of one newspaper (Greater Kashmir) and one T.V programme (Butraat) of six months will be analyzed, to know how much coverage and importance these media outlets give to agriculturals issues and among the covered issues, which issues get maximum coverage.

Agriclinics and Agribusiness Centres Scheme: Providing Opportunity for Agripreneurs

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Abstract:

Agriclinics and Agribusiness Centres provide agricultural advisory services to the farmers through trained agricultural graduates, known as "agripreneurs". The Central Government provides one-third of the total cost of the project as subsidy for setting agriventure. The ACABC programme is evolved from the perceived need of farmers on the basis of locally available, reliable, effective and knowledgeable third- party advice. The objectives of the programme are to strengthen the technology transfer, public extension system and employment generation in rural areas and has proved in a healthier way. This programme aims at to fill up the gaps in the public sector extension system where in input dealer plays a major role in providing advice to the farmers about input use. The ACABC centres provides a package of inputs consultancy and other services (which included repeated visits to the farmers' fields) in order to strengthen the transfer of technology process through on efficient extension service network. The agripreneurs who had set up dairy units were also carrying out milk production and marketing. The extension efforts of the agripreneurs culminated in better awareness about the dairy practices, feed and fodder management and better production and price realization. According to ACABC Cell MANAGE, there are 74 Nodal Training Institutes, the number of agriventures established during the period is estimated at 20,999 depicting a success rate of 43.67 per cent. In Jammu and Kashmir, 45 training programmes were completed in which 1333 agricultural graduates were trained and 176 agriventures were established till September, 2016 (ACABC Cell, MANAGE). There is still some need to make efforts by government to focus more on ACABC and on the ventures which are having untapped potential.

Global distribution modeling and invasion risk assessment of *Acacia holosericea* under climate change

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Abstract

The interactive effects of climate change and invasive alien species pose serious threats to biodiversity, ecosystems and human well-being worldwide. Species distribution models (SDMs) are becoming increasingly important in predicting spatial patterns of biological invasions, identification of hotspots for early detection and informing management of invasive species. *Acacia holosericea* is a woody shrub that is highly invasive in many countries of the world. It has a profound economic and environmental impact worldwide. The present study, using MaxEnt modelling, has mapped current and future global distribution of *A. holosericea* and predicted the invasion hotspots for present and future (RCP's 2.6 and 8.5 covering 2050 and 2070). The model predicted a global increase in the suitable habitat for the potential invasion of this species under climate change. The total potential area of invasion based on current environmental variables is 272684 km^2, with an additional 32600, 19967, 66958 and 104763 km^2 becoming suitable under RCP 2.6 (2050 and 2070), RCP 8.5 (2050 and 2070) respectively. The risk analysis showed South Africa as the high-risk and Europe as the low-risk region respectively to the potential invasion of this species under both current and future climate change scenarios. The global distribution modelling and risk assessment of *A. holosericea* has immediate implications in mitigating its invasion impacts under climate change, as well as predicting the global invasion hotspots and developing region-specific invasion management strategies. Distribution maps of risk of potential invasion can be useful tools in public awareness campaigns, especially in regions that have been identified as becoming climatically suitable for *A. holosericea* under the future climate scenarios.

Keywords: Climate change, Invasive alien species, MaxEnt, Risk analysis, Species distribution models

Awareness Towards Health, Hygiene and Nutrition Among Adolescent Girls in District Srinagar

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Abstract

Adolescence which is known as the transitional phase of growth and development between childhood and adulthood can bring up issues of independence and self-identity. Many adolescents especially girls face tough choices regarding perception of self, sexuality, career choices and social life. Early adolescence after the first year of life is the critical period of rapid physical growth and changes in body composition, physiology and endocrine. Adolescence is usually associated with the teenage years, but its physical, psychological or cultural expressions may begin earlier and end later onwards. For example, puberty now typically begins during preadolescence, particularly seen in females. Research is needed that focuses on adolescent girls' knowledge about their personal hygiene including their menstrual hygiene, difficulties they face during puberty and their dietary knowledge. Adolescent girls as we know are a sensitive group about whom more study is needed. Therefore, they should be given prominence by health researchers and in programs provided by the educated community, teachers, reform groups, health departments, media and other functionaries. The present study was conducted on a sample of 120 adolescent girls selected randomly from various degree colleges of district Srinagar. Data collected revealed that majority of the girls were in the age group of 19-20yrs and they were well aware about the proper health and hygiene measures. While most of them had good dietary patterns and consumed balanced diets, there were still plenty of girls relying on the junk foods. Since adolescence is an important time that demands for health and nutrition education, it requires proper knowledge of health, diet and hygiene. Lack of timely information and guidance on these matters may certainly cause complications for individuals in adulthood.

Keywords: Adolescence, dietary patterns, self-identity, hygiene and nutrition.

In Vitro Flowering *in Ammi majus* L.

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Abstract

Ammi majus L (Apiaceae/umbelliferae) is well known for its horticultural significance. The seeds contain drugs used in Unani system of medicine. Since, *Ammi majus* L. is a seasonal plant it is hard to get the material in the entire year for the purpose of drugs. Keeping in view the medicinal value of this plant it has been tried to study *in vitro* for its callusing and morphogenic potentials. MS medium fortified with IAA (2mgl^{-1}) + Kn (1.5 mgl^{-1}) results in complete direct regeneration of the whole plant. So that the raw material can be made readily available as and when needed.

Keywords: Ammi *majus*; callus; leaf explants; nodal; regeneration; tissue culture.

Ecofriendly Management of Major Pests of Capsicum

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Abstract

Introduction Bell pepper (*Capsicum annuum*) commonly known as Shimla Mirch or Sweet Pepper, is one of the most popular and highly remunerative vegetable crops. Capsicum is an emerging and important off-season vegetable of North Western Himalayas and offers potential for boosting economy of farmers in the hilly regions. Among the plethora of constraints in capsicum cultivation, the attack by a large magnitude of insect pests and mites at different crop stages is of utmost concern. Over 35 species of insects and mites are reported as pests of capsicum among which thrips is the major pest infesting both under protected and open field conditions. The warm, humid conditions and abundant food under protected conditions provide an excellent, stable environment for pest development. Escalated public concern over extensive pesticide use and high pesticide residue levels in vegetables demanded the use of integrated pest management approaches in high pest attractive vegetable crops.The treatments with Solar light traps + insecticide molecules (Spinosad and Emamectin Benzoate) were found significantly superior over the treatments with insecticides alone. The combination of solar light traps and insecticides also resulted in significantly highest yield of capsicum, highest net returns and C:B ratio.

Keywords: Capsicum,Thrips,Insects and Mites Solar light traps, Spinosad,Emamectin Benzoate

Analytical Study of the Open Access Agriculture, Food and Veterinary Digital Repositories

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Abstract

Purpose: OpenDOAR is primarily a service to enhance and support the academic and research activities of the global community. OpenDOAR maintains a comprehensive and authoritative list of institutional and subject-based repositories. By 2003, a multiplicity of Open Access research archives had grown up around the world, mushrooming in response to calls by scholars, researchers and open access advocates to provide open access to research information. The main purpose of the study is to discover the composition of the repositories in the Directory of Open Access Repositories (OpenDOAR) based on the seven key parameters i.e. regional distribution, country-wise contribution, repository type, collection development, contents archived, language diversity and software used. The OpenDOAR was accessed to collect the related data to achieve the laid down objectives

Research design/methodology/approach: The study was initiated with analyzing the digital repositories on different parameters in the field of Agriculture, Food and veterinary sciences. After that data was collected and analyzed further.

Findings: The results show that Europe has contributed the highest number of repositories followed by the Asia among various regions whereas the USA contributes the maximum. Most of the repositories are institutional; accept contents in the English language.

Research Limitations/implications: The scope of this study is confined to Agriculture, Food and Veterinary repositories available in the Directory of Open Access Repositories (OpenDOAR). Hence, the findings can't be generalized.

Originality/value: The present study is the primary effort to find the open access repositories in the field of Agriculture, Food and veterinary. The study will serve as a baseline for future research in this regard.

Keyterms: Open Access; Digital Repositories; Institutional Repositories, Agriculture Repositories.

Development of *Phoniex sylvestris*-based Agroforestry Models for Livelihood Security in Semi Arid Region of India

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Abstract

"Trees for life" is becoming very popular slogan in an international context. Trees have been the way of life since time immemorial for livelihood security and reducing vulnerability to climate-related risks. The utilization of trees and their products (*viz.* 6F's food, fruit, fibre, fertilizers, fodder and fuelwood) for the sustenance are intricately woven with indigenous, traditional, and farmers knowledge. In this context, one such important tree species of semi-arid tract of India is widely utilized for a number uses due to their multifarious benefits i.e. *Phoenix sylvestris* or date palm tree. This tree is widely growing near water bodies, road side, canal side, wastelands, farmland, households and railway track in Madhya Pradesh, Maharashtra, Gujarat, Uttar Pradesh, Rajasthan, Haryana, Bihar and Deccan plateau of India. Traditionally date palm juice for jaggery and toddy; leaves for brooms, mattresses, thatching material, baskets, ropes, tiffins, marriage crowns, fodder; fruits for edible purpose; stem for beams or construction material and trees for ornamental etc. are used in rural areas. The every part of the tree is useful and providing livelihood supports to tree dependent communities. This plant has been instrumental for landless traditional craftsmen in providing a substantial livelihood through their own indigenous wisdom. The agroforestry survey, exploration visits and interviews has provided very beneficial information about utilization and conservation status. In this paper, different case studies from Madhya Pradesh, Uttar Pradesh and Haryana have been discussed to understand the utilization pattern and livelihood dependency of this neglected species. Also the unscientific harvesting of date palm is hampering the growth and reproduction. Therefore, the "Kulpvruksha of semi-arid region" need to be domesticated in farmlands by developing suitable agroforestry models, which in turn will help in conserving this species and will also generate sustainable livelihood in drought hit semi-arid regions.

Keywords: *Phoenix sylvestris, livelihood, NTFP, agroforestry and semi-arid*

Seasonal Histopathological Alterations Caused by *Pomphorhynchus Kashmirensis* in *Schizothorax Niger* of Kashmir Valley

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Abstract

Liver and intestines effected by an acanthocephalan parasite viz. Pomphorhynchus kashmirensis along with their host (Schizothorax niger) were collected randomly. Pomphorhynchus kashmirensis causes damage to the intestinal tissues and induce complex host response, mainly, due to deeper penetration into the gut mucosa and worm burdens. The degenerative lesions of liver could be the result of various toxic metal concentrations in water in addition to the additive damaging effect of parasites. Histopathologically, the parasite induced various intensities of enteritis coupled with hyperplastic goblet cells with increased acid mucopolysaccharide concentrations.

Keywords: Pomphorhynchus kashmirensis; Schizothorax niger; hyperplastic; enteritis Histopathological effects by pollutants

Histomorphological Changes in Mammary Gland Affected With Acute Purulent Mastitis in Small Ruminants

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Abstract

The study was conducted to observe the pathological changes of mammary gland in acute purulent mastitis in small ruminants in Kashmir valley. A total of 582 samples were screened and 63 were positive for mastitis (10.82% prevalence) among them 19 samples showed acute purulent mastitis (3.26%), and were further graded as Grade I, Grade II and Grade III depending upon the severity and extent of the lesion. Grade II acute purulent mastitis was highest (42.1%) followed by Grade I (31.5%) and Grade III (26.3%). Grossly, the mammary glands and corresponding supra mammary lymph node were swollen (unilateral or bilateral), firm and sometimes reddish in colour. Histologically, the inter-alveolar areas showed degeneration, presence of bacteria and heavy infiltration of polymorphonuclear cells which were also prevalent in the alveolar exudate. The cases of Grade I showed degenerative changes in the acinar epithelium and revealed presence of few polymorphonuclear cells in the acini whereas Grade II included those cases where the involved lobules showed degeneration, atrophy of epithelium and infiltration of polymorphs both in the inter-alveolar and intra-alveolar spaces. Grade III mastitis was characterized by severe and extensive mastitis with loss of architecture of the lobules, infiltration heavy number of polymorphs, desquamation and dilatation of acini and presence of erythrocytes in the alveoli. Affected lymph nodes showed either lymphoid hyperplasia or lymphadenitis. The study of mastitis is important in small ruminants as the disease goes unnoticed leading to loss of milk production which in term affect the health of new borns feeding on dam's milk.

Keywords: acute purulent mastitis, polymorpho nuclear cells, inflammatory exudate, lymphoid hyperplasia, lymphadenitis.

Biodiversity: Scenario and Food security

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Abstract

Biodiversity and food security are connected in many ways. Across scales from genes to species, landscapes and biomes biodiversity is an important resource for humanity. Biodiversity helps regulate the nutrient and water cycle (floods) and mitigates impacts of climate change. Food security faces significant challenges due to population growth, poverty, globalization, climate change and other factors. Supplying healthy food to all citizens is crucial for global development to reach it, not only food production but also equitable access to food for all people must be improved substantially. Agriculture and biodiversity have often been regarded as separate concerns. Although biodiversity underpins much of modern agriculture, the development of contemporary production systems has resulted in extensive land conversion and concomitant biodiversity loss. In order to feed an ever growing population, innovative and acceptable ways of integrating biodiversity conservation and food production need to be identified. Maintaining diversity within agricultural systems is not a novel approach but one practiced by many smallholder farmers globally, in many different ways. The nutritional and livelihood benefits of diverse production systems are one way of achieving food security. Such systems are also more resilient to climate induced events or other shocks. Forests represent an important repository of food and other resources that can play a key role in contributing towards food security, especially if integrated into complex systems that are managed for multiple benefits. . Biodiversity loss and global food security are hence two major challenges of our time. Linking these two areas from a research perspective and seeking synergies between them are likely to generate multiple benefits for social, ecological and economic development.

Keywords: Biodiversity, Biodiversity conservation, Food security, Sustainable agriculture

Character Association and Path Analysis in Rice (*Oryza Sativa* L.) for Seed and Seed Vigour Traits

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Abstract

An experiment comprising thirty-five diverse genotypes of rice maintained at division of plant breeding and genetics of MRCFC, SKUAST-K, Khudwani was carried out to assess the nature and magnitude of association among different seed and seed vigour traits. Data on twelve seed and seedling characters was recorded and analysed statistically for correlation and path analysis. Association studies revealed that seedling length (mm), shoot length (mm), germination (%), root length (mm), seed breadth (mm) and 1000 seed weight (g) showed high and significant positive association with seed vigour index at both genotypic and phenotypic levels. Seedling length (mm) and germination (%) showed highest direct positive effect on seed vigour index at both genotypic and phenotypic levels. Hence, these traits should be given priority in rice improvement programme and keeping in mind the importance of seed.

Keywords: Seed, seed vigour, Correlation, Path and *Oryza sativa* L.

Molecular Characterization of Cowpea (*Vigna unguiculata* (L.) Walp.) Germplasm for Yellow Mosaic Virus (CYMV) Resistance in North-western Himalayas of State Jammu and Kashmir

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Abstract

Cowpea (*Vigna unguiculata* (L.) Walp.) is one of the most important grain legume crops in the world. It possesses high protein content (23-29%, with potential up to 35%) and has the ability to fix atmospheric nitrogen and thus improves soil health. The productivity of cowpea is greatly affected by a number of biotic stresses including fungi, bacteria and viruses. However, viral diseases including attack of yellow mosaic virus (CYMV) are considered major limiting factor for low productivity of cowpea worldwide. Therefore, the present study was undertaken toscreen a set of >350 cowpea genotypes at the Research farm of the Division of Genetics and Plant Breeding, Faculty of Agriculture, Wadura, Sopore for cowpea yellow mosaic virus (CYMV) resistance. The analysis of the results indicated that ~38 genotypes were highly resistant and 46 were moderately resistant to CYMV. The CYMV cowpea lines will be used in cowpea breeding programs to enhance CYMV of local cowpea genotypes and release of next-generation CYMV resistant cowpea varieties. The data will also be used to work out marker-trait associations through genome-wide association studies for CYMV. The most promising, major and stable QTLs/genes for CYMV resistance will be used in cowpea molecular breeding programs.

Key-words: Cowpea; cowpea yellow mosaic virus (CYMV), QTLs/genes, Molecular Breeding

Food insecurity and environmental degradation: The Exacerbating Factors for Global Climate Change.

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Abstract

The most important global issues of the present century include abrupt climate change, food insecurity, and environmental degradation. Climate change is caused by emission of greenhouse gases through anthropogenic activities including land use change, deforestation, biomass burning, draining of wetlands, soil cultivation and fossil fuel combustion. Despite the increasing use of fossil fuel, about 31% of global carbon emissions come from tropical deforestation and indiscriminate use of agricultural practices. Food insecurity affects about 815 million people globally challenging the 2030 Agenda for Sustainable Development and the UN Decade of Action on Nutrition (2016–2025) to accomplish the global goals of ending hunger, malnutrition and poverty by 2030. By 2050, the risks of hunger and child malnutrition could increase by up to 20% due to climate change. Achieving food security under a changing and uncertain climate requires enhanced access to adequate and nutritious food and capacities to cope with the risks posed by climate change on the one hand, as well as substantial increases in food production on the other. Thus, increasing food production requires identification of suitable eco-regions for bringing new land under production in addition to the intensification of agronomic production on existing agricultural lands. Biological ecosystem continuously encounters pollution caused by heavy metals, organic micro-pollutants and acid rain. These pollutants have a negative impact on the terrestrial food chain and the soil system of the earth. Dramatic increases in crop productivity in modern agriculture has also resulted in environmental degradation in terms of soil erosion, pollution by pesticides, salinization. Environmental measures which include interventions on land and water in the range of ecosystems spanning the agriculture, forest and live stock sectors, should be assessed in terms of impact on both productivity and ecological functions and also for the effects they will have on ecosystem stability, resilience, human livelihoods and the global support system.

Climate Change: Adaptation and Mitigation Strategies in Agriculture

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Abstract

Climate is the one of the important factor for agricultural production. The climate change effects on agriculture will differ across the world. This study reviews the adaptation and mitigation strategies in agriculture to cope up with effects of climate change. Adaptation is the process of adjustment to actual or expected climate and its effects in order to either lessen or avoid harm or exploit beneficial opportunities. Mitigation is the process of reducing emission or enhancing sinks of greenhouse gases (GHGs), so as to limit future climate change. The main strategies involve promoting agro-forestry systems, enhancing management of agricultural waste, promoting efficient fertilizer utilization, promoting good agronomic practices and technologies, alternative farming systems, promotion of indigenous knowledge, integrated crop and pest management, make better use of climate and weather data, weather forecasts and other management tools, create awareness on the negative etc.

Keywords: Climate change; agriculture; adaptation; mitigation

Advances in Mechanisms of Cold Stress Tolerance in Plants

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Abstract

Being sessile organisms, plants are unable to escape from many abiotic and biotic stressors that cause a departure from optimal conditions of growth and development. Low temperature represents one of the most harmful and detrimental abiotic stresses affecting plants. Whether, and to which extent a plant becomes damaged by exposure to low temperature depends on many factors, such as its developmental stage, the duration and severity of frost, the rates of cooling (and rewarming) and whether ice formation takes place intracellularly or extracellularly in the intercellular spaces. Intracellular ice formation, by disintegration of the cellular membranes, is known to be inevitably lethal. Species adapted by natural selection to cold environments have evolved a number of physiological and morphological means to improve survival in the face of extended cold periods. Conventional breeding techniques have resulted in only modest improvements of cold tolerance through inter-specific or inter-generic hybridization. Besides, *in vitro* induced variations have also been applied to improve the abiotic stress tolerance of various crop plants but without much success. Biotechnology offers new strategies that can be used to improve plant freezing tolerance and result in increased plant productivity and expanded areas of agricultural production. Identification of the key genes underlying cold stress has thus become a major priority in the search for improved crop winter hardiness. A deeper understanding of the regulation of these genes, and of their response to low-temperature stress, would allow clarification of the ways in which plants adjust to the stress. Knowledge of this type is widely expected to provide opportunities for the manipulation of gene expression in crop plants, with a view to engineering higher levels of cold tolerance.

Plant Resistance Mechanisms to Cold Stress

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Abstract

Plants cannot escape from many biotic and abiotic stresses being sessile, which affects their optimal conditions of growth and development. Low temperature constitutes one of the most harmful abiotic stresses affecting plants. The degree to which a plant becomes damaged by exposure to low temperature is governed by many factors such as developmental stage, severity of frost, the rates of cooling and whether ice formation takes place intracellularly or extracellularly in the intercellular spaces. Number of physiological and morphological means to improve survival in the face of extended cold periods have been evolved by crop species adjusted by natural selection to cold environments. Although conventional breeding techniques have resulted in modest improvements of cold tolerance through inter-specific or inter-generic hybridization but biotechnology offers new strategies that can be used to improve plant freezing tolerance and result in increased plant productivity and expand areas of agricultural production. Besides, *in vitro* induced variations have also been applied to improve the abiotic stress tolerance of various crop plants but without much success. Thus, the use of biotechnological interventions for identification of the pivotal genes underlying cold stress has thus become a major priority in the search for improved crop winter hardiness. Major study and understanding of the regulatory pathways of these genes and of their response to low temperature stress would facilitate clarification of the ways in which plants adjust to the stress. Knowledge of this type is widely expected to provide opportunities for the manipulation of gene expression in crop plants with a view to engineering higher levels of cold tolerance.

Keywords : Cold stress, cold acclimation, CBF/DREB

Comparative Efficacy of Novel Synthetic Peptides and Listeriolysin O-based ELISA for Rapid & Reliable serodiagnosis of Listeric Infections in Ovine Population.

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Abstract

The present study was aimed to develop and evaluate virulence marker Listeriolysin-O (LLO) peptide based ELISA for rapid and reliable serodiagnosis of Ovine listeriosis generally caused by two pathogenic strains of *Listeria* species namely *L. monocytogenes* (LM) and *L. ivanovii* (LI). A total of 200 clinical samples comprising of blood (30), vaginal swabs (47), faecal swabs (47), brain tissues of fetus (7), abomasal tissues and contents of fetus (10) and sera (59) were screened from organized sheep farms of Kashmir region. After standard isolation and biochemical confirmation the overall prevalence of *L. monocytogenes* was found to be 2.83%. Serologically, indirect plate ELISA revealed positivity for antibodies against listeriolysin O (ALLO) in 32(54.2%) out of 59 sera samples which after adsorption with streptolysin O (SLO) reduced to 14(23.7%), indicating the need for sera adsorption for removal of cross-reactivity. Two synthetic peptides (LLO-1 and LLO-2) representing major antigenic domains of Listeriolysin-O (LLO) were identified, analyzed, synthesized and were employed in indirect ELISA. On screening LLO-1 peptide an overall seropositivity of 18.6% was observed which after adsorption of sera with SLO reduced to 10.1%, whereas with regard to LLO-2 peptide the seropositivity was 15.2% before SLO adsorption which after adsorption was found to be 6.7%. Overall, result of seropositivity with LLO-1 and LLO-2 peptides revealed comparatively less cross-reactivity with that of native LLO. Moreover, an interesting observation was noted during the course of the study, wherein native LLO and LLO-1 peptide based ELISA detected antibodies even in non-pathogenic isolated *Listeria* spp., whereas LLO-2 peptide was found to be specific for L.M isolated cases only. In conclusion, LLO-2 peptide based indirect ELISA holds great promise for specific serodiagnosis of listeriosis in field. Besides this, an excellent correlation was observed between *in vitro* and *in vivo* pathogenicity test, wherein the standardized mPCR targeting virulence associated genes could serve the purpose of rapid and reliable diagnosis of pathogenic *L. monocytogenes* by *in vitro* method.

Comparison of Haematological Parameters and Iron Status of Sheep Reared in Different Managemental Conditions.

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Abstract:

A study was conducted to evaluate the egg load in sheep reared in two different conditions and its effect on vital parameters. A total of 17 sheep of either sex and uniform age were selected. Among the 17 sheep, 8 were selected from unorganised sectors and nine sheep were selected from organised sector. Two ml of blood was collected from jugular vein in EDTA vacutainer for assessing the haematological parameters and 2ml in heparinised vacutainer for estimation of iron content. A significant change was observed in haemoglobin, total erythrocyte count and total leukocyte count between the two groups, however no significant change was observed in packed cell volume and differential leukocyte count. A Significant change was also observed in total iron content between the groups.

Comparison of mineral status of sheep reared in different managemental conditions

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Abstract

A study was conducted to evaluate the egg load in sheep reared in two different conditions and its effect on vital parameters. A total of 17 sheep of either sex and uniform age were selected. Among the 17 sheep, 8 were selected from unorganised sector and nine sheep were selected from organised sector. Two ml of blood was collected from jugular vein in heparinised vacutainer for estimation of calcium, phosphorus, magnesium and iron content of different sheep. A significant change was observed in calcium and phosphorus content between the sheep reared in different conditions. Iron status of sheep reared in unorganised sector was more compared to organised sector, however no change was observed in magnesium content between the two groups.

Comparison of Radiographic and Rumenotomy Findings in Animals Suffering from Traumatic Reticuloperitonits

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Abstract

The spresent study was conducted on 10 animals suffering from traumatic reticuloperitonitis which were treated with conventional therapy that included antibiotics and a reticular magnet but did not show any clinical recovery by 3rd day of treatment. On second radiograph taken on third day of treatment multiple foreign bodies were found attached to magnet. On 4th day rumenotomy was performed by standard procedure over the left flank under paravertebral anesthesia. Rumenotomy revealed that offending foreign body had perforated more than 3/4th into reticular wall in 9 animals while in remaining animal the offending foreign body was non-ferromagnetic in nature. Multiple additional foreign bodies were found attached to magnet in all the animals. Over all 30 foreign bodies were recovered from 10 animals on rumenotomy out of which 18 were attached to magnet, 3 were free and rest 9 perforated into the reticular wall. Two out of these 3 free foreign bodies included a hypodermic stainless stain needle and a copper wire. Non-ferromagnetic nature of these two foreign bodies was the reason for their non-attachment to the administered magnet. Therefore rumenotomy is indicated in animals with TRP which do not respond to magnet therapy in first 3 days. Furthermore the sensitivity of radiography in detecting foreign bodies considerably improved after magnet administration. Magnet administration also aids in determining the nature of offending foreign bodies. Six animals recovered and 4 died after rumenotomy due to altered hemogram.

Keywords: Traumatic reticuloperitonitis, foreign body, radiography, reticular magnet

Exploiting Wild Relatives for Genomics-Assisted Breeding in Walnut

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Abstract

A survey was done to characterize walnut germplasm in Jammu province at different walnut growing areas, to select promising accession and assess variability in their physiological and morphological characteristics. During survey different promising strains have been identified which show disease resistance and pest resistance like blight disease, anthracnose and good quality nuts with respect to kernel percentage, kernel colour, oil content and protein content can be exploited for breeding purpose. Some lateral bearing genotypes were found which are useful for increasing yield in walnut and mitigation of effect of climate change. These genotypes can be used as gene sources for introgression of different traits in the known cultivar through marker assisted selection (MAS) to increase the fruit yield and quality. Therefore there is an urgent need for further exploration in these areas for collection and characterization of better genomic resources for different traits to improve the yield and quality.

Keywords: Walnut, Genotypes, Diversity, Qualitative, Quantitative.

Use of Fenugreek Seed Extract for the Development of Functional Patties from Spent Hen Meat

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Abstract

The functional value of meat products can be improved by different interventions and incorporation with plant based natural ingredients is one such possibility. Hence, a study was designed to evaluate the effect of incorporation of Fenugreek Seed Extract (FSE) at four levels; 2.5% (T1), 5% (T2), 7.5% (T3) and 10% (T4) replacing chilled water in the formulation of the product. Cooking yield of spent hen meat patties showed a non-significant (P>0.05) increase with increase in levels of Fenugreek Seed Extract. The percent protein as well as fat content showed a non-significant (P>0.05) difference among all the treatments including control. The percent ash content of 10% level was significantly (P<0.05) higher than control while as a non-significant difference was found between control and all the other treatments. The antioxidant activity in terms of DPPH-RSA value showed a significant (P<0.05) increase with increase in the levels of Fenugreek Seed Extract and was higher at 10% FSE incorporation. Sensory evaluation of the products revealed a non-significant (P>0.05) difference in various attributes of control and all the other treatments. With advancement of storage period, the pH and TBARS showed significant increase while as moisture and DPPH-RSA values followed significant decrease (overall mean at day 0 and 21: 6.20, 6.33 for pH; 0.14, 0.32 for TBARS; 67.72, 63.05 for moisture and 62.07, 38.39 for DPPH-RSA, respectively). Further, the total plate count showed significant increase from day 0 (0.77) to day 21 (3.43). Coliform count showed growth after day 14 (0.21) which increased significantly to 0.71 on day 21 whereas, Yeast and Mould showed growth on the last day (day 21). However, the values for all microbial parameters were within acceptable limits throughout the storage period. Although, the sensory scores decreased with storage period for all attributes but remained acceptable throughout the period. Thus, it was concluded that Fenugreek Seed Extract can be efficiently incorporated in spent hen meat for the development of functional spent hen meat patties without having any adverse effects during the refrigerated storage under aerobic conditions.

Key words: aerobic, functional, patties, sensory, spent hen

Genetic transformation: A tool for management of abiotic stress in horticultural crops

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Abstract

In the face of a global scarcity of resources, abiotic stresses like water stress, temperature stress, mineral stress, oxidative stress are major limiting factors in plant growth and development and will soon become even more severe as desertification covers more and more of the world's area. The extremes of the major environmental conditions, namely soil moisture, salt concentration and temperature, limit the growth, development, productivity and geographical distribution of agricultural crops across the globe and reduce potential crop yields by as much as 70%. The response of plants to environmental stresses depends on the plant developmental stage and the length and severity of the stress. Plants may respond similarly to avoid one or more stresses through morphological or biochemical mechanisms. Adapting horticulture to future conditions is essential to meet the need of the growing population and increasing demand for vegetables, and other horticultural products. Employing transgenic technology (genetic transformation), functional validation of various target genes involved in diverse processes, can be attempted through various approaches viz., engineering of genes for Osmolyte biosynthesis, engineering of genes encoding enzymes for scavenging reactive oxygen species, engineering of genes encoding LEA Proteins, engineering of genes encoding heterologous enzymes with different temperatures, genetic engineering of molecular chaperones, engineering of genes encoding transcription factors and genetic engineering of cell membranes.

Keywords: Abiotic stresses, transgenic technology, crop yields.

Global climate change: Issues and Challenges

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Abstract

The way we humans are living our lives is affecting the environment and these changes in the environment can sometimes spell big trouble for human itself. The climate is changing and the earth is warming up. This global warming is on increase continuously and species and their habitats on the decrease, chances for ecosystems to adapt naturally are diminishing. Global warming refers only to the Earth's rising surface temperature, while climate change includes warming and the side effects of warming - like melting glaciers, heavier rain storms, or more frequent drought. For the past 150 years, the average temperature of the Earth's atmosphere and oceans has been rising, and the pace of this change in our climate appears to be accelerating. After decades of research and hundreds of studies, an overwhelming majority of scientists have come to believe that human activities, especially the burning of fossil fuels are a major cause of this trend toward higher temperatures. Carbon dioxide levels are now approximately 40 percent higher than they were at the start of the Industrial Revolution, and they have reached levels not seen in the atmosphere in 20 million years. The increase in heat waves, episodes of extreme rainfall, and the intensity of hurricanes may be related to climate changes caused by global warming, and that we can expect harsher weather if the warming trend is allowed to continue. Droughts Rising temperatures may increase the number of droughts, which will in turn affect food crops and water availability across the globe. Coastal Flooding Global warming is already creating higher sea levels as glaciers melt and the warming oceans expand. A growing concern is that the large ice sheets of Greenland and West Antarctica will likely melt more quickly in the future, accelerating the rise in sea levels and threatening many coastal communities.

Diversity, Biomass Accumulation and Carbon Storage of Shrub Community in a Foothill Forest of Indian Eastern Himalayas

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Abstract

Understorey vegetation especially the shrub is a dynamic layer of the forest strata. Shrub communities are very useful for protecting the soil and water regimes and improve productivity and soil fertility. However, as compared to trees, studies on shrub diversity and ecology still remains neglected. Thus a study was carried out at sub-humid tropical foothill forest of West Bengal, India to document the status of shrub diversity, biomass and carbon accumulation. Qualitative and quantitative characters were analyzed with help of random quadrate sampling method. Species richness of the shrubs in the forest was 32. The shrub diversity index, concentration of dominance, Shannon and Wiener index and evenness index was estimated as 0.73, 0.037, 2.87 and 1.89, respectively. Relative frequency varied from 0.22 to 2.00. Density ranged from 0.84 to 4.56.11 individuals ha^{-1} and relative density ranged from 0.08 to 1.25 %. Relative abundance ranged from 0.14 to 1.79 %. IVI values ranged from 0.47 to 3.71. This indicates the the shrub communities in the forest diverse but dominance distributed with less skewed IVI values. Biomass and carbon storage of shrub communities in the was 4.90 and 2.21 Mg ha^{-1}, respectively. Stems contributed the most to the total shrub biomass and carbon storage. Shrub communities were recorded with good growth inside the forest which was reflected in their good quantity of biomass accumulation and thus have a great potential to store good quantity of biomass carbon and support the ecosystem.

Keyword: Shrub; Carbon; Biomass; Diversity

Herbal de-wormers- An alternative to chemical Control

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Abstract

Organic animal husbandry or Organic livestock farming may be defined as a system of livestock production system that promotes the use of organic and biodegradable inputs from the ecosystem in terms of animal nutrition, animal health, animal housing and breeding. It deliberately avoids use of synthetic inputs such as drugs, feed additives and genetically engineered breeding inputs, while ensuring the welfare of animals. The international demand for organic products has increased significantly in recent years, suggesting that the production of food and fibre with minimal or no chemical input is a desirable characteristic of organic farming systems. Currently, chemotherapy is used extensively to control helminth parasites, but the worldwide and rapid development of drug resistance especially of small ruminants and equines coupled with increasing costs of developing new drugs and public`s distrust of drug treated meat, it is important to look for safer and eco-friendly anti-helminthic agents. There has been resurgence in the use of medicinal plants to treat cases of parasitism in ruminants and much of the success has been achieved in this direction against a variety of parasites. Herbal dewormers are used extensively and quite effectively for primary health care treatment to make domestic animals productive and healthy. Herbal dewormers are characterized by various mixtures of dried plants/plant products such as *Artemisia absinthium* (wormwood), *Allium sativum* (garlic), *Juglans nigra* (black walnut), *Cucurbita pepo* (field pumpkin), *Artemisia vulgaris* (mugwort), *Foeniculum vulgare* (fennel), *Hyssopus officinalis* (hyssop) and *Thymus vulgaris* (thyme). Many of these plants have displayed efficacy against nematodes and other parasites of humans and animals. The paper seeks to review certain key debates regarding use of Herbal dewormers as an alternative to chemical control and as a support to evolving the notion of organic farming.

Keywords: Herbal dewormers, chemical control, Organic farming

Gyps himalayensis: A Natural scavenger of Himalayas

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Abstract

Gyps himalayensis is the largest and heaviest bird found in the Himalayas. They act as nature's cleaners. They feed on carcasses of different sizes and hence prevent the spread of disease to other animals and humans. But unfortunately, in Indian sub-continent the population of Vultures declined drastically since 1990s. Usage of diclofenac to treat farm animals was attributed to this decline. The other threats to Vultures include- habitat loss, infectious diseases, environmental contaminants, low food availability and human interference. To provide diclofenac free carcass by implementing ban on diclofenac, to maintain captive breeding centres and to minimize disturbance to Vultures are some of the suggested measures for conservation of vultures in general and *Gyps himalayensis* in particular.

Key words: Gyps himalayensis, natural scavenger, Cleaner, habitat loss, diclofenac, captive breeding

ICT: A Path Towards Modernization and Technology Building Among Farmers

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Abstract

ICT or the information and communications technology is the aggregate of all the technologies that embraces or helps in circulating the latest information related to agriculture, livestock, market, weather conditions etc, to the farmers who are in utmost need of it. The ICT is the most preferable way to enunciate the outreach of Agricultural Extension in the country. Now with the development of ICT tools like cellular phones, computers, radio, television, internet, the farmer can get better access to the desired information pertaining to different soil types, crops, desired livestock products, national and international markets, marketing options, demand of the consumers and the necessary ways to increase the production efficiency. The relevant information about such things will in turn benefit the farmers in getting better returns from the various resources available and thereby will help them in maximizing their profit along with improvement in the quality of their life. With the coming up of new (ICT) measures like Drishtee, e chaupal, Gyandoot, kisan kerala, e-krishi etc, there has been abatement in the gap between urban and rural people which somewhat has led to better income generating options, social integration and poverty reduction and has avoided the digital divide. The latest development in the ICT tool is the blooming up of mandatory Aadhar cards which has empowered the people including farmers to be given access to monetary benefits by establishing the correct identity and in turn has helped in expanding rural economy and is a leading step towards modernization.

Keywords: ICT Tools, Production efficiency, Farmers, Profit, Digital divide

Doubling The Farmers' Income Through Integrated Farming System

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Abstract

Livelihood security, nutritional improvement, agricultural sustainability and environmental safety have been major concern of Indian agriculture in context of small-farm holders representing more than 86% of farm families. Past experience has clearly demonstrated that the income from cropping alone is hardly sufficient to sustain the farmers' needs. The integrated farming systems (IFS) approach is considered to be the most powerful tool to enhance the profitability of farming systems, especially for small and marginal farm-holders. It can be concluded that diversification of existing farming systems with changes, addition or improvement of crop and livestock components and inclusion of horticulture are essential to improve on-farm income of small holders with environmental restitution. Diversification of existing farming systems clearly demonstrated the advantages in terms of production increase and employment generation. IFS paves way for meeting with the household demands of balanced food, improved recycling of nutrients and water besides increasing the on-farm employment for family. Recycling and intermittent use of products and by- products within the system could save in cost to the extent of 45% and even more.

Keywords; IFS, diversification, employment generation, profitability, nutrient recycling

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Impact of Climate Change on Vegetable Crops

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Abstract

Vegetables are considered as protective foods because of ability to prevent diseases by supplying vitamins and minerals and moreover their nutritional quality is determined by Soil factors like temperature, light and carbon dioxide. So, a little change in these parameters will bring a drastic change in the quality there by affecting the nutritional value of the vegetables. Vegetables crops, like other agricultural crops, are sensitive to climate variability. Climate change has an adverse impact on productivity and quality besides aggravate the environmental stress on vegetable crops. Environmental stresses like increasing temperature, reduced irrigation water availability, flooding and salinity are thought to be the major limiting factors in enhancing vegetable productivity. Climatic fluctuations are also known to affect post-harvest quality of vegetables and cause severe losses and affect food safety during storage. These also influence the pest and disease occurrences, host-pathogen interactions, distribution and ecology of insects, time of appearance, migration to new places and their overwintering capacity, there by becoming major setback to vegetable cultivation. To mitigate the adverse impact of climatic change on productivity and quality of vegetable crops there is need to develop sound adaptation strategies and integrated approaches like cultural management practices including nutrient and tillage residue management, water management, mulching, improved pest management, and breeding approaches like development of genotypes tolerant to high temperature, salinity, moisture stress should be resorted.

Keywords*:* Climate change, vegetables, quality, environment, productivity

Comparative evaluation of two lytic bacteriophages in biofilm disruption of pathogenic *Staphylococcus aureus* isolated from bovine mastitis using confocal microscopy

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Abstract

Antimicrobial resistance is presently the biggest challenge faced by human and animal health-care system. The situation has worsened due to proliferation of biofilm forming community of pathogenic microrganisms, to which currently available antimicrobials agents are not able to penetrate and eliminate completely. Proliferation of such bacteria can lead to significant economic losses in the agri-food sector.The present study demonstrates the potential of two lytic *Staphylococcus aureus* bacteriophages in disruption and disintegration of biofilm forming *staphylococcus aureus* strains isolated from cases of acute and chronic mastitis from bovine. The biofilm forming abilities of strains was ascertained using genotypic screening for *ica A, ica C* and *FnBPA* gene loci associated with biofim formation. SA-3 strain was positive for all the genes and formed dense biofilm as revealed by confocal microscopy. The study revelaed that of the two lytic phages tested in present study one SAJK-IND(Gen Bank:2041337) exhibited 100% eradication of *Staphylococcus aureus* biofilms where as MSP a podoviridae phage could only remove upto 60% of biofilms.

Key words: Biofilm, Confocal, Disruption, Phage, *Staphylococcus aureus*

Innovative technology of Crop improvement in the 21st century

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Abstract

Crop yields increased dramatically in the 20th century as recorded in world averages. The vast majority of that increase has occurred since the last world war and has been powered by changes in the genetic potential of the crop and in the way in which it has been managed. Nevertheless, the challenge to feed a world population that is likely to rise to 8 billion is formidable, particularly since recent analyses suggest that the rate of increase in yields of several crops may have dropped over the last decade. Improvements in agronomy are likely to be more concerned with efficiency and elegance rather than in major breakthroughs. More sophisticated crop protection chemicals designed on the basis of vastly increased screening potentials to aid management choices which can be precisely implemented. Genetic improvement is the area in which to look for the major breakthroughs. The broad potential of recombinant DNA technology will provide the possibility of both molecular analyses of crop productivity and ways in which it may be possible to improve that productivity. The goal of analysis may be approached in three ways: starting at the beginning by generating complete sequences of the plant genome; starting at the end by genetic analysis of phenotypes using genetic marker technology; or, starting in the middle, by metabolic analysis. Improvements may be obtained by re-assorting what has been achieved through enhanced breeding technologies, by randomly induced change, and by generation of totally new possibilities through biochemical engineering. The onset of genomics will provide massive amounts of information, but the success will depend on using that to improve crop phenotypes. The ability to meet the challenges of the 21st century will depend on the ability to close that 'phenotype gap'.

Keywords: Genetic improvement, recombinant DNA technology, metabolic analysis, phenotype gap

Parental Characterization and Study of Marker Trait Association for Earliness in Wheat (*Triticum aestivum* L.)

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Abstract

One of the most important wheat breeding objectives for our Kashmir region is for cultivars that fit in the rice–wheat crop rotation, which will ensure food security for the people in this region. Development of extra early maturity wheat varieties will help to fit in Rice-Wheat double cropping system. To make this rotation successful, we screened wheat germplasm/ nurseries received from national partners like Indian Institute for Wheat and Barley Research (IIWBR), Karnal, Haryana, and from international institutes like Borlaug Institute for South Asia (BISA), CIMMYT. The screening led to the identification of six (06) early maturing lines from material provided by national partners, and a set of 25 early maturing lines were procured from BISA. The material was evaluated at two locations in Kashmir, including the Faculty of Agriculture, SKUAST–K, Wadura, Sopore (extreme northern Kashmir) and at the Mountain Research Centre for Field Crops (MRCFC), Khudwani, Anantnag (extreme southern Kashmir). In order to develop the bi-parental mapping population, crosses were attempted between the extra-early maturing lines as well as with the winter wheat lines and F_1 seeds were obtained for ~140 cross combinations. The F_1 seed were planted in the greenhouse in order to obtain F_2. The F_2 population along with the parents were evaluated and data was recorded in the main season (Nov 2017-June 2018). The wheat lines have been characterized using 26 unlinked SSR markers and the markers/ QTLs/genes already reported for early maturity/ flowering time in wheat. In addition the data generated will be used in the study of genetic diversity and study of marker-trait associations for earliness and associated traits. The useful/important markers identified will be used in future wheat molecular breeding programs for manipulating wheat maturity period.

Keywords: Wheat; Gene; Winter wheat; Trait evaluation; Marker-trait association; Genetic diversity; QTLs; Mapping population

Knowledge Management in Agriculture

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Abstract

Agriculture continues to be the most important activity man has pursued throughout ages and it will continue until man has to eat and wear. Growing populations, shrinking farm lands , climate change and so many other problems have further increased the role of agriculture . sustainable agriculture that could meet the present and future needs of mankind is the hot research topic that is being researched in labs of almost every country. The research done in agriculture universities and research centres has bought a revolution which has reduced global hunger . Knowledge produced in labs need to be disseminated to the farmers so that they can apply it . The lack of exchange of knowledge among and between farmers, and those who produce of farm-relevant knowledge, has often been regarded as the key issue in pro-poor agricultural development. For that reason, many agricultural extension and development programmes, run by both governments and international donor agencies, have focused on diffusing knowledge to farmers who, in turn, were expected to gain from applying this knowledge in their production practices. This calls for an effective knowledge management practices .In this back drop the paper discusses the role of knowledge management in agriculture

Keywords: Agriculture Extension , Knowledge Management , communication

A Study on Awareness about Zoonotic Diseases Among Livestock Farmers in 2014 Flood Affected Areas of Kashmir Division in J&K State

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Abstract

A study was conducted to gather information related to awareness about Zoonotic diseases in three severely flood affected districts of Kashmir division viz Pulwama in South, Srinagar in central and Bandipora in north of Kashmir. Four affected villages were randomly chosen from two flood affected blocks where from 10 livestock farmers from each village were randomly chosen making a sample size of 240 respondents for the study. Variables selected for the study included the awareness about zoonosis and knowledge about existence of specific zoonotic diseases. Data was collected through structured interview schedule developed for the purpose. The findings revealed that more than half of the livestock owners had awareness about disease transmission between humans and animals. About 43.75% respondents had Knowledge about existence of Foot and Mouth disease followed by awareness about bird flu (24.17%). The trend with respect to awareness level was observed to be as FMD>Bird-flu>Rabies Brucellosis> Bovine Tb respectively. However a major good number of respondents (26.25%) perceived milk as a possible source of contamination for any disease outbreak followed by aerosol route of transmission and Direct contact was perceived to be the least source of contamination for any disease outbreak. The overall picture revealed that the awareness level with respect to existence of specific zoonotic diseases and knowledge about possible source of contamination was very low and the need of the hour is to create awareness amongst the livestock owners in the study area regarding the same.

Keywords: Zoonosis, Livestock, Awareness level, contamination, Knowledge

Chromosomal Stability of Feline Cultivated Adipose Derived-Mesenchymal Stem Cells for Clinical Application

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Abstract

Karyotyping was performed to assess the chromosomal stability in feline adipose derived mesenchymal stem cells (fAD-MSCs) in different passages. Analysis of all the passages showed that the fAD-MSCs had a normal diploid karyotype with 38 chromosomes. No chromosomal aberration was observed in the cells from all passages (from P0 to P3), which indicated that the cells did not mutate during *in vitro* culture condition. In conclusion, the present study demonstrated that fAD-MSCs maintained stable immunophenotype and chromosomal structure which provided an experimental basis for safety of fAD-MSCs in cytotherpy.

Keywords: Feline, Chromosomal stability, Stem cells and Adipose tissue**.**

RESPONSE OF CHICKPEA (*Cicer arietinum L*) TO DI- AMMONIUM PHOSPHATE AND PHOSPHATE SOLUBILIZERS ON ITS YIELD AND YIELD ATTRIBUTES .

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Abstract

The investigation was carried out to study the response of chickpea-1 (SKUA-C2331). to Phosphate and Phosphate solubilizers. The result reveal that application of Di ammonium phosphate (DAP) proved significantly superior to Phosphorus solubilizing Biofertilizer (PSB) with respect to dry matter, seed and straw yields and yield attributes like 1000- seed weight and number of pods per plant. However the application of DAP with phosphorus solubilizing biofertilizer (PSB) gave results not only at par with DAP but also significantly superior to DAP alone.

Keywords : Chickpea, DAP, PSB, , yield ,yield attributes

Introduction of Pigeon pea (*Cajanus cajan* L. Milsp.) in Kashmir Valley of North-western Himalayas for Diet Diversification

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Abstract

Pigeon pea is one of the most important nutrient dense grain legume crops in the world. In India, pigeon pea ranks second after chickpea as one of the most important grain legume crops. Common bean (*Phaseolus vulgaris* L.) is the only principal grain legume crop being consumed in Kashmir; therefore pigeon pea was introduced for the first time successfully in the Kashmir valley to help in diet diversification and overcoming micronutrient malnutrition. A set of eight extra-early, photo-insensitive determinate/indeterminate genotypes were tested initially at Research farm of the Division of Genetics and Plant Breeding, Faculty of Agriculture (FoA), SKUAST-Kashmir, Wadura (34° 17′ North and 74° 33′ E at analtitude of 1594 meters above sea level) and data was recorded for all important traits. The analysis of data revealed significant variation for all traits including days to flowering, days to maturity, yield and yield contributing traits, insect pest and disease resistance. Multi-location testing of two most promising (early maturing, high yielding and disease resistant) determinate genotypes is being done at several locations for the release of varieties for farmers of Kashmir valley. The introduction and adoption of this crop by farmers of Kashmir valley will help in diet diversification and thus overcoming malnutrition.

Keywords: Pigeon pea; Introduction in Kashmir; Diet diversification

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Mitigating the impact of Global Warming and Climate change

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Abstract

Research and extension activities should aim at reducing or cut down the emission of greenhouse gases. This may be achieved by altering some existing practices, adopting new technologies and learning from the experiences of other countries. Policies to reduce anthropogenic greenhouse gas emissions aim to redirect investment in critical infrastructure. Because this infrastructure will be in place for many decades, it will be inevitably subjected to intensifying effects of climatic change. Considering the demands of adaptation while planning for mitigation will help to ensure that both efforts are more effective. Given that scientific uncertainty makes precise impact prediction difficult, local policies that both protect populations from climate impacts while also reducing greenhouse gas emissions offer no regret options.

Keywords: Greenhouse gases, Infrastructure, Climatic change, Impacts.

Importance of Indigenous Technical Knowledge in Agriculture

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Abstract

An old African proverb states "when a knowledgeable old person dies, a whole library disappears." Indigenous technical knowledge is the information that people in a given community, based on experience and adaptation to a local culture and environment, have developed over years, and which is being continued to develop and evolve. It is the totality of all knowledge and practices, whether explicit or implicit, which are used in the management of socio-economic and ecological facets of life. Traditional farmers in India developed agricultural practices to successfully grow crops and raise animals in the highly diversified agroecological conditions with the help of locally available raw materials. The resource poor farmers with the help of highly efficient techniques that depend on locally available, low cost inputs get their livelihood. Most of these practices used in agriculture are highly sustainable. The practices for crop protection, field management used by traditional farmers are mostly cultural practices. These practices decrease the cost of cultivation of crops not only without adversely affecting yield but also by increasing the soil fertility. Traditional agricultural practice is very potent tool for improving the economic position of farmers and for banishing unemployment and underemployment, by better utilization of resources such as animals and machineries, water etc. Many studies revealed that, the farmers perceived that the cause of poverty in the form of indebted farmers, landless farmers, unemployed or only seasonally employed land labourers are all the direct or indirect result of a move towards modernization leaving traditional agriculture far behind. Thurston (1990) indicated that traditional agricultural practices must be understood and conserved before they are lost with rapid advancement of modern agriculture.

Effect of Potassium Bicarbonate, Sodium Bicarbonate And Potassium Phosphate on Alternaria Leaf Blotch of Apple Under Invitro Conditions on Ambri Apple.

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Abstract

Apple is the most important temperate fruit crop in Kashmir occupying the first most important position in Kashmir valley with annual production of 60 percent of total production in india.Apple is vulnerable to large number of fungal diseases as Apple scab, Alternaria leaf blotch Morssonina, Canker, Collar rot and root rot in which alternaria is the most important disease which drastically reduce the fruit production of apple due to pre-mature defoliation The present investigation entitled “Effect of potassium bicarbonate, sodium bicarbonate and potassium phosphate on alternaria leaf blotch of apple under invitro conditions on ambri apple The experiment was laid out in complete random block design Block with five treatments replicated thrice times. Studies showed significant effect on percent mycelial growth inhibition as potassium bicarbonate (83.4%), sodium bicarbonate (72%) and potassium phosphate (52%). Growth inhibition with maximum mycelial growth inhibition of 83.4% and minimum mycelia growth inhibition of 52%.

Keywords: Apple, Alternaria leaf blotch, organic fungicides, percent mycelial growth inhibition

Characterization, Classification and fertility status of the soils of KVK Jhajjar Haryana, North-west India

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Abstract

A detailed soil survey of Krishi Vigyan Kendra (Jhajjar), Haryana, was carried out to characterize, classify and evaluate soils of research farm for soil fertility. Geologically, the area constitutes part of Indo-Gangetic alluvial plains and belongs to the Pleistocene age. The climate of the area is semi arid and monsoonal type. The average annual rainfall is around 500 mm, about seventy percent of which is received during July to September. The morphological characteristics revealed that the soil colour varied from dark yellowish brown to yellowish brown with dominant hues 10YR to 7.5YR. The soils were sandy loam to loam in texture. The soils have medium subangular blocky structure. The soils of the study area were neutral to moderately alkaline. The irregular distribution of calcium carbonate present in few pedons was due to fluvial nature of soils. The water retention characteristics of horizons were strongly associated to texture with the finer soil showing higher retention and vice versa. The particle density, bulk density and total porosity varied from 2.60 to 2.67, 1.51 to 1.65 Mg m^{-3} and 37.50 to 46.24 percent, respectively and did not show regular pattern down the profile. The cation exchange capacity (CEC) varied from 6.46 to 15.77 cmol (p+) kg^{-1}. Among exchangeable cations, Ca^{2+} was the dominant cation followed by magnesium, sodium and potassium. The soils of the farm were placed under the order Inceptisols. All the soils were low in available nitrogen, low to high in available phosphorous and medium to high in potassium, therefore, the application of nitrogenous, phosphatic and potassic fertilizers is necessary to ameliorate nutrient deficiency and enhance crop production. Organic carbon was significantly correlated with N, K, Fe and Cu.

Keywords: Soil Survey, pedon, Entisols, Inceptisols, CEC, texture

Quality Planting Material (QPM) in Black pepper (*Piper nigrum* L.): Prospects and Possibilities

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Abstract

The base for successful crop production system is the use of quality planting materials. For enhancing the production, use of quality planting material is of utmost importance as it forms the base for horticulture development. All efforts put into improve the production and productivity of horticulture crops would go in vain, if the good quality planting materials are not used. Hence, there is a great need for production of sufficient quantity of quality planting materials and making it available to the beneficiaries at the right time for the success of crop production. One of the main focus areas in horticulture development has been the production of quality planting materials since 8th five year plan. Despite various interventions, the supply of quality planting materials has not improved significantly. Till today, a large number of nurseries continue to operate without any certification. Quality planting material production in vegetatively propagated crops like black pepper becomes prime importance in increasing area and production by considering its vast potential. The important criteria for the selection of the mother plant for obtaining planting materials are: vigorous growing vine having high quality characters, dry recovery and high yield and its attributing characters like long spikes, more number of spikes/unit area, bold berries, regular bearer and disease tolerance etc. Selection of mother plants should be in the age group of 5-12 years. Mark and label the selected mother plants in October-November. Pepper is propagated vegetatively through cuttings. Select runner shoots produced at the base of mother plants and keep them coiled and raised to prevent from striking roots in the soil. Separate them from the vines in February-March. The middle one-third portion of runner shoot is preferred for planting. Very tender and too hard portions of the shoots are to be avoided. The shoots are cut into pieces with 2-3 nodes in each. Leaves, if any, are to be clipped off leaving a small portion of the petioles on the stem. Dipping the lower cut end (up to 2 cm) of the cuttings in 1000 ppm solution of 3-indole butyric acid (IBA) for 45 seconds will increase root formation and development. Treating the cuttings with Seradix B2 is equally effective. But IBA treatment is cheaper and hence is recommended for large nurseries where technical supervision is available. Farmers and small-scale nurseries can conveniently use Seradix B2.

Prospects of Molecular Markers in Improvement of Medicinal Plants

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Abstract

The World Health Organization has estimated that more than 80% of the world's population in developing countries depends primarily on herbal medicine which are generally considered to play a beneficial role in health care. Henceforth, it is a very high time to characterize the medicinal plants with significant characters which can be made through genetic markers. DNA-based molecular markers have acted as very useful tools in various fields like taxonomy, physiology, embryology, plant breeding, ecology, genetic engineering etc**.** The conventional method used by plant breeders for the selection through phenotypic markers is limited by having its own kind of constraints. Molecular markers can be employed for characterization, since the progress made in genetic markers has been exciting. DNA markers are more reliable because the genetic information is unique for each species and is independent of age, physiological conditions and environmental factors which also has a great utility in the drug analysis and ultimately used for the characterization of medicinally important plant species. Extensive research is being carried out on molecular markers in many research institutes all over the world.

Keywords: molecular markers, DNA markers, hybridization based markers, medicinal plants, characterization

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ICT in Agriculture

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Abstract

Information Communication Technology(ICT) has brought a revolution in our daily lives.it has impacted every sphere of our life and agriculture is no exception. The modern communication technologies can help in bring the latest research from labs to fields which can revolutionise the agriculture. Farmers can learn new methods ,technologies of farming right at their door steps .The present paper is an attempt to highlight the role of ICT in agriculture and various initiatives taken in this regard in India

Traits Enhancing Grain Yield Of Rice Under Alternate Wetting And Drying (Awd) Under Favourable Climate

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Abstract

Water resources, both surface and underground, are shrinking and water has become a limiting factor in rice production which necessitates the development of alternative rice systems like alternate wetting drying (AWD) and direct seeded rice (DSR). Their wide dissemination combined with suitable improved rice varieties that best respond to local agro ecology has promising prospect in closing wide yield gap. The AWD system of irrigation is one of the most common water saving technique in practice which deals with problem of water shortage in irrigated rice cultivation and has the potential to contribute to more sustainable and effective water and energy use. In AWD, producer allows the rice field to dry intermittently during the rice life cycle rather than having the field continuously submerged. An experiment was conducted to evaluate four rice genotypes against two local checks (Govind and HKR-48) to identify stable high yielding genotypes with yield contributing traits better suited to AWD across variable ecosystem during 2016 at CCS HAU Rice Research Station, Kaul. Water saving upto 25 % was achieved without significant yield penalty under the AWD system. Longer sunshine hours during reproductive stage contributed to higher grain yield through better photosynthesis and grain filling. Optimum rains at intermittent intervals contributed to the vegetative growth and more tillering. Genotype IR 95780-43-1-1-1 was suitable under both AWD and submergence as it gave higher grain yield than local check Govind which was contributed by yield contributing traits like tillers/m^2, harvest index and 1000 grain weight. It also yielded numerically higher than another check HKR-48 (5312 kg/ha) under both the conditions. Genotype IR 97046-39-2-1-2 gave highest grain yield with the same yield contributing traits than local check in controlled condition. Genotypes IR 95870 43-1-1-1 (6719 kg/ha) and IR 97046 39-2-1-2 (7031 kg/ha) yielded significantly higher than local check Govind (3906 kg/ha) in submerged condition. Hence on the basis of overall performance, genotype IR 95780- 43-1-1-1was found stable in yield and shall encourage the farmers for cultivation to adopt AWD. For other genotypes yield did not differ significantly indicating that AWD could considerably enhance crop water use efficiency.

Dynamics of Agriculture Sector in Jammu & Kashmir State: The Time Series Analysis

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Abstract

Agriculture has been the mainstay of Jammu and Kashmir (J&K) economy contributing almost 37.3% to its domestic product and employing around 69.1% of its population/workforce. In recent times, the State like other regions of the country has been experiencing dramatic changes in its climate and the result was severe floods, droughts and uneven and untimely rainfalls. The state which used to produce substantial agriculture crop like rice, wheat and maize, is now suffering from the shortfall even in its minimum average crop production. If the change of climate continues at the same manner, the state especially Kashmir region will very soon be **importing every bit of the food item from outside State.** Such situation would neither seem good for the state nor for the center, because agriculture is not only the main source of staple crop in the state but equally a source of employment to sizable chunk of population. Owing to its **peculiar** topography, rugged terrain, existing extreme weather conditions and less developed economy, the **State has a challenging** task of managing its economy and society on sustainable basis in the changing climate and fragile environment. The J&K state which nestles in the delicate Himalayan ecosystem, has considerable dependence on its ecology as its major sector of the economy i.e., agriculture highly dependents upon weather conditions. Changes in weather cycles have a major effect on crop yield and food supply which in the present conditions poses a serious threat to state populace if it remains unattended. **In this backdrop**, the present study has been undertaken to evaluate the trend of major crops production of J&K State, figure out the causes and put forth the remedial measures.

Keywords: Food security, Human induces, paddy, Deforestation, Urbanization, Disasters, ecosystem, agriculture production and Peculiar etc.

Agricultural Marketing Management Strategies for Sustainable Farming

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Abstract

Market led extension is a market ward orientation of agriculture through extension, including economics and is the perfect blend for reaching at the door steps of farming community with the help of appropriate technology Even after 70 years of Indian independence, the quality, timely and cost effective delivery of adequate inputs remains a dream. Farmers are not able to sell their surplus produce remuneratively. Plenty of distress exists among farmers**.** The perceived lack of success of public agricultural extension systems has given birth to market-driven approach in India and elsewhere. Different models involving both private-sector firms and civil society organizations (CSOs) have been given right to provide basic extension services to farmers. Markets led technology, has become the primary driver for agricultural development in many countries. More attention is now being given to the concept of agricultural innovation systems (AISs). 85% of the 27,294 rural periodic markets lack in efficient trade. 7161 market yards/sub yards are inadequate, ill equipped and mismanaged. Due to lack of proper handling at farm gate there is loss of 30 % F&V, 7% grains and 10% spices before reaching market. There is an estimated loss of Rs 50,000 crores /year due to poor marketing chain. Improving the communication and interactive skills of the farmers to exchange their views with consumers and other market forces (eg middlemen) for getting feedback. Farmers need to be informed about the benefits of direct marketing like Apni Mandi in Punjab and Haryana, Rythu Bazars in AndhraPradesh, Uzavar Santhaigal in Tamil Nadu etc. For this purpose information technology, print and electronic media need to be harnessed to disseminate the production and market information. Information on market network, like price trends, current prices, demands status etc which may serve the specific needs of farmers. In order to be successful in the liberalized market scenario the farmers will have to shift their focus from 'supply driven 'to 'market driven' and to produce according to the market needs in order to earn high. Storage of farm produce:- Whether storage takes place on the farm or in silos off the farm, increases in the value of products due to their time utility must be sufficient to compensate for costs at this stage, or else storage will not be profitable. Processing is not the only way of adding value to a product. Similarly, transporting commodities to purchasing points convenient to the consumer adds value. The process of collecting, interpreting, and disseminating information relevant to marketing decisions is known as market intelligence. The question of where the funding of the investment is to come from, at all points between production and consumption, is one that marketing must address.The system acts as liaison between the researchers and the farmers. In the light of this scenario the extension personnel are required to be motivated to learn the new knowledge and skills of marketing before assigning them marketing extension jobs to establish their credibility and facilitate significant profit for the farming community.

First Report of Structural And Numerical Chromosomal Anomalies in Pollen Mother Cells of *Trichosanthes Cucumerina* Var. *Anguina* L. and its Consequences

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Trichosanthes cucumerina var*. anguina* (snake gourd) belonging to the family Cucurbitaceae, is a monoecious, annual, cultivated variety, grown in tropical and sub-tropical regions of the world for nutritious vegetables. Presently, three local and a lone commercial cultivar of *T. c.* var. *anguina* from Jammu Province were evaluated for phenotypic aspects. Of these, commercial cultivar formed very few fruits and seeds. To pinpoint the mechanisms underlying reduced fertility of commercial cultivar, six of its plants were studied for male meiosis. Out of the 237 analyzed pollen mother cells (PMCs), 7% were hypo- (2n=2x-2=20) or hyperploid (2n=2x+2=24), with the rest (93%) being diploid (2n=2x=22). This cultivar was further notable in exhibiting translocation heterozygosity, manifested by occurrence of quadri- and/ trivalents in 8.6% diploid and 30% hyperploid cells. Existence of multivalents and univalents at metaphase I, resulted in irregular segregation patterns of 15:7, 13:9; 12:10, 10:3:9 and 11:1:10 in 24% of the pollen mother cells scrutinized which largely accounted for reduction in pollen fertility to 75%. Against theoretical expectations, present cultivar set very few fruits (4-5 per vine) and seeds (on an average 20 seeds per fruit). Apart from describing meiotic anomalies detected for the first time in snake gourd, reasons underlying reduced reproductive capacity have been discussed in this communication.

Impact of *Glyphodes Pyloalis* Walker (Pyralidae: Lepidoptera) Infested Leaves on the Economic and Nutritional Parameters of Silkworm Hybrid (NB_4D_2 X SH_6) *B. mori* L. During Autumn Season

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Abstract

The study was conducted on silkworm larvae fed with infested and healthy mulberry leaves. Observations were made on some economic and nutritional characters like leaf fed, larval duration, larval weight, cocoon yield, single cocoon weight, single shell weight, shell ratio, filament length, fecundity and viability. In all these observations, it was found that there was more negative impact on the traits when the silkworm larvae were fed with infested leaves as compared to healthy leaves.

Keywords: Silkworm larvae, infested mulberry leaves, economic traits**.**

New Frontiers in Disease and Pest Management

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Abstract

World-wide crop loss caused by insect pests and diseases reaches critical level. Minimizing losses by pests and diseases is therefore a crucial means of meeting this challenge and securing food supply. The current methods of controlling insects and diseases are mostly dependent on agro-chemicals that have resulted additional side effects including occurrence of resistant insects and diseases, environmental contamination and accumulation in human body. The development of plants with resistance to the most damaging pests and diseases is increasingly important in the face of growing pressure to reduce synthetic chemical inputs including pesticides, fungicides and herbicides used for crop protection. For virtually all pest species and disease eradication is biologically impossible or economically infeasible. In the move towards more sustainable production systems based on integrated pest and disease management (IPDM) approaches is gaining momentum. The development of more resistant cultivars and also monitoring and management strategies is a major factor contributing to the success of these systems. In addition, there is a recognized need for frameworks which combine natural enemies with resistant cultivars and other management practices to reduce reliance on crop protection chemicals and maintain viable and sustainable future crop production. Individually, these techniques can control insect pest populations but also can produce harmful environmental effects. New frontiers of microbe-based environment friendly procedure and effective methods of biological and cultural methods are used to manage pests and diseases to overcome the deleterious effects on environment.

Keywords: Food Security, IPDM, Resistance, Biocontrol

Gene Expression Profiles Involved in Development of Freezing Tolerance in Common Wheat

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Abstract

Exposure of plants to low , non-freezing leads to an increase in freezing tolerance, called cold acclimation. Most of the changes in metabolism are regulated through changes in gene expression. The mechanism behind developing freezing tolerance is induction of the *Cor*(cold responsive)/ *Lea* (late- embryogenesis- abundant) gene family .In common wheat , major loci controlling freezing tolerance(*Fr*-1and *Fr-2*)have been assigned to long arm of five group chromosomes (Galiba et al.1995; Snape et al.1997).Fr-2 is coincident with a cluster of genes encoding C-repeats binding factor(CBFs) in wheat and barley , which directly induce downstream *Cor/Lea* gene expreesion during cold acclimation. In expression quantitative trait locus(eQTL) analysis of *Cor/Lea* and *CBF* genes , four eQTLs controlling cold-responsive genes were found , and the major eQTL with the greatest effect was located on long arm chromosome 5A. A lot of other genes including *Wlip 19 and Wabi5B*ZIP transcription factor genes , contribute to cold acclimation and freezing tolerance in common wheat. These transcription factors , which act in abscissic acid signalling , bind to ABA –responsive elements in the promoters of *Cor/Lea* genes. Thus, ABA induces expression of a variety of genes that function in the regulation of gene expression , signal transduction and abiotic stress tolerance in common wheat. ABA sensitivity strongly affects the basal levels of freezing tolerance and some QTLs on wheat chromosomes controlling ABA sensitivity at the seedling stage are also related to *Cor/Lea* gene expression and putatively associated with freezing tolerance(Kobayashi et al.2010).

Keywords CBF, *Cor/Lea* genes transcription factors , abcissic acid.

Study on Symptomology Morphology and Cultural Characters of Leaf Spot (*Phleospora maculans*) Disease in Mulberry.

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Abstract

Fungus causing leaf spot was isolated from infected leaves on potato dextrose agar medium. It was observed that culture was very slow to grow and sporulated only under high humidity conditions at high temperature (25-35°C). The optimal temperature for fungal growth was ascertained 25±1°C. The pathogenicity of the fungus was proved by following Koch's Postulates. The typical diseased spots were developed on potted plants within 10-14 days. *Phloeospora maculans* is identified as causal agent of leaf spot disease and the disease is initially confined to lower older leaves but later extended to younger upper leaves. The symptoms appear as isolated spot, circular to irregular, 2.7mm in diameter with brown margins and ashy grey center. The small spots gradually coalesce to farm large irregular lesion. The symptoms were developed on both the sides of leaves as minute circular dots which later turn to greyish white in the center surrounded by a broad yellow diffusion zone. The spot at maturity becomes reddish grey. The necrotic area sometimes coalesced usually at the margin of the leaves. The spot measures 2 -15 x 1.5 -9 mm, with an average size, 5.5-3.4 mm.

Influence of Different Storage Conditions on Pigment Content and Color Quality of *Celosia Argentia* L. Var *Plumose* of Kashmir Region

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Abstract

Celosia argentia L. var *plumose* (Cockscomb) belonging to family Amaranthaceae is an annual erect herb which is cultivated in lawns as ornamental. The objective of the present study was to analyze the total anthocyanins, total carotenoids, and the color characteristics of its inflorescene. The stability and color quality of pigments (anthocyanins and carotenoids) were assessed by quantifying the pigments and recording their color quality under ambient and refrigerated storage conditions at 10 days interval at 0, 10, 30, 40, 50, 60, 70, 80 and 90 days after collection. Results revealed that the total carotenoid content (mg/100 g) in inflorescence ranged between 0.42 to 21.02 mg/100g, however, anthocyanins were not detected. Highest pigment content was recorded at 0 days of storage. With increase in days of storage pigment content decreased in both plant material and extract. Pigment degradation was more in the plant material as compared to the plant extract. L*, a*, b*, Chroma (C*), Hue angle (H^o) and total color change (ΔE) changed with increase in days of storage. The L* value ranged from 51.13 to 62.22, a*, b*, H^o, C* and ΔE values ranged from 24.71 to 30.71, 42.35 to 63.19, 54.39 to 68.64^o, 52.74 to 67.85, 67.02 to 74.72. With the increasing days of storage a* value increased while L*, b*, H^o, C*, ΔE values were reduced. From the present study it was concluded that *Celosia argentia* L. var *plumose* can be utilized as a raw material for extraction of yellow edible food colour.

Key words: Cockscomb, Carotenoids, Anthocyanin, Hunter Lab, *Celosia argentia* L. var *plumose*

Ohmic Heating of Aloe Vera Juice: Design, Construction and Performance of Ohmic Heater

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Abstract

Ohmic heating is an advanced food processing technique. The basic principle of ohmic heating is that the food behaves as an electrical resistor and the electrical energy is internally converted into heat. The food is sandwiched between the two electrodes. The amount of heat generated is directly related to the current induced by the voltage gradient in the field and the electrical conductivity of the food sample. The main advantage of ohmic heating is the rapid and uniform heating, which turns in minimal losses of the nutritional values of the food. Moreover, ohmic heating has high (95%) energy efficiency, low investment cost and is considered technically simple. In the present study an ohmic heater has been designed, constructed and its specific performance coefficient (SPC) has been evaluated. The ohmic heater has been constructed from PVC pipe having length of 10.5 cm and diameter 3.47cm.Two stainless steel electrodes of thickness 0.2 cm, were placed at the two ends of the pipe and has two opening for temperature measurements. For this electrical conductivity and heating rate has been measured at five different voltage gradients (8,10,12,14 and 16V/cm) and five different concentrations (60%, 70%, 80%, 90% and 100%) of Aloe Vera juice. Heating rate increases linearly and is more at higher voltage gradients for higher concentrations. Electrical conductivity also varies linearly with temperature. SPC has been calculated from the values of energy given to the sample and the energy consumed by that sample. It has been observed that constructed ohmic heater has maximum efficiency at 8V/cm for all the concentrations.

Optimizing the Search Operations and Data Extraction Using Graph Database

Abstract

The Data Relationships tool is a collection of programs that we can use to manage the consistency and quality of data that is entered in certain master tables. Using this tool to set up data relationships enables us to place tighter controls over our data and helps increase efficiency during data entry.SQL is used to query the RDBMS which generates the specific results according to the needs of the user. Apart from querying the data, we can also update and modify the records in the database. But unfortunately it is not so easy to perform the above mentioned operations. This is because importance of relational databases is going to decrease due to the exponential growth of data as it is difficult to work with large number of joining tables. The best solution to such kind of problem is to make use of graph database for storing data. This pap compares the graph databases Neo4j with relational SQL.

Keywords: Graph, Neo4j, MySQL, Cypher query language.

Impact of Climate Change on Carbon Sequestration for Sustaining Soil Health

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Abstract

According to intergovernmental panel on climate change the global temperature of the atmosphere during 21ist century are expected to increase between 1.1 to 6.4 °C. The projected climate change may adversely impact soil health by reducing soil organic matter, increasing soil temperature and thus decreasing soil aeration, soil structure, soil water holding capacity and increasing vulnerability to erosion, soil salinity and other degradation process. The climate change also threatens to reduce the agriculture production thus negatively impacting food security and growing population. In agriculture, soil health and the mitigating climate change are very closely associated with each other. The agricultural soils are capable of being a source or sink for the atmospheric green house gases. This progressive enhancement in the concentration of the green house gases since the industrial era has created worldwide attention for the reduction of these gases in the environment. Various systemic models and observations over the past one thousand years provided evidence that climate change occurred due to anthropogenic enhancement in $CO_{2,}$ CH_4 and CO. Thus a need was felt to reduce the concentration of the green house gases like CO_2 from the atmosphere and increase its concentration in the soil through the process known as carbon sequestration. (Benbi and Kaur 2009) The sequestration potential of the soil ranging from 100- 1000 kg/ha depends on vegetation, climate, mineralogical composition, depth of solum and soil drainage and the water availability. The global potential of soil organic carbon sequestration is estimated to be 0.6 to 1.2 Gt C/ year consisting 0.4-0.8 Gt C/ year through the various management practices. (Karmakar *et al.,* 2016). The most important management practices for carbon sequestration and mitigating climate change and increasing soil health are conservation tillage, mulch farming, cover crops, integrated nutrient management, agro-forestry and using manures and compost. The carbon sequestration is the essential technology for the preservation of optimum CO_2 level in the atmosphere by decreasing its concentration in the atmosphere and increasing its amount in the soil. The carbon sequestration affects the key indicators of soil health like physical, chemical and biological properties including soil aggregate stability, bulk density, penetration resistance, water holding capacity: percent organic carbon, soil NPK, micronutrients, CEC: decomposition rate, soil microbial biomass,, respiration rate, earthworm count and genetic biodiversity.

Keywords: CH_4, Climatic change, CO, CO_2, Genetic biodiversity, Soil.

Effect of Organic, Inorganic and Integrated Nutrient Management on Productivity and Economic Viability in Rice Based Cropping Systems in Madhya Pradesh

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Abstract

A field investigation was conducted during 2012-13 to 2013-14 at Breeder Seed Production Unit (Groundnut),Jawaharlal Nehru Krishi Vishwa Vidhyalaya, Jabalpur, Madhya Pradesh to study the effect of nutrient management and cropping system on productivity under different rice based cropping systems in Madhya Pradesh. The 4 different cropping systems Green manuring -rice-wheat, Rice-chickpea-sesame, Rice-berseem (green fodder+seed) and Rice-vegetable pea-sorghum (green fodder) and three nutrient managements viz.,Organic, Inorganic and Integrated nutrient management with 3 replications in strip plot design. The soil of the experimental field was sandy clay loam in texture, neutral in reaction (7.3), normal EC (0.52), low in OC (0.72%), medium in available N (264 kg/ha) and P(13 kg/ha) and high in K(285 kg/ha).The highest rice equivalent yield (68.13 and 74.99 q/ha) was recorded from 100% inorganic nutrient management with growing of rice-berseem (fodder+seed) cropping system. The highest net monetary return 95251,111155 Rs/ha and B:C ratio of 2.70 and 2.60 was obtained from this 100% inorganic nutrient management and rice-berseem (green fodder+seed) cropping system superior over other treatments. Therefore, this cropping system is best suitable for this particular area.

Climate Smart Agriculture : Food Security of Future to the Climate Change

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Abstract

Adverse climatic variabilities draw attention of people towards a sustainable approach to mitigate against climate change to fulfil the increasing demand of this exploding population. But due to increasing population, food security requires a sustainable strategy and to combat these effects of climate, climate-smart agriculture (CSA) came into existence in present climatic scenario for sustainable food security and enhances food security and development. CSA is an integrative and interacting approach to address these interlinked challenges of food security and climate change, i.e., sustainably increasing agricultural productivity, adapting and building agricultural resilience and reducing emissions of greenhouse gas (GHGs) from agriculture activities (including crops, livestock and fisheries). CSA combines to the actions

both on-farm and off-farm, and incorporates technologies, policies, organizations, institutions and investment on an equal platform

A Study on Socio-Economic Status of Gujjars And Bakerwals of Jammu Division

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Abstract

Gujjars and Bakerwals are the third largest ethnic group in Jammu and Kashmir and constitute more than 11.9 per cent of the total population of the state (Census, 2011). The study was conducted in order to access the socio-economic conditions and migration status of Gujjars and Bakerwals of Jammu division. Multi-stage random sampling technique was employed for the selection of districts, blocks, villages and ultimate respondents. The total sample size was 112. Pre-tested interview schedule was used for collection of data. The mean age of the respondents was 49.91±15.50 years and mean education was 5.80 ± 5.17 years. 36.6 per cent of the respondents were illiterate. Majority of the respondents (60.71%) had marginal land holding and 19.64 per cent respondents had small land holding, in case of migration status only 47.3 per cent were migrating. Kacha houses were possessed by 63.4 per cent of the respondents. Further, it is concluded that the number of sheep, goat and buffalo affected the migration status of gujjars and bakerwals significantly (R^2=0.580) followed by sheep, goat and cow (R^2=0.556).

Keyword: Gujjars, Bakerwals, Migration, Sheep, Goat, cow and Buffalo.

Adoption of Recommended Practices after Watching Video Films by the Farmers in Punjab

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Abstract

In India, agriculture plays a dominant role in the economy, growth and progress which largely depends, on the improvement of agricultural technology and the adoption of the agricultural innovations by the farmers. It is necessary to change the attitude of the farmers to adopt modern methods of farming. Video films are just one among the tools that are used for disseminating agricultural information. The use of video has been seen as catalyst to effective knowledge transfer to rural areas of the developing world. However, the use of video films in dissemination of agricultural information to farmers only started to take root in developing countries few years ago thus necessitating for more studies to establish its effectiveness. This study therefore endeavored to study the adoption of recommended practices after watching video films by the farmers in Punjab. The study employed a descriptive survey research design to collect data from 200 farmers whom had been showing video. The data was collected using a semi-structured questionnaire. The study was conducted in 2015-16. The analysis shows that after watching video films, 41 percent of the farmers followed recommended soil testing practices, majority (73.17%) of the farmers decreased the dose of nitrogen application, 51 percent and only 33 percent adopt leaf colour chart. Thus, the agricultural scientist as well as the extension workers should be encouraged to prepare video films on different farm practices to be used by the farmers at local levels.

Keywords: Adoption; video films; agricultural practices; seed treatment; fertilizer application

Biotechnological Interventions for Mining of Pathogenicity Genes in Fungi

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Abstract

From last few decades, whole genome sequencing of pathogens has put new insights into various pathogens processes. One of such insight is the identification of candidate effector proteins i.e. pathogenicity genes encoded by pathogen genome. Emerging evidences suggest that a diverse range of effectors can potentially target host resistance. Therefore it is necessary to understand pathogen effector function, which can provide new foundation for revisiting and reshaping biotechnological approaches for crop protection. We need to explore the pathogen virulence factors and its role in disarming the plant defence. Bioinformatics pipeline revealed diverse effector proteins in different fungi. The effector candidates mostly reside on repeat regions of fungal genome (AT rich regions), where repeat induced point mutation (RIP) leads to diversification of effector complements. The techniques that researchers exploit for generation of information about the pathogenicity genes are insertional mutagenesis, RNA seq, comparative genomics, whole genome sequencing and nowadays genome editing. Genome editing in these days is becoming an outstanding tool to understand pathogenesis mechanism. It facilitates genetic alteration of genomes in a variety of organisms, though used for number of plant pathogens to ascertain gene function. Genome editing exploits zinc finger nuclease (ZFN), transcription activator-like effector nuclease (TALEN) from *Xanthomonas* sp and most versatile system i.e. clustered, regularly interspaced, short palindromic repeats (CRISPR) and CRISPR associated genes (Cas9). CRISPR/Cas9 system is widely used to identify gene function and to impair its function in many plant pathogens.

Performance of Kashmir Merino Lambs Grazing on The Sub-Alpine Pastures of Kashmir Himalayas

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Abstract

The study aimed to evaluate the feed intake and growth performance of the local Kashmir merino lambs grazed on the sub-alpine pastures of the Kashmir valley in two seasons of summer and autumn. Kashmir valley is also bestowed with natural temperate pastures (114 thousand hectares) at alpine and subalpine altitudes (Forest report, 2017). The study was conducted on the sub-alpine pastures of the Zaberwan hills (34° 09' N, 74° 55' E) located at the height of 1760m amsl and associated with the Govt. Sheep Breeding Farm and Dachigam national park. Fifty Kashmir merino male weaner lambs, twenty-five in each season of summer and autumn were selected for the experiment. Animals were weighed fortnightly for sixty days in each season. The experimental animals were allowed to graze on their respective pastures for 8 hours/day without any feed supplementation. A ten-day digestion trial in each season was conducted by the indirect indicator method with chromium oxide as external indicator. Apparent digestibility of nutrients were higher ($P < 0.05$) in summer season than autumn season. Feed and nutrient intakes (DMI, DMI/kg, MEI and CPI) were higher ($P < 0.05$) in summer season than in autumn season. Average daily gain was higher in summer (41g/day) than in autumn season (30g/day) and animals suffered serious liveweight loss in the last two fortnights of autumn season (Figure 1). Results indicated that sub-alpine pastures of Kashmir valley did not provide sufficient nutrients to sustain the maintenance and growth requirements of the lambs hence warrants supplementation especially in the autumn months to prevent loses in the production performance of sheep.

Importance of Food Processing Industries in the Economic Development of Rural People

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Abstract

Food not only fulfills the basic needs of people but also sustains the life of the people. With the continuous increase in the population, efforts are required to feed additional 15million people every year. By enhancing food production does not answer this problem because all foods particularly fruits and vegetables are perishables and seasonal. Unless excess production is processed and preserved, it will be wasted. Today only one percent of the total fruits and vegetables produced are processed in the 3000 food industries in the country. Although India is the second largest producer of fruits and vegetables only two percent is being commercially processed wastage is estimated to be very high and value addition is constrained by long chain with too many intermediaries making scale efficiencies difficult. Much progress has been made in the last two to three decades regarding the development of processed fruit and vegetable products. Many technologies and products have considerable potential for establishing fruits and vegetable industry in rural areas. Food industry contributes 18% GNP and employs 1.5million workers i.e., about 20% of our industrial labour. In India, the value addition of food production is only 7% compared to 23% in China, 45% in Phillipines or 188% in UK. According to a report, India produces around 150 million tonnes of fruits and vegetables, but the annual wastage is estimated at Rs. 100 billion, India wastes more fruits and vegetables than are consumed in a country like Britain. To reduce wastage and improve delivery to customers, value addition units and food processing industries should be set up, as it also contribute to the economic development of rural population.

Diversity of cellulose degrading bacteria in soils of Kashmir valley

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Abstract

Bacteria are known for their versatility with respect to secretion of different types of enzymes for metabolism of a large number of substrates as sources of their energy. The cellulolytic bacteria known for their effective role in carbon cycle in nature were isolated on carboxy methy cellulose agar medium from the soil samples collected from agricultural fields, pastures and forests in Kashmir valley. The objective of the study was to screen effective bacteria for rapid degradation of cellulose rich organic materials. Only those isolates which showed hollow zone at incubation temperature between 15^0C to 20^0C were characterized on morphological and biochemical characteristics and were placed in to three genera as Bacillus, Streptococcus and Cellulomonas. The isolate CBGM7 belonging to the genus Bacillus showed a solubilization hollow of 1.12 cm with cellulase activity of 98.253 U/ml/min, followed by the isolates CBM3 and CBS8 with solubilization hollow and cellulose activities of 1.05 cm,91.60 U/ml/min and 1.02 cm,87.24 U/ml/min respectively. Both the later isolates belonged to genera Cellulomonas. The most outstanding isolates CBGM7 was then used for decomposition of saw dust under pot culture experiment and it was observed that it decreased the C/N ration of the decomposing material from 69:1 to 18:1 within 80 days in comparison to 42:1 in untreated control. It is concluded from the current study that cellulolytic bacteria were present in all the samples and the most effective cellulose degrading bacterial isolate can be successfully used for composting of cellulose rich organic matter and can be further screened other beneficial activities.

Recent Advances in Genetic Engineering & Biotechnology for Improvement of Fruit Crops

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Abstract

Genetic improvement of most fruit crops is the major problem due to long juvenile period which further aggravates by seedlessness, inter and intra specific incompatibility, high heterozygosity, sterility etc. Conventional breeding method of genetic improvement would not be a better option owing to its difficult, expensive and time consuming breeding techniques. Besides, non-conventional breeding method like recombinant DNA, a genetic engineering approach, is more precise in correcting the deficiencies in commercial cultivars or root stocks without disturbing their desirable genetic makeup. Transgenic plants develop through a number of gene delivery methods, the most common of which is vector mediated and particle bombardment mediated gene transfer. Generally, two tissue culture methods have been used for regeneration of transgenic plants: organogenesis and somatic embryogenesis. Genetic engineering technique has been used for resistance of a number of important diseases and pests. Despite the usefulness of genetic engineering in many aspects, many countries are reluctant to adopt such technique on the ground of their risk to health and environment linked to the introduction of transgene into crop species of genetic material derived from alien organisms. To overcome the notorious aversion against transgenic, new genetic engineering approach, namely 'cisgenesis' and 'intragenesis' has been proposed. The acceptance of science-based approaches like cisgenesis or intragenesis or use of selection marker free transgenic will encourage confidence, and bring the benefits of genetically modified products to consumers.

Keywords: Genetic engineering, organogenesis, somatic embryogenesis cisgenesis, intragenesis.

Regeneration Dynamics of Dominant Tree Species in Temperate Forests of Keran Valley, Kashmir Himalaya

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Abstract

The existence of a species in the forest ecosystems depends to a greater extent on its natural regeneration capacity under varied environmental conditions. The regeneration potential is the ability of a species to complete its life cycle in a given environment, which indicates the fate of the forest in general and suitability of a species to forest environmental conditions in particular. The present study was undertaken to study the regeneration potential of the dominant tree species in the temperate forest of Keran Valley, Kashmir Himalaya. For this purpose, two forest sites were selected based on community composition. The plant associations were recognized on the basis of IVI values of the species. Forest site I (FS-1) was dominated by the species like *Pinus wallichiana, Parrotiopsis jacquemontiana and Dyropteris stewartii,* where as forest site II (FS-II) showed the predominance of species such as *Cedrus deodara, Parrotiopsis jacquemontiana, Stipa sibirica*. A total of 37 plant species belonging to 35 genera and 23 families were recorded from the sampled forest sites. The seedling density of (FS-1) (3200 seedlings per ha) was higher than that of (FS-II) (1200 seedling per ha). Sapling density also followed the same trend, i.e., higher (2300 saplings per ha) at (FS-1) and lower (800 saplings per ha) at (FS-II). The ratio of seedling and saplings to trees indicated the regeneration performance of the tree species in the two forest sites. The regeneration performance was not very much satisfactory because most of the species had low Se/T and Sa/T ratios. 50% and 33% of the tree species had 'no regeneration performance' at (FS-1) and (FS-II) respectively. The results of the present study highlight that there is a urgent need of scientific measures to be taken especially by local government to improve the regeneration performance of these forests so that they can be conserved for sustainable utilization.

Keywords: Forests; Kashmir Himalaya; Regeneration potential; Seedling density;

Regeneration Dynamics of Dominant Tree Species in Temperate Forests of Keran Valley, Kashmir Himalaya

Shiekh Marifatul Haq[a,*], Irfan Rashid[a], Anzar A. Khuroo[b], Rameez Ahmad [b], Maroof Hamid[b], Zubair A. Malik[c], Zeenat Ismail[b], Shugufta Rashid[b], Tabasum Hassan[b], Zubair A. Rather[b],Sakina banoo[b]

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Abstract

The existence of a species in the forest ecosystems depends to a greater extent on its natural regeneration capacity under varied environmental conditions. The regeneration potential is the ability of a species to complete its life cycle in a given environment, which indicates the fate of the forest in general and suitability of a species to forest environmental conditions in particular. The present study was undertaken to study the regeneration potential of the dominant tree species in the temperate forest of Keran Valley, Kashmir Himalaya. For this purpose, two forest sites were selected based on community composition. The plant associations were recognized on the basis of IVI values of the species. Forest site I (FS-1) was dominated by the species like *Pinus wallichiana, Parrotiopsis jacquemontiana and Dyropteris stewartii,* where as forest site II (FS-II) showed the predominance of species such as *Cedrus deodara, Parrotiopsis jacquemontiana, Stipa sibirica*. A total of 37 plant species belonging to 35 genera and 23 families were recorded from the sampled forest sites. The seedling density of (FS-1) (3200 seedlings per ha) was higher than that of (FS-II) (1200 seedling per ha). Sapling density also followed the same trend, i.e., higher (2300 saplings per ha) at (FS-1) and lower (800 saplings per ha) at (FS-II). The ratio of seedling and saplings to trees indicated the regeneration performance of the tree species in the two forest sites. The regeneration performance was not very much satisfactory because most of the species had low Se/T and Sa/T ratios. 50% and 33% of the tree species had 'no regeneration performance' at (FS-1) and (FS-II) respectively. The results of the present study highlight that there is a urgent need of scientific measures to be taken especially by local government to improve the regeneration performance of these forests so that they can be conserved for sustainable utilization.

Keywords: Forests; Kashmir Himalaya; Regeneration potential; Seedling density;

Development of an Innovative Multiuse FMIS for Sheep Breeding Farms

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Abstract

Data recording and its analysis is crucial for the success of any farm. The state of Jammu and Kashmir presents ideal conditions for sheep rearing and the demand for mutton is always high. Despite this, the true potential of sheep husbandry in the state is largely unmet and there is a yawning gap between demand and supply. This may mainly be attributed to the lack of proper record keeping and data analysis for management of farms and for futuristic decision making. Therefore, a study was planned to develop a Farm Management Information System for performance recording in sheep both at the farm and field level. A fully functional multi-use online FMIS for performance recording, farm data management and decision making in sheep farms was developed. This System was designed to perform various tasks related to farm management ranging from operational planning, implementation and documentation for assessment of performed field work. The developed tool facilitates data management through multiple simple-to-use data entry e-forms, data update forms and generates a myriad of customized reports on various aspects of sheep production. This web-based tool also estimates multiple genetic parameters for scientific selection and breeding of animals. Alfa and beta testing on the tool was done using data acquired from 3 sheep breeding farms across the State. Considering the potential of the developed tool for the development of sheep husbandry in the State, the adoption of an FMIS is strongly recommended for the management and evaluation of sheep breeding data which will ultimately help to achieve the goal of making the state self-sufficient in meat and wool production.

Keywords: Breeding tool, Breeding Value, FMIS, Heritability

Role of Silicon on Plant Pathogen Interactions

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Abstract

Silicon (Si) is the second most abundant element after oxygen in the earth's crust, and comprises up to 70% of soil mass. Although silicon is not recognized as an essential element but it has beneficial effects on the growth and production of a wide range of plant species. Si is known to effectively mitigate various environmental stresses and enhance plant resistance against both fungal and bacterial pathogens. Si-enhanced disease resistance is associated with the density of silicified long and short epidermal cells, the thick layer of silica under the cuticle, the double cuticular layer, the thickened Si cellulose membrane, formation of papilla, and complexes formed with organic compounds in epidermal cell walls that strengthen plants mechanically. It induces biochemical defense by up-regulating gene expression related to defense related enzyme synthesis PALa, PALb and LOXa associated with suppression of gray leaf spot. Along with PAL Si increased the transcript abundance 4CL, ABC transporter and POD which is in line with the enhanced lignifications and suberization of rice plants. Si may regulate plant stress responses by modulating phytohormone homeostasis and signaling pathways. It enhanced expressions of EDS1 and PAD4 genes, as well as NPR1 necessary for SA biosythesis. Si primes jasmonic acid mediated anti-pathogenic defense responses. Ethylene and JA interact to regulate the expression of particular defense-related genes such as PDF1.2 upon pathogen perception. Si could induce tomato resistance to Ralstonia solanacearum via upregulating the expression of genes involved in defense and stress responses, such as WRKY1 transcription factor, disease resistance response protein, ferritin, late embryogenesis abundant protein, and trehalose phosphatase.

Keywords: Lignification, Suberization, Phytohormone, Jasmonic acid, Ethylene, Trranscription

Blood Biochemical Indices Lack Diagnostic Significance in Subclinical Caprine Brucellosis: Evidence from Non-Vaccinated Brucella Melitenensis Positive Changra Goats in Northern Himalayan Region of Ladakh

Abha Mariam*, Masood Saleem Mir, Hilal Musadiq Khan, Feroz-ud-Din Sheikh, Rayeesa Ali, Anisa Qadir Janwari, Omer Khalil Baba, Umar Amin, Asif Hassan Sofi, Asiya Kazmi and Sarfaraz A. Wani

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Abstract

Caprine brucellosis caused by *Brucella melitensis* is prevalent globally causing severe economic losses in terms abortions and still births, maintenance of animals with sub-clinical or latent infection and associated labour, besides being an important zoonosis. Cohort serum biochemical profiling aimed at elucidating any possible diagnostic efficacy in caprine brucellosis was undertaken in unvaccinated Pashmina goats. Positive and negative reactors from farmer's flocks were identified by RBPT and STAT, and Brucella melitensis infection confirmed by species specific Dot-ELISA and Plate-ELISA and serum based PCR. Evaluation of serum biochemical parameters with respect to positive vs negative reactor goats revealed non-significant differences in blood glucose (76.697 ± 4.747 vs 67.534 ± 4.019); total protein (5.959 ± 0.106 vs 5.947 ± 0.104); albumin (3.191 ± 0.048; 3.272 ± 0.062); globulin (2.769 ± 0.107 vs 2.675 ± 0.100); AST (62.722 ± 3.839 vs 67.972 ± 4.925); ALT (16.753 ± 1.340 vs 15.684 ± 1.197); ALP (250.670 ± 20.067 vs 266.960 ± 20.100); Creatinine (0.638 ± 0.072 vs 0.713± 0.073); urea (30.717 ± 1.443 vs 30.397 ± 1.808); cholesterol (137.214 ± 3.406 vs 138.322 ± 3.363). The serum biochemical indices seemed to be stable with respect to brucellosis at least in sub-clinical or latent phase of infection in goats.

Keywords: Brucellosis, serum biochemistry, changra goats.

Comparative Efficacy of mRBPT, STAT, dot-ELISA, Plate-ELISA and PCR For diagnosis of Brucellosis in Goats

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Abstract

Brucellosis constitutes an important diagnostic challenge in animals as the disease is overtly recognized at maturity especially following abortion in late gestation. Also, it can revert to latency suggests that a certain amount of animals could be silent carriers of the disease. Many of the gestating dams can, therefore, transfer the disease in utero to the fetuses or post-natally to the offspring throughout lactation. Different tests are in vogue for screening and confirmation of the disease with varying sensitivity and specificity. Present study was conducted to evaluate comparative efficacy of Modified Rose Bengal Precipitation Test-(RBPT), Standard Tube Agglutination Test (STAT), Dot ELISA, Plate ELISA and PCR for diagnosis of brucellosis in non-vaccinated Changra goats. Pair-wise comparison of different tests employed for diagnosis of brucellosis revealed almost perfect agreement was observed between RBPT and Dot-ELISA (k = 0.8366), while substantial agreement was observed between STAT and Plate ELISA (k = 0.7364), Dot ELISA and PCR (k = 0.6414) and Plate ELISA and PCR (k = 0.6642). Results from STAT vs Dot ELISA (k = 0.6009), STAT vs PCR (k = 0.5981), Dot ELISA vs Plate ELISA (k = 0.5572), RBPT vs Plate ELISA (k = 0.5412) and RBPT vs STAT (k = 0.4487) revealed moderate agreement between tests. RBPT and PCR showed a fair agreement with kappa value of 0.3924. Evaluation of relative sensitivity and specificity of different diagnostic tests revealed highest sensitivity (98.78%) for Dot ELISA followed by RBPT (85.3%) while they lack specificity. However specificity of Plate ELISA (99.8%) and PCR (99.4%) was highest but with low sensitivity. The study suggested use of a combination of serological tests for screening, supplemented with direct test like isolation and/or PCR for confirmation and species level identification.

Keywords: Brucellosis, Changra goats, Elisa, PCR, mRBPT.

Health Problems of Changra Goats in Changthang and Adjoining Trans-Himalayan Area of Ladakh

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Abstract

Studies on Mortality pattern in Changra goats in different traditional and non-traditional rearing areas of Changthang, Ladakh (J&K) was investigated. Active animal health survey performed over a period of six years from 2008 to 2013. Out of a total of 3344 deaths recorded, maximum mortality was due to to hypothermia (27.2%) followed by starvation (24.52%), contagious ecthyma (24.43%), diarrhoea (14.74%), contagious caprine pleuropneumonia (CCPP) (5.56%), and wild attacks (3.50%). Contagious ecthyma was the major cause of death during 2008 to 2010; starvation during 2011 and 2012 and hypothermia during 2013. Mortalities due to wild attacks were noted in Tangyar, Digger, Ankung, Gya and Miru. Hypothermia was major cause of mortality among kids. The study revealed animal health asone of the most important constraints in rearing of Changra goats warranting extensive investigations and tailored technological interventions.

Keywords: Changra goats, hypothermia, starvation, ontagious ectyma, diarrhoea.

Eclampsia with Mastitis-Metritis-Agalactia Complex in A Boxer Bitch - A Case Report

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Abstract

Puerperal hypocalcemia or eclampsia is an acute, critical condition usually seen at peak lactation, 2–3 wks after whelping. Small-breed bitches with large litters are commonly affected. The etiology of Eclampsia is poor nutrition, decreased blood albumin levels, too much milk production and derangements of parathyroid gland. A case of 3 years old Boxer bitch was presented to Veterinary Clinical Services, FVSC & AH, Shuhama, Alusteng with the history of inappetance and whelping of 8 pups out of which 2 were dead. Clinical observation revealed excessive panting, vomiting, convulsions, salivation, ataxia, whining, hyperexcitablity, polyuria and poydipsia. Clinical examination was performed that exposed pyrexia, tachycardia and tachypnea. Further, radiographic evaluation revealed absence of pups. For the confirmatory diagnosis, serum ca levels of 5mg/dl were revealed on biochemical examination. Simultaneously the bitch showed mastitis metritis complex. For the therapeutic management the bitch was treated with Inj Ca Sandoz, 20 ml in normal saline (Inj administered at the rate of 300 ml intravenously). To control fever Inj Paracetamol and for pain management, Inj melonex were adminstered. In addition antibiotic therapy with Inj. Monocef (ceftriaxone), intravenously, twice a day, for a period of 5 days, plus injection of vitamin D was administered for 3 days. In addition, Inj. Aciloc- 1 ml twice and for vomiting Inj Perinorm 1.5 ml was administered. The bitch was also put on oral calcium therapy for a month plus syrup Heptoglobilin for improvement in appetite and general body health. After a period of 6 days, the bitch showed marked recovery.

A Study on the Effect of Type and Level of Various Emulsifying Salts on the Quality of Processed Paneer.

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Abstract

This investigation was undertaken with aim of evolving a product that emulates the western processed cheese and is readily acceptable to domestic consumer. The study involved the determination of suitability of type and levels of various emulsifying salts for achieving desirable characteristics in processed paneer. The data revealed that the type of emulsifying salts (ES) had no influence upon chemical composition of processed paneer except for Dipotassium Phosphate (DPP) where in ash content was significantly higher than other samples. Level of ES did, however, elicit variations in most of the constituents. Moisture decreased while protein, fat and ash increased with increasing levels of ES. The type and level of ES both had a significant influence upon all physico-chemical characteristics of processed paneer. TSC (Trisodium Citrate) induced lowest meltability followed in order by DSP (Disodium Phosphate), STPP (Sodium Tri Polyphosphate). Free fat values were significantly lowest in TSC followed in order by DSP, DPP and STPP. Expressible serum values were significantly lowest in STPP followed in order by DSP, DPP and TSC. Titratable acidity values of TSC and DPP were comparable among themselves whereas they were significantly higher than in STPP and DSP which in turn had comparable values among themselves. pH values of TSC and DPP were comparable among themselves whereas they were significantly lower than in STPP and DSP which in turn had comparable values among themselves. Electrical conductivity values of TSC and STPP were comparable among themselves whereas they were significantly lower than in DSP and DSP which in turn had comparable values among themselves

Keywords: Emulsifying Salt, Level, Physico-Chemical, Processed Paneer, Quality, Type

Pre-Harvest Sprouting Tolerance in Barley (*Hordeum Vulgare* L.)

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Abstract

Barley (*Hordeum vulgare* L.) is one of the highly acclaimed members of the family Graminae (Poaceae) and tribe Hordea. Among the cereals, barley ranks fourth after maize (*Zea mays*), rice (*Oryza sativa*), and wheat (*Triticum aestivum* L.) in terms of total production. An earlymaturation and a high level of adaptability to stressful conditions (including cold, drought, alkali, and saline soils) make it well suited for cultivation throughout the world. About two-thirds of the global barley crop is used for animal feed, while the remaining third is used for malting, brewing and distilling industries. Pre-harvest sprouting (PHS) is a problem in barley especially malting barley. Pre-harvest sprouting (PHS) and seed dormancy (SD) are two important physiological traits. Pre-harvest sprouting (PHS) is a phenomenon of cereal crops when germination of grains occurs in the spikes before harvest and therefore it is a big problem in barley production. It reduces crop yield to the point of a total damage of the harvest. Seed dormancy can prevent sprouting but delay the malting process in cultivated barley. A set of 103 barley genotypes were initially procured from NPBGR (National Bureau of Plant Genetics Resources) and were evaluated for pre-harvest sprouting. PHS was measured as sprout score (SSc) based on visual scoring on a scale of 1-9. Results revealed that 12 genotypes showed resistance against pre-harvest sprouting, 34 genotypes are intermediate and rest of the genotypes (57) are susceptible to pre harvest sprouting.

Keyword: Dormancy, Pre-harvest sprouting, Resistance, Sprout Score, Susceptible.

Fasting induced Histomorphological Changes in the Adrenal Gland of Broiler Chicken (*Gallus Domesticus)*

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Abstract

Histological features of the adrenal gland and subsequent changes at different hours of fasting of broiler chicken (G*allus domesticus)* were observed. The experiments were conducted on 24 broiler chickens, divided into four groups (each group consisting of 6 birds) exposed to different hours of fasting. The grouping was done according to duration of fasting stress as; A (control), B (exposed to 12 hours of fasting), C (exposed to 24 hours of fasting), D (exposed to 48 hours of fasting). Clinically healthy samples of adrenal gland of broiler chicken were collected immediately after sacrifice following fasting stress.5µm thick sections were stained for various histological and histochemical studies.The adrenal gland was surrounded by a thick capsule consisting of well-developed collagen, reticular and few elastic fibres. The parenchyma of the adrenal gland was formed of intermingled cortical and medullary cells, which was further divided into three different zones viz; sub capsular zone, peripheral zone and inner zone. Cortical cells were columnar in shape with eccentrically placed nucleus and were classified as Type 1, Type 2 and Type 3 cells based on staining affinity of their cytoplasm. Medullary cells were polygonal to roughly columnar with centrally placed nucleus and were differentiated into Type 1 and Type 2 depending upon the concentration of chromaffin granules, rather basophilic nature of their cytoplasm. Adrenal gland of broiler chicken exposed to different hours of fasting stress was characterised by marked hyperaemia, lymphocytic infiltration, increase in capillary network and medullary sinuses, hyperplasia of interrenal cells with vacuolation, changes in the distribution and arrangement of type 1 and type 2 cells both that of cortical and medullary tissue, and smaller affinity for staining of chromaffin cells compared to control group. These changes were found maximum at 48 hours of fasting; indicating that degree of histological changes under influence of fasting stress depends upon the duration of exposure. The histological structure of the adrenal gland of different fasting groups indicate that adrenal gland is sensitive on this kind of stress and fasting as a stressor could introduce the birds in stress reaction. These results might indicate the increased adrenal activity and evidence of inflammatory process as consequence of hours long fasting stress. Results showed that fasting caused significant adrenal gland changes, suggesting a possible role for the study of adrenal gland morphology as an indicator of chronic welfare problems in broiler.

Keywords: Adrenal gland, Fasting stress, Histological changes, Broiler chicken

Correlating Lycopene and Moisture Content in Dried Tomatoes Using Image Processing Technique.

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Abstract

Tomatoes (Lycopersicon esculentum) are food staples that contain high levels of lycopene, a red caratenoid thought to provide a health benefit and is responsible for the deep red colour of ripe tomatoes. Appearance and colour of tomatoes are the critical factors for acceptance of food item by the consumer. The conventional method for the measurement of Colour like Minolta chromameter, and Dr. Lange colorimeters are based on surface characters which makes the measurements obtained quite unrepresentative and furthermore the global analysis of food's surface becomes more difficult.This study presents a method based on computer vision system to measure the colour of tomatoes during drying and to correlate this colour with lycopene and moisture content of tomatoes.The colour was also measured by using Hunter lab colorimeter and then correlated with lycopene and moisture content.

L*a*b* colour space was used due to the uniform distribution of colours, and because it is very close to human perception of colour.The results indicated that L*a*b* values obtained by Hunter lab and by analysing the images using image processing showed a significant decrease during drying. The regression of moisture content produced reasonably a good correlation with experimental results of moisture content.The correlation of lycopene was also good with experimental results of lycopene content

Taxonomic Characterization and Ethno-Mycology of Some Wild Mushrooms of District Anantnag, Kashmir, J&K

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Abstract

As a result of an extensive survey in different areas of Anantnag (Daksum, Sinthantop, Akingam, Pahalgam etc.), a total of 30 macro-fungal species were collected, of which 13 mushroom taxa belonging to 11 families were identified. These include *Agaricus campestris*, *Amanita flavipes*, *Caloboletus rubripes*, *Cantharellus cibarius*, *Coprinellus micaceus*, *Coprinopsis atramentaria*, *Geopora arenicola*, *Helvella compressa*, *Hericium* sp., *Panaeolus papilionaceus*, *Rhizopogan ochraceorubens*, *Russula emetica*, *Suillus americans*. Detailed description of the identified taxa along with their ethno-mycological importance will be highlighted in the paper.

Studies on Impact of Storage and Shelf Life on Physiological and Quality Traits of Apple cv. Red Delicious

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Abstract

Investigation on “Effect of paclobutrazol and summer pruning on quality of apple cv. Red Delicious” during the period of storage was carried out in Division of Fruit Science, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Shalimar during the years 2011 and 2012. The selected trees were sprayed with paclobutrazol at (250 ppm, 500 ppm and 750 ppm) four weeks after full bloom followed by summer pruning (I and II) eight and twelve weeks after full bloom, respectively. The fruit samples with respect to size, weight, volume, colour change, firmness, organoleptic rating, physiological loss in weight, spoilage, acid content, total soluble solids, sugars (total, reducing and non-reducing sugars) and calcium content at regular interval of 10 days and the last sample drawn at 30 days after storage were studied. Results revealed that trees treated with 750 ppm paclobutrazol + summer pruning (I and II) resulted in fruits of better quality characteristics under ambient storage conditions for a period of 30 days. Highest fruit weight, minimum physiological loss in weight, no spoilage, maximum fruit firmness, highest fruit colour and maximum organoleptic rating in terms of fruit taste, maximum fruit texture and fruit flavour was obtained in trees treated with 750 ppm paclobutrazol + summer pruning (I and II).

Keywords: Apple, paclobutrazol, fruit colour, firmness and fruit flavour

Genetic Diversity of *Clostridium Perfringens* Type D Isolates from Sheep and Goats in Kashmir

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Abstract

Clostridium perfringens (*C. perfringens*), especially Type D isolates are associated with enterotoxaemia, which causes heavy economic losses. In the present study, 462 faecal samples comprising 376 (diarrhoeic-192; healthy-184) from sheep and 86 (diarrhoeic-47; healthy-39) were examined for isolation of *C. perfringens*. The isolates of *C. perfringens* were finally identified by 16S rRNA gene specific PCR and they were subjected to toxin-typing by a multiplex PCR. The Type D isolates were further genotyped by pulsed field gel electrophoresis (PFGE) to determine their genetic diversity. Out of 462 samples, *C. perfringens* was isolated from 286 samples. Toxin-typing of 286 isolates revealed 228 (79.72%) as Type A, while 58 belonged to Type D. Among the Type A isolates 31 (13.6%) also carried enterotoxin gene (*cpe*) in addition to alpha toxin (*cpa*) gene. Out of 228 *C. perfringens* Type A, 61(26.7%) and 18 (7.8) isolates were obtained from healthy adult sheep and lambs and 46(20.1%) and 58(25.4%) isolates from adult sheep and lambs with diarrhoea, respectively. Similarly, 8(3.5%) and 12(5.2%) Type A isolates were recovered from healthy adult goats and kids and the diarrhoeic samples yielded 15(6.5%) and 10(4.3%) type A isolates, respectively. Out of 58 *C. perfringens* Type D, 2(3.4%) and 9(15.5%) isolates were obtained from healthy adult sheep and lambs respectively. Similarly, 5(8.6%) and 34(58.6%) isolates from adult sheep and lambs with diarrhoea, were typed as D, respectively. Likewise, 3(5.1%) Type D isolates of *C. perfringens* were recovered from healthy kids and no type D toxinotype was found in healthy adult goat. The diarrhoeic samples yielded 2(3.4%) and 3(5.1%) Type D isolates from adult goats and kids, respectively. None of the isolates belonged to Type B, C and E. Type D isolates were higher in dairrhoeic lambs. Among these 58 isolates, 47 (81.03%) isolates gave reproducible patterns in PFGE analysis and 29 different PFGE pulsotypes (patterns) were obtained. Eleven (18.96%) isolates were found to be untypable by PFGE. Many isolates obtained from the animals of the same farm, revealed similar PFGE patterns. But in other cases, different pulsotypes were identified from the animals of the same farm also, although all the isolates produced an ~1,100-kb fragment in PFGE. Thus the difference between the banding patterns of these pulsotypes can be used as a tool in epidemiological studies.

Keywords: *Clostridium perfringens* Type D, sheep, goat, PFGE, Kashmir

Effect of Non-Genetic Factors on Growth and Fitness Traits in Corriedale Sheep

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Abstract

The present study was undertaken to evaluate the performance of Corriedale sheep under the agro-climatic conditions of J & K. Data on pedigree information for 49 years (1969-2017) for growth and fitness traits collected from records maintained at Mountain Research Centre for Sheep & Goat (**MRCSG),** F.V.Sc& A.H**,** SKUAST-K Shuhama, were utilized for the study. The traits studied were body weights at birth (BW), weaning (WW), 6 months (6MW), 9 months (9MW), 12 months (12MW), age at first lambing (AFL), litter size (LS), total lambs born per ewe (TLB) and survival rate (SR). The mean, standard errors and coefficient of variations (CV) of all growth and fitness traits were computed statistically. The effects of non-genetic factors such as period and sex on various normalized growth and fitness traits were analyzed by least squares analysis using the technique developed by Harvey (1990). The overall means for BW, WW, 6MW, 9MW, and 12MW was found to be 3.72±0.01 kg, 13.31±0.07 kg, 18.65±0.05kg, 22.15±0.04 kg, and 25.84±0.06 kg respectively. The average mean for age at first lambing (AFL), litter size at birth (LS), total lambs born per ewe (TLB) and survival rate (SR) was found to be 807.20±4.34 days, 1.08±0.00, 4.83±0.03, and 80.76±1.98 respectively. Period of birth was found to have highly significant (P<0.01) effect on all the traits under study. The least square means revealed that lambs born in P1 (1969-1975) have higher body weights at birth, weaning, six months, nine month, twelve months of age, higher values of total lambs born per ewe, higher percentage of survival rate and lowest value of age at first lambing. Sex of lamb was found to have significant effect on all growth traits and survival rate. Least square means revealed that males were heaver as compared to females and females have higher survival rate as compared to males. The significant difference between periods may be due to difference in the availability of inputs in terms of feed and fodder availability, managemental practices which directly effects the health, climatic conditions prevailing in different periods and may also be due to effect of inbreeding. The significant difference in between the sex may be due to reflection of physiological difference in the growth of both the sexes.

Keywords: 12MW, 6MW, 9M, AFL, BW, Corriedale sheep, LS, TLB, SR and WW,

Studies on Pytochrome and their role in Arabidopsis (*Arabidopsis thaliana*) & rice (*Oriza sativa*) plant

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Abstract

The phytochrome family of photoreceptors are potent regulators of plant development, affecting a broad range of responses throughout the plant life cycle, including hypocotyls elongation, leaf expansion and apical Dominance. The plant hormone auxin has previously been linked to these phytochrome-mediated responses; however, these studies have not identified the molecular mechanisms that underpin such extensive Phytochrome and auxin cross-talk. In this paper, we show that phytochrome regulates the emergence of lateral roots, at least partly by manipulating auxin distribution within the seedling. Thus, shoot-localized phytochrome is able to act over long distances, through manipulation of auxin, to regulate root development. The Rice phytochrome gene family is composed of three members known as *PHYA*, *PHYB* and *PHYC*. It has been elucidated that individual phytochromes display both unique and overlapping roles in rice photo morphogenesis by characterization of all rice phytochrome mutants including single mutants, all combinations of double mutants as well as triple mutants.

Keywords: Phytochrome, auxin, mutants, *Arabidopsis thaliana, Oriza sativa*

Host Defense Mechanism in Plants: Role of Chemical Inducers in Fruit Crops

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Abstract

Plants are challenged by a variety of biotic stresses like fungal, bacterial, or viral infections which lead to a great loss to plant yield. During the course period, plants develop defense mechanism with the co-evolution of pathogen. Plant have innate ability to recognise pathogens which in turn respond by the activation of defense genes, the formation of reactive oxygen species, the synthesis of pathogenesis related (PR) proteins, localised cell wall reinforcement and the production of low molecular weight anti-microbial compounds like phytoalexins. Hypersensitive response (HR) is used by plants to prevent the spread of infection by microbial pathogens. These responses can be addressed in two major layers of plant immunity: pathogen associated molecular pattern (PAMP) i.e. pathogen triggered immunity (PTI) and effector triggered immunity (ETI).PAMP is recognised by PRR (Pathogen recognition receptors) due to which PTI is induced which leads to the production of reactive oxygen species (ROS) and phytoalexins. ETI is mediated by resistant genes leading to the hypersensitive response (HR). All kinds of phytopathogens can potentially activate PTI and/ or ETI which may result in systemic plant response such as induced systemic resistance (ISR) or systemic-acquired resistance (SAR). These immune response involve intricate metabolic pathways mediated by several plant hormones, such as jasmonic acid (JA) and salicylic acid (SA). The protection of plants against pathogen through induced resistance can be made by the use of exogenous substances, lead to the reduction of use of traditional chemicals which is of major concern regarding the preservation of environment.

Keywords: pathogenesis related proteins, Hypersensitive response, Pathogen associated molecular pattern, Pathogen triggered immunity, Effector triggered immunity, Reactive oxygen species, Induced systemic resistance, Systemic-acquired resistance.

Effect of Inbreeding on Growth and Fitness Traits in Corriedale Sheep

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Abstract

The present study was undertaken to evaluate the performance of Corriedale sheep under the agro-climatic conditions of J & K and to estimate the inbreeding coefficient and its effect on growth and fitness traits. Data on pedigree information for 49 years (1969-2017) for growth and fitness traits collected from records maintained at Mountain Research Centre for Sheep & Goat (**MRCSG),** F.V.Sc& A.H**,** SKUAST-K Shuhama, were utilized for the study. The traits studied were body weights at birth (BW), weaning (WW), 6 months (6MW), 9 months (9MW), 12 months (12MW), age at first lambing (AFL), litter size (LS), total lambs born per ewe (TLB) and survival rate (SR). The individual inbreeding coefficients were calculated for Corriedale sheep population using CFC software and regression of different growth and fitness traits on inbreeding coefficient was analyzed using the procedure of GLM of SAS version 9.3, (2010). The mean inbreeding coefficient (F), proportion of population inbred (per cent), for Corriedale sheep were 18.3 and 43.3 respectively. The regression of most of the traits was negative. Significant effects of F were observed for BW, WW, 6MW, 9MW, 12MW, AFL, TLB, & SR whereas non-significant effect of F was observed on LS. In general, inbreeding classes were found to influence almost all the traits under study in Corriedale sheep. It was found that mean of all the traits under study increased or decreased regularly by increasing the inbreeding coefficient. With increase in the level of inbreeding there was a decrease in the body weights from birth to yearling, total lambs born per ewe and survival rate where as age at first lambing is increased with the onset of inbreeding which disturbs the farm economics and puts a big burden to farm resources by keeping the unproductive animals at the farm.

Keywords: 12MW, 6MW, 9M, AFL, BW, Corriedale sheep, Inbreeding coefficient, LS, TLB, SR and WW,

Preparation of Area Specific Mineral Mixture Based on Mineral Profile of Locally Available Feed and Fodder Resources in District Ganderbal of J&K State

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Abstract

To prepare area specific mineral mixture for district Ganderbal mineral profile of feeds and fodders available for feeding of livestock in the district was evaluated. The average mineral profile of composite fodder was Ca (0.67 g %), P (0.23 g %), Mg (0.24 g%), Zn (13.54 ppm), Cu (13.04 ppm) and Fe (246.23 ppm). It was observed that the feeds analysed though were containing Ca content higher than the critical level were poor in P, It was also found that most of the feed ingredients; particularly dry roughages were low in Zn content (<30 ppm). Oilcakes and wheat bran were found to contain exceptionally high concentration of zinc. Cu content was found to be in adequate quantities in most of the feed ingredients except paddy straw and rice bran in which it was found below critical level (<8.0 ppm). Invariably all the feed ingredients analysed were containing adequate quantities of iron (>50.0 ppm). It was found that the trace mineral content along with P of the locally available feeds and fodders particularly dry roughages were below critical levels and supplementation of such minerals is required in livestock fed on such feeds and fodders. In this backdrop and with these findings in hand area specific mineral mixture was developed for the region. The mineral mixture based on the aforesaid calculations was formulated with the composition as Zinc sulphate (4%), Copper sulphate (1.2%), Iron sulphate (0.75%), Manganese sulphate (0.82%), Iron sulphate (0.12%), Cobalt sulphate (0.085%), Di-Calcium phosphate (51%), Limestone phosphate (32%) and Magnesium oxide (10%).

Keywords: Area specific mineral mixture, Feeds and Fodders, Mineral status, livestock

Molecular Cloning and Expression of Epsilon-Toxin Gene of *Clostridium perfringens* type D

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Abstract

Epsilon toxin produced by *Clostridium perfringens* types B and D causes enterotoxemia in sheep, goats and calves. Enterotoxemia can cause acute or superacute disease, with sudden death of the affected animal. It provokes huge economic losses when large numbers of livestock are affected. Therapeutic intervention is challenging, because the disease progresses very rapidly. However, it can be prevented by immunization with specific immunogenic vaccines. A gene coding for epsilon-toxin was isolated from a field isolate of *Clostridium perfringens* type D by PCR amplification and was cloned in pET28a vector under the control of T7 promoter fused with six-histidine tag at the amino terminal end. The resultant construct showed high-level expression of the recombinant epsilon toxin (r-Etx) in soluble form in the cytoplasmic fractions of BL21 *E. coli* cells. Monoclonal antibodies against the native epsilon toxin were able to detect the recombinant *etx* as established by Western blot analysis confirming that the recombinant toxin retained antigenicity. The results in this study showed that the r-Etx could be used as a candidate of epsilon toxoid vaccine to provide protective immune response against *C. perfringens* type D infection.

Keywords: *Clostridium perfringens,* epsilon toxin gene, cloning, expression, pET 28a vector

Effect of Cold Stress and its Various Mitigating Remedies on the Haemato-Biochemical Parameters and Immune Response in Broiler Chicken

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Abstract

A biological trial was conducted on commercial chicks during the winter months (December and January). Day-old commercial meat type chicks (273) were procured from a reputed source. Cold conditioning (2^0C to 8^0C) at 3rd and 4th day of age for 3-4 hours was provided to 78 birds. These early cold conditioned birds were kept separate until distributed into respective treatment groups (fifth and sixth). On 14th day (end of second week), the chicks were individually weighed, distributed into 7 treatment groups of 3 replicates with 13 chicks in each replicate. Cold challenge @ 2^0C to 8^0C for 8 hours was provided from 3rd week of age to 6th week of their age for all treatment groups except first and fifth treatment groups. The broiler birds in the treatment groups T_1 and T_5 were reared under normal temperature conditions @25^0C.Treatment group first (T_1) was kept as control group. Antioxidant Vitamin E @ 250 mg per kg of feed was supplemented to the basal diet in the third treatment group. Chromium @ 0.1 gram per kg of feed was supplemented to the basal diet in the 4th treatment group. Chromium @ 0.2 gram per kg of feed was supplemented to the basal diet in the 7th treatment group. At the end of experimental trail, blood samples from 6 birds per treatment were collected randomly and analyzed for haematological and biochemical parameters. Similarly, cell mediated immune response and humoral immune response were assessed to detect immune status of broiler chickens. There was significant ($p<0.05$) difference in Haemoglobulin content, Total leucocytes count, Heterophil percentage, Lymphocyte percentage and H/L ratio among various treatment groups. The cold stress caused significant ($p<0.05$) increase in Haemoglobulin content but significant ($p<0.05$) decrease in Total leucocyte count in broiler chickens reared under cold conditions when compared with broiler chickens reared under normal temperature conditions. The cold stress caused significant ($p<0.05$) increase in H/L ratio in broiler chicken. The cold stress caused significant ($p<0.05$) increase in blood glucose, cholesterol, LDH (lactate dehydrgenase) and cortisol level in broiler chickens when compared with broiler chickens reared under normal temperature conditions. The cold stress also significantly ($p<0.05$) decreased immune responses both cell mediated and humoral in broiler chickens when compared with broiler chickens reared under normal temperature conditions. Vitamin E and Chromium decreased blood cortisol and improved the immune responses, thus decreasing stress in broiler chickens reared under cold conditions.

Keywords: Broiler chickens, Blood Biochemistry, Chromium, Cold stress, Haematology, Immune response, Vitamin E.

Common Health Problems and Feeding Practices of Livestock in Ganderbal District of Kashmir Valley

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Abstract

A field survey study was conducted in twenty villages representing four blocks of the district to assess the common health problems, existing feeding practices and nutritional status of livestock. For this purpose 195 lactating crossbred cattle, 152 lactating does and 103 lactating ewes were evaluated through a questionnaire developed for the purpose. The most common health problems among dairy cows were repeat breeding, anestrous, Ketosis, milk fever followed by Post parturient haemoglobinurea, bloat and pica. In does and ewes abortions, alopecia, poor growth and anemia was common. Majority of the lactating cows (57.4%) and 98.0% of does were kept on low plane of nutrition. While as none of the ewes was put on medium of high plane of nutrition and were fed insufficient diet (100%). 43.6 % of lactating cows, 1.54% of does and 0 % ewes were receiving mineral supplementation. The present study revealed that lack of awareness with regard to balanced feeding is impeding the growth and probably the major cause of production and reproduction diseases in animals of the district.

Keywords: health problems, feeding practices, nutritional status, health problems, mineral mixture

Effect of Cold Stress and Various Mitigating Remedies on the Histology of Lymphoid Organs, Adrenal Gland and Jejunum of Broiler Chickens

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Abstract

A biological trial was conducted on commercial chicks during the winter months (December and January). Day-old commercial meat type chicks (273) were procured from a reputed source. Cold conditioning (2^0C to 8^0C) at 3rd and 4th day of age for 3-4 hours was provided to 78 birds. These early cold conditioned birds were kept separate until distributed into respective treatment groups (fifth and sixth). On 14th day (end of second week), the chicks were individually weighed, distributed into 7 treatment groups of 3 replicates with 13 chicks in each replicate. Cold challenge @ 2^0C to 8^0C for 8 hours was provided from 3rd week of age to 6th week of their age for all treatment groups except first and fifth treatment groups. The broiler birds in the treatment groups T_1 and T_5 were reared under normal temperature conditions @25^0C. Treatment group first (T_1) was kept as control group. Antioxidant Vitamin E @ 250 mg per kg of feed was supplemented to the basal diet in the third treatment group. Chromium @ 0.1 gram per kg of feed was supplemented to the basal diet in the 4th treatment group. Chromium @ 0.2 gram per kg of feed was supplemented to the basal diet in the 7th treatment group. Samples from lymphoid organs, adrenal gland and jejunum from randomly selected birds from different treatment groups at slaughter were subjected to histo-morphological studies. The cold stress caused lymphoid depletion and necrosis in the lymphoid glands in broiler chickens when compared with broiler chickens reared under normal temperature conditions. But Vitamin E and Chromium decreased lymphoid depletion in broiler chickens reared under cold conditions. The cold stress caused hypertrophy of cells of adrenal gland in broiler chickens reared under cold conditions. The villus length and crypt depth in the jejunum of broiler chickens reared under cold conditions were significantly ($p<0.05$) lower when compared with broiler chickens reared under normal temperature conditions. Vitamin E and Chromium significantly ($p<0.05$) improved villus length and crypt depth in broiler chickens reared under cold conditions.

Keywords: Adrenal gland, Broiler chickens, Chromium, Cold stress, Jejunum, Lymphoid glands, Vitamin E

Genetic Divergence and Phenotypic Stability Across the Cutting Environments in Lucerne (*Medicago Sativa* L.)

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Abstract

The present investigation was conducted in alfalfa (*Madicago sativa* L.) adopting 9x9 double lattice design and seven cutting management environments. Attempts were made to examine the extent of variability and genetic divergence amongst 81 forage alfalfa genotypes of different geographical origin, workout the nature of association and direct and indirect effects of different characters on fodder yield, and identify the differential response of genotypes over the cutting schedules and finding out stable genotypes. Observations were recorded for Plant Height (cm), No. of Primary Branches /plant, No. of Nodes / plant, Inter Nodes Length (cm), Stem Girth (mm), Plant Spread (cm), G.F.Y. / plant (g), L. S. ratio/ plant (g), Leaf Weight / plant (g), Stem Weight / plant (g), D.M.Y./ plant (g), Protein content (g) and weevil infestation.

Analysis of variance revealed substantial amount of variability for various characters in all the environments. Mahalanobis D^2 statistics revealed considerable genetic diversity among the genotypes. The genotypes were grouped into 12 clusters in all the cutsand on pooled basis. The 2nd, nineth cluster having the maximum number of genotypes in forth cut followed by cluster 3nd in C_3 and forth in C_5 and cluster 4 have maximum number of genotypes followed by 10th clusters in pooled analysis. This envisaged that the genotypes grouped within a particular cluster are more or less genetically similar to each other and apparent wide diversity is mainly due to the remaining genotype distributed over rest of the other clusters in various cutting environments. There was no association between clustering pattern and eco-geographical distribution of the genotypes.

Genotypic correlations were of higher magnitude as compared to their corresponding phenotypic correlations in most of the character combinations. Green Fodder yield was found to be positive and significantly correlated with leaf weight, stem weight, DMY, protein contents and dry fodder yield per plant was found to be positive and significantly correlated with GFY, plant spread, leaf weight, stem weight, protein content on pooled basis. Path-coefficient analysis revealed that number of primary branches, plants spread, leaf weight, L-S ratio and stem weight, stem grith were the most important characters controlling directly to fodder yield and quality in alfalfa.

Significant linear and non-linear components of G x E interactions were recorded for some traits. Linear portion was higher for number of nodes, number of primary branches and plant height, whereas for internodes length, stem girth, plant spread, GFY, DMY, L-S ratio, Leaf weight and stem weight showed greater portion of non-linear components of G x E interaction. The genotypes, IL-03-36, IL-2000-60, IL-2000-113, IL-2000-117 and IL-2000-77 were identified as promising for hybridization on the basis of their genetic divergence, stability and *per se* performance for several traits particularly green and dry fodder yield and their quality.

DNA Barcoding – Significance and Future Prospects in Pest Management And Biological Control

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Abstract

Identification of a specific pest is central to its management strategy and prime requirement for the sustainability of modern food production which has been marred by alarming environmental changes and increasing pest damage and disease. Owing to resistance of some insects to Pesticides and environmental concerns, Biological control has taken a central stage for the management of pest population in an environmentally friendly manner. Misidentification of insects species encountered by researchers or farmers especially in case of sibling species or cryptic ones creates unnecessary delay in deploying appropriate management strategies and also poses serious economic and environmental consequences. DNA barcoding has come as a boon to identification process and complements morpho-taxonomy to assuage the challenges posed by identification of insect species. Based on DNA sequence, viewed as genetic barcodes it exploits diversity to identify organisms and critically examines the precision of morphological traits commonly used in taxonomy. DNA barcoding enables taxonomists to identify a pest in any life stage, more accurate and cost effective manner and in short span of time, thereby allow researchers and farmers apply more appropriate control strategy before it crosses the economic injury level.

Keywords: Identification, cryptic, morpho-taxonomy, biological control, DNA barcode, pest

Theme : Biotechnology and Genetic Engineering

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Abstract

Chickpea *(Cicer arietinum* L.), is the second most important cool season food legume in the world after dry beans (Mallikarjuna *et al.,* 2017). Among abiotic stresses, cold temperature stress represents a major limiting factor in chickpea production especially in North India, (Jha *et al.,* 2014). For the development of high yielding cold tolerant chickpea varieties, a set of 192 chickpea genotypes which include cultivated as well as wild species have been grown under natural conditions in the field (sowing done in October, 2017) and evaluated for cold screening (on the scale of 1-9), in the month of March, 2018 and LT50 was calculated by electrolyte leakage, after plants were subjected to standardized cold treatment. At the molecular level, genetic diversity and population structure analysis studies are being carried out by whole genome genotyping (representing all the 8 linkage groups of chickpea genome) for cold tolerance using SSR markers and gene specific marker. Genes/QTLs for cold tolerance will be identified by studying marker-trait association through association mapping using mixed linear model of TASSEL software programme. The most promising marker-trait associations will be recommended for the use of MAS programs for the improvement of cold tolerance. In addition, superior candidate lines (for cold tolerance, nutritional traits and extra early maturity) already identified have been also utilized in crossing program and a set of ~20 F_1 seeds have been obtained. The F1 plants have been further advanced to F2 generation. Marker-assisted selection (MAS) of hybrids/recombinants with introgressed genes shall be carried out in F2 generation using SSR markers. The trait evaluation for cold tolerance and high-throughput genotyping data to be generated using SNP array will be utilized for the study of marker-trait associations (MTAs). The useful MTAs will be utilized in marker-assisted breeding (MAB) programs for developing new chickpea cultivars with enhanced nutrient density and cold tolerance.

Keywords: Cold tolerance, QTLs, MAB.

Evaluation of Feeding Practices and Nutritional Status of Adult Horses in District Ganderbal of Kashmir Valley

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Abstract

A study was carried in three blocks of district Ganderbal, to find out the existing feeding practices and nutritional status of equines there in. 30 families were randomly selected from each study block with a total of 90 families in 3 blocks. The feed/fodder samples offered to equines were collected and analyzed for nutritive composition and macro minerals (Ca and P). The intake of DM, DE, CP, Ca and P was calculated and compared to requirements (NRC, 2007). The most common feeds and fodders offered to the equines in this district were paddy straw, oat hay, mixed hay, maize stover, as a source of roughage and rice bran, wheat bran, MOC and maize grain as a source of concentrate. Further, roughages were fed in twice a day. Concentrates were fed thrice a day. The equines were fed blend of several spicy ingredients locally popular as “masala” which comprised of onion, ginger, greenchillies, black cumin and salt.The daily feed intake in terms of dry matter for adult equines was optimum as compared to requirements (NRC, 2007).

Keywords: Feeding practices,Equines, Ganderbal, Nutritional status, Masala

Comparative Study on Ketofol and Propofol Anesthesia in Canine Surgical Patients

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Abstract

The present study was undertaken to study the physiological, analgesic and anesthetic parameters of propofol and ketofol as total intravenous anesthesia (TIVA) in canine patients. Twelve animals were randomly divided into three groups (A, B and C) comprising four animals each. Following the administration of preanesthetics (atropine @ 0.04 mg/kg and xylazine @ 0.5 mg/kg), induction and maintenance of anesthetic agents were followed in all the three groups. In Group A, induction was done with Propofol (@ 5mg/kg IV) and maintenance with Propofol bolus (@ 2.5mg/kg IV); in Group B induction with Ketofol (@ 2 mg/kg IV) and maintenance with Ketofol bolus (@ 1mg/kg IV) was done. While in Group C, induction was done with Propofol (@ 5mg/kg IV) and maintenance with Propofol using CRI (@ 0.2 mg/kg/min IV). All the physiological parameters (i.e., heart rate, respiration rate and pulse rate) and blood glucose were recorded before the administration of any drug and after 10, 20, 30, 40, 50 and 60 minutes of drug administration. Anesthetic parameters, depth of analgesia, duration of analgesia, recovery time were also recorded. No variation was observed in physiological parameters during the anesthetic protocol. Quality of induction was better in group B and group C but relaxation of jaw was better in group A and group C when compared to group B. Blood glucose showed an increasing trend till fifty minute interval post induction in group B and group C while in group A, values were high even at sixty minute interval post induction. Recovery time and duration of analgesia was significantly higher in group C followed by group B and then group A. It may be concluded that Propofol (CRI) provided longer duration and better quality of anesthesia as compared to Propofol (bolus). However, Ketofol (bolus) provided better anesthetic effect than Propofol (bolus) in terms of its duration and quality.

Keywords: Analgesia, Canine, Constant rate infusion, Ketofol, Propofol.

Breed Clustering Analysis of Six Indian Cattle Breeds Using Genome-Wide Snp Data

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Abstract

Population structure and diversity analysis form an important part of genetic structure studies in livestock populations. Genomic breed clustering is an important approach to study population genetic structure based on genotypic data. In the present study, 50K SNP genotypic data pertaining to the total of 83 animals belonging to six *indicine* cattle breeds were used to assess genomic breed clustering amongst them. The six breeds included Hariana (10), Kankrej (10), Tharparkar (12), Red Sindhi (10), Sahiwal (17) and Gir (24). These were arranged in different datasets and a separate dataset was prepared with combined data of all six breeds (dataset A). After processing the data for inclusion thresholds and quality filters, only polymorphic markers with definite chromosomal coordinates were left. Further analysis in terms of polymorphism proportion, average MAF values and chromosome-wise marker coverage parameters was done. Chromosome-wise marker coverage depicted the efficient distribution of SNP variant markers across the whole genome. All the breeds of dataset A were exclusively clustered in ADMIXTURE programme into separate clusters except Red Sindhi population. With PCA based approach, diverse nature of individual populations and stratified breed-group clustering along two axes was evident with three breeds stratified separately and the rest three positioned in a single cluster. Sufficient levels of variation of single dimensional nature were explained by first two principal components in each dataset. The Indian indigenous cattle breeds were thus found to maintain efficient population genetic structure amongst them.

Keywords: Admixture, clustering, *Indicine*, PCA, PLINK, SNP

Effect of Host Density on Oviposition Behaviour of Trioxys Pallidus (Hymenoptera: Braconidae)S. Tariq Ahmad*,

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Abstract

Successful oviposition rates of walnut aphid parasitoid, *Trioxys pallidus* was evaluated at different densities of its host, *Chromaphis juglandicola*. Experimental arena consisting of different patch sizes of the host of 5, 10, 15 and 20 individuals was selected. It was found that as the density of aphid increases, the number of successful oviposition decreases. Average proportion of successful oviposition per aphid was 1.56 (±0.43) at 5 aphids per leaflet, 1.20 (±0.56) for 10 aphids, 0.80 (±0.41) for 15 aphids and 0.62 (±0.48) for 20 aphids. Declining efficiency of the parasitoid with increasing density of host has broader implications as far as biocontrol in walnut orchard system is concerned.

Keywords: Walnut, *Trioxys*, *Chromaphis*, oviposition

Evaluation of the Dyeing Potential of Natural Dye with a Combination of Natural Mordants

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Abstract

Coloured products have gained a lot of importance in present day societies. Textile dyes are considered as the most polluting industrial process. The work was carried out with an aim of substituting the harmful chemical agents with natural dyeing agents and mordants. The experiment was conducted to investigate the dyeing potential of the natural dye extracted from *Juglans regia L.* (leaves) with the combination of *Salix alba* L. (wood extract) and *Populus deltoides* Bartram ex Marsh. (wood ash) mordants. Extraction and application of the dye and mordant was carried out using distilled water. Dyeing efficiency of the material was tested on Wool, Cotton, Silk and Pashmina fabrics. Extraction of the dye was carried using Soxhlet apparatus. The process of the dyeing was carried out in different combinations including and excluding mordants by adopting pre, simultaneous and post mordanting methods. The efficiency of the dye and mordant in isolation and in combination were recorded in terms of the percent absorption, Colour coordinates (CIELAB) using Chromometer based on CIE system, Colour strength (K/S), Relative K/S using a JAYPAK-4802 colour matching system and retention of the colour were tested as per ISO 105-B02 for light, ISO 105 X-12 for rubbing and ISO 105-C01 for washing respectively. Grades for the colour change and colour staining were assigned as per ISO 105-AO2 and ISO 105-A03. The dye in combination with mordant showed significant importance and resulted in beautiful shades in case of the Wool, Silk and Pashmina fabrics. However, Cotton fabric does not showed much affinity and recorded lower values of colour quality and retention grades. Colour strength of the dyed fabrics recorded best in unmordanted samples and better in mordanted samples. The retention in terms of the washing, light and rubbing recorded excellent grades with slightly lower grades in unmordanted dyed samples.

Molecular Based Genetic Modification of Insects for Pest Management

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Abstract

Genetically modified insects are insects with newly expressed characteristics as a result of manipulation of D.N.A. The changes are heritable and passed on to the next generation. The development and use of GM insects offers significant potential for both the control of infectious diseases and the management of agricultural pests. It is possible to manipulate an insect's DNA in order to alter its function or reduce its fitness. GM insect technologies are a potential form of biological control, in contrast to the use of chemical controls, such as insecticides, which can be harmful to people and the environment. Genetic modification of pest and beneficial arthropods can be achieved by multiple methods. Initially, the only methods available were artificial selection or hybridization. After it became possible to develop genetically modified Drosophila using transposable-element (TE) vectors, scientists focused on transgenesis (insertion of exogenous genes into the nuclear genome) using TE vectors. That approach has limitations (possible lack of stability and randomness of the insertion of the transgene), as well as a potential for horizontal transfer (HT). Once RNA interference (RNAi) was discovered, its possible use to control pests began to be explored. It is used to describe a number of gene silencing phenomena characterised by the specific binding of short RNAs (20-30 nucleotides in length) to target sequences in a process mediated by Argonaute family proteins leading to cleavage of the targeted endogenous RNA. Paratransgenesis (the insertion of genetically modified symbionts into an insect) has been studied as a method for control of vector-transmitted diseases. Molecular-genetic methods could improve genetic-control programs, especially the sterile insect technique, in which males of pest species are mass reared, sterilized by irradiation, and released to mate with wild females, resulting in suppression or eradication of the population over time. Producing sterile males or producing only females using molecular tools could improve the efficiency and cost-effectiveness of such programs. Other goals include producing honey bees (*Apis mellifera*) that are disease resistant, and silk moths (*Bombyx mori*) that produce improved silk or novel drugs. The genetic modification of silk moths to produce improved silk or to produce proteins used in drugs is an active area of research. Natural enemies used in biological control programs could be modified to enhance their effectiveness by altering their sex ratio, host range, temperature and relative humidity tolerances, or diapause attributes. However the potential risks of permanent releases of GM insects into the environment raise concerns about risk, it is appropriate to release relatively low-risk examples first. This might involve the release of a transgenic beneficial arthropod that is carrying a marker gene or sterile pests that can not reproduce in the environment.

Keywords: Genetically, modified, paratransgenesis, pest, transgenesis

Fascioliasis (*Fasciola sp.* Infection) in Slaughtered Sheep and Goats and their Epidemiological Survey in Anantnag, Kashmir

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Abstract

The aim of the present study was to compare the prevalence of fascioliosis infection parasitizing liver in small ruminants from various regions of District Anantnag, Kashmir. Livers of small ruminants from various slaughter houses were collected randomly and examinations were carried out. 230 sheep and 210 goats were examined which indicated a marked variation in the level of fascioliosis with season, age and sex. Out of these, 102 (44.34%) sheep and 88 (41.90%) goats were found infected with fascioliosis respectively. Overall the highest seasonal prevalence in all types of sheep and goats was recorded during summer (65.51% and 64.28%); followed by spring (57.40% and 48.07%), autumn (33.82% and 31.66%), while the lowest (20% and 19.04%) was recorded during winter respectively. A higher infection rate was recorded in animals below 9 months than above 9 months of age both in sheep and goats. Males show high infection rate as compared to females. Effective control measures to proper management, improved hygiene and the strategic use of regular deworming is need for the treatment of intensive fascioliosis in small ruminants.

Keywords: Fascioliosis; Prevelance; Small ruminants; Season; Age; Sex; Proper management; Regular deworming.

Processing of Walnuts by Different Methods And Identification of Compounds Using GC–MC and LC–MS and Estimation of Antioxidant Activity

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Abstract

The soaking and microwave treatments of whole walnuts with shells were made with the intention to assess the effect of treatments on antioxidant and anti-proliferative activity of walnut kernels. The extraction of processed walnut kernels with different solvent and the effect of extract on the antioxidant activity using various assays were examined, also the impact of the water extract on colo-205 human cancer cells were studied. The significant effect of solvents was found on the antioxidant activity of walnut kernels and acetone showed good results followed by methanol and water. The soaked walnut extracts unveiled increase in antioxidant activity compared to the un-soaked walnuts. Soaked walnuts showed good anti-proliferative activity followed by microwaved and unprocessed walnuts. The two different chromatographic techniques (GC–MS and LC–MS) were used to gauge the range of bioactive compounds present in the walnut kernels after processing and the major compounds found were linoleic acid, oleic acid and hexadecanoic acid and epicatechin, quercetin, epicatechin 3-O-gallate and ellagic acid.

Value Addition in Livestock Product for Socio- Economic Upliftment

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Abstract

As per 19th Livestock census, 2012 (GOI, 2014) India's livestock sector is one of the largest in the world with a holding of 11.6% of world livestock population which consists buffaloes (57.83%), cattle (15.06%), sheep (7.14%), goats (17.93%), camel (2.18%), equine (1.3%), pigs (1.2%), chickens (4.72%) and ducks (1.94%). India has huge livestock population of 512 million nos. which mainly includes cattle, buffaloes, goats, sheep and pigs. Demand, especially for edible livestock products, has increased as a result of growth in domestic consumption and exports and is predicted to more than double in 20 years. The emergence of the modern retail sector has led to higher standards for meat and dairy products in increasingly large parts of the world. With the right approach, supplying this growing demand can be a pathway out of poverty, especially for small-scale livestock keepers at the upper and middle levels of the pyramid., provided that they are organized and have access to the necessary inputs, services and finance. Livestock keepers at the bottom of the pyramid, and even landless people, can also participate in livestock Value Chain as service providers, feed suppliers or simply workers. A thriving livestock Value Chain supports other agricultural Value Chains, as it "pulls" demand from the small-scale crop producers who grow fodder crops or supply crop residues to livestock producers. Besides offering great potential and outstanding contribution in agricultural sector over the past years, livestock sector is performing well in the manner of production, value addition and export of dairy, fishery, wool, poultry and other products. Apart from its performance there are some threats also exist like social taboo, unorganized livestock market etc. and we need to re-correct it and take the global market opportunities.

Keywords: Livestock, Value addition, products, exports, economy, socio-economic uplift

Histopathological Study of the Effect of Antioxidants Present in 5% Ethanolic and Aqueous Extracts of *Salix Acmophylla* on Skin Wounds in Rabbits.

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Abstract

Oxidative stress and free radicals have been implicated in impaired wound healing. *Salix acmophylla*, an important herbal plant belonging to the family Salicacae and is locally available in Kashmir valley. The plant possesses wide range of natural antioxidants which are known to ameliorate the oxidative stress generated during various physiological and pathological conditions. Hence, the present study was designed to evaluate its scientific validity. The 5% ethanolic and aqueous extract ointments of leaves of *Salix acmophylla* were investigated for the their healing efficiency and antioxidant effect on full thickness excisional skin wound in rabbits. The effect produced by both the extract, in terms of early wound contracting ability, wound closure, decrease in surface area of wound, faster tissue regeneration at the wound site which was seen after routine histological processing of biopsy samples stained with H&E to detect morphological changes and Mason's Trichrome stain (MTS), to assess the collagen content of the healing wounds and antioxidant effects were significant ($p < 0.05$) in treated rabbits compared to control group. The present study thus provides a scientific rationale for the traditional use of this plant in the management of the wounds.

Keywords: Antioxidants, Free radical, H&E, Mason's Trichrome, Oxidative stress, *Salix acmophylla*, Wound healing.

Helminth Fauna of Dog (*Canis Familaris*) In Srinagar City, Jammu and Kashmir, India.

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Abstract

The ever increasing rise of anthropogenic activities on ecosystem has been associated with an increase in the incidence of emerging helminth disease. Surveilling emerging helminth disease should be a priority in regions where wildlife, livestock and human habitat has an overlap, thus increasing chances of disease transmission. Despite the fact that cats harbor number of helminths with zoonotic potential and they inhabit in close association with human, comprehensive information with regard to the prevalence, epidemiology and public health significance associated with gastrointestinal helminths of dogs in Kashmir valley is lacking. A study was conducted from February, 2017 to January, 2018 in Srinagar city with the objective of evaluating the gastrointestinal helminth fauna and their prevalence in stray cats. A total of 478 fresh fecal samples were collected for examination of helminth infection. Eggs of helminths were separated from fecal samples employing floatation and centrifugal techniques. The overall prevalence of infections was 44.35%. Most prevalent helminth eggs were of *Ancylostoma* spp. (31.38%), followed by *Toxocara canis* (26.15%), *Dipilidium caninum* (19.87%), *Taenia* spp. (5.23%), and *Echinococcus granulosus* (4%).

Keywords: Helminth, cat, Srinagar, *Canis familaris* and *Toxocara canis*.

Rootstock and Cultivar Effect on Mineral Nutrition, Seasonal Nutrient Variation and Correlation with Fruit Quality Parameters

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Abstract

The nutrient accumulation curves of apple trees are good indicators of plant nutrient demand for each developmental stage. As for as the rootstock are concerned semi vigrous rootstock MM_{106} had the highest level of nutrient concentrations as compared to dwarf M_9 rootstock. The exotic cultivars like Vista Bella on MM_{106} recorded highest leaf N (2.37, 2.38%) P (0.21, 0.20%), Zn (37.4, 34.8 ppm), B (44.07, 45.30 ppm) and Fe (83.6, 114.2 ppm). The Mollies Delicious on MM_{106} recorded maximum Ca (1.65, 1.67%), N (2.36, 2.39%) and Cu (12.3, 14.5 ppm) content and highest K content (1.54, 1.55%) recorded in Starkrimson on both rootstocks. However, the maximum Mg content (0.30, 0.30%) and Cu (11.3, 9.2 ppm) was observed in Cooper IV on both rootstocks. The seasonal variation of nutrients in leaves indicate stability period of various nutrients like N, P, Ca, Zn, Mg, B and Fe in early maturing cultivars like Vista Bella and Mollies Delicious from 15th of June to 15th of July, while as in mid-season cultivars Starkrimson and Cooper IV the stability in nutrient concentration was recorded from 30th June to 30th of July indicating the appropriate leaf sampling period for these exotic cultivars as against the sampling time of existing cultivars which is from mid-July to mid-August under similar conditions. The seasonal variation of leaf nutrient content indicate that early maturing cultivars viz, Vista Bella and Mollies Delicious recorded increase in nutrient content upto 30th of June, thereafter the trend decreased, while as the mid-season cultivars like Starkrimson and Cooper IV observed a similar trend upto 15th of July and decreased thereafter. The present study also revealed a significant influence of rootstocks and cultivars on growth and quality characteristics of apple. Fruits harvested from trees on MM_{106} rootstock were superior in respect of length, diameter, volume, TSS, acidity, total sugar and TSS acid ratio compared to those on M_9 rootstocks. Significant and positive correlation was obtained between leaf nutrient content and different quality parameters. By comparing all possible one-on-one relationships, it is concluded that any factor which affects fruit size can influence a series of factors related to quality.

Keywords: Rootstock, cultivar, seasonal variations, nutrient concentrations

Elicitation of Fenugreek (*Trigonella Foenum-Graecum*) Sprouts for Improving their Bioactive Potential for Better Management of Diabetes

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Abstract

Plant Secondary metabolites are being recognized as excellent anti-hyperglycemic agents and can be increased in plants by different food based elicitor treatments. Therefore, enhancing such bioactive constituents in plants and determining their antidiabetic mechanism of action under *in vitro* and *in vivo* conditions is a need of hour. The prime objective of this research was to improve the phenolic-linked antioxidant and anti-diabetic properties of fenugreek sprouts through elicited sprouting and inter-relate these findings with their metabolite profile.In the current study, vitamin C, folic acid and lactoferrin were used as natural phenolic elicitors in germinating fenugreek sprouts. The genotype showing the maximum increase in phenolic compounds and antidiabetic potential under *in vitro* conditions was selected and revalidated for its antidiabetic potential under *in vivo* conditions.The current Investigation revealed thatt vitamin C treatment elicited the maximum phenol content as well as anti hyperglycaemic activity via inhibiting **α**-amylase, **α-** glucosidase and invertase activities under *in vitro* conditions. Further, diosgenin and trigonelline content of elicited sprouts was found to decrease as germination proceeds and ranged between 0.130% to 0.050 %(w/w) and 0.387% to 0.083 % (w/w), respectively. In contrast to this, highest quercetin content was observed in the elicited sprouts on 4th day of germination, and ranged between 0.1375% to 0.000247 % (w/w) correlating to high phenolics and antioxidant activity. A direct correlation was also found between increase in quercetin content and hypoglycemic activity, thereby, providing a strong evidence for confirmation of phenolic enriched fenugreek sprouts as antidiabetic remedy under *invitro* conditions.Under *in vivo* conditions, the effect of aqueous sprout extract on various biochemical markers showed encouraging results in streptozotocin-induced diabetic rats. Additionally, combination therapy of aqueous extract (300mg/kg bw) with voglibiose (1mg/kg bw) demonstrated synergistic anti-hyperglycemic effect. Our findings clearly reveal that the phenolic enriched fenugreek sprouts alone or in combination can be used as potential candidate for diabetes management. The present study clearly reveals the interrelationship between the metabolite profile and the possible antidiabetic mechanism of action of Vitamin C elicited fenugreek sprouts for their use as an economical antidiabetic agent.

Key Words: Diosgenin, Quercetin, Trigonelline, Diabetes, Antioxidant

Morpho-Physiological and Pathogenic Variability in Phomopsis Vexans Isolates Causing Blight Disease in Brinjal and its Integrated Management in Kashmir

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Abstract

Brinjal is also known as eggplant due to the shape of fruits of some varieties which are white and resemble the chicken eggs. In Kashmir it is grown as a warm season crop but is susceptible to severe frost. Brinjal is attacked by many fungal, bacterial, viral and nematode diseases of which Phomopsis blight caused by *Phomopsis vexans* is considered to be the most destructive and one of the major constraints of brinjal production. The study to ascertain the variability among different isolates of *Phomopsis vexans* developed from brinjal growing areas of valley revealed that the isolates varied in their cultural behaviour ranging from fluffy to embedded with regular to irregular margins. Colour of colonies varied from white, pinkish, blackish brown to grey. Growth rates of the isolates was between 29.15 to 84.10 mm while as mycelial dry weight ranged from 107.20 to 408.90 mm. Morphological studies of isolates revealed variations in size and shape of pycnidia, shape, size of α and β conidia and formation of guttulae in α-conidia. Average size of α-conidia varied from 4.01 × 1.25 to 14.12 × 4.09 µ while as β-conidia ranged from 15.39 × 0.65 to 35.57 × 1.07 µ. Pycnidial size varied from 144.47 × 410.67 to 534.89 × 321.19 µ. Majority of the isolates took 10 to 20 days to produce sporulating pycnidia on PDA with marked differences in pycnidial density however, some isolates produce sporulating pycnidia in less than 10 days. In most of the isolates pycnidia were randomly distributed in the colony however, distribution of pycnidia in concentric rings was also found in some isolates. The effect of temperature, pH, carbon and nitrogen sources on the mycelial growth and fructification of *Phomopsis vexans* were studied in the laboratory. The isolates produced best mycelial growth and fructification at 25°C and at pH 5.5. Disaccharides among the carbon sources and nitrate form among the nitrogen sources proved best for both mycelial growth as well as fructification. On the basis of disease reaction expressed by different brinjal lines, Pusa Purple Long (PPL) was found to be most susceptible to PV_1, PV_{11}, PV_{16}, PV_{17} and PV_{21} isolates of *P. vexans* while as SK-BL-01 was found to be least susceptible to the said isolates. Role of temperature in the interconversion of α and β-conidia was studied under both field and laboratory conditions and it was found that lower temperature (10-15°C) favoured the formation of β-conidia while as the higher temperature (25-30°C) produced α-conidia. Host range studies on tomato, chilli, capsicum and okra revealed that only tomato acts as a host for the said pathogen. Management of Phomopsis blight of brinjal has mainly been through the use of fungicides. However, fungicide applications are only partially effective under environmental conditions that are favourable for pathogen infection. Furthermore, fungicides alone are not sustainable especially in small holding farming system in Kashmir, due to the high cost and risks to the environment. Keeping the prospects under the economic importance of the crop and amount of destruction by *P. vexans*, field evaluation of soil amendments, seed treatments with bioagents and fungitoxicants and foliar sprays with fungitoxicants during two cropping seasons of 2015 and 2016 were carried out. The results revealed significant disease control by all these treatments in both nursery and in transplanted field. Among all the treatments in nursery, highest seed germination of 94.72 per cent was

recorded in soil amendment with vermicompost @ 7q/ha + seed treatment with carbendazim @ 2g/kg seed and the lowest seed germination 73.38 per cent but far better than control was recorded in soil amendment with FYM @ 10q/ha. In controlling damping off and seedling blight in nursery, the performance of the treatments were in similar trend of germination percentage. In transplanted field, the treatment combination viz. vermicompost @ 7q/ha as soil amendment + *T. viride* @ 5 kg/ha as soil amendment + carbendazim 50 WP @ 0.1% as root dip + carbendazim 50 WP @ 0.1% as foliar spray was noted as the best treatment against leaf blight, stem blight and fruit rot showing intensity values of 5.48, 0.95 and 5.63 per cent respectively while the lowest performance was recorded in the treatment viz. soil amendment with vermicompost @ 7q/ha showing intensity values of 19.29, 13.59 and 20.83 per cent respectively. Further, the highest fruit yield of 234.38 q/ha was also recorded in the same treatment combination.

Integrated Effect of Chemical Fertilizers and Bio-Inoculants on the Soil Health with an Increase in Cost Benefit Ratio in *Gladiolus* (Tourn.) L. cv. Priscilla.

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Abstract

Biofertilizers are microbial inoculants which were applied to the soil before planting any crop for increasing the fertility status. These not only helped in improvement in nutrient uptake by the plants, releasing of growth hormones and antibiotics but also improved the quality of produce along with reduced cost of production. The treatments were comprised of *Azotobacter, Azospirillum,* VAM(vesicular arbuscular mycorrhiza) and PSB(phosphorus solubilizing bacteria) with reduced doses of nitrogen and phosphorus. The results revealed an improved nutrient status with highest N and P in soil (0.094 & 0.129%), in leaves (4.61 & 0.28%) and in corms (4.8 & 0.75%) in treatment combination containing Azotobacter +Azospirillum +78% N +100% P & K of recommended dose. Maximum number of corms plant^{-1} (3.18) were observed in treatment containing Azotobacter +Azospirillum +78% N +100% P and K which is at par (2.98 & 2.88) with the treatment containing VAM(vesicular arbuscular mycorrhiza) + PSB(phosphorus solubilizing bacteria) + 78% P +100% N and K of recommended dose and treatment containing PSB (phosphorus solubilizing bacteria) + 78% P +100% N and K of recommended dose. Highest net profit and benefit cost ratio was recorded under treatment containing a combination of Azotobacter + Azospirillum +78% N +100% P and K of recommended dose followed by Azospirillum +78% N +100% P and K of recommended dose. Hence, it may be concluded that the application of bio- inoculants not only improved the general health of the soil but also increase the benefit cost ratio by producing maximum number of corms m^{-2}, hence this standardized technique of application of bio inoculants is recommended to serve as a viable tool in ensuring the healthy soil and profitable crop of gladiolus which would ensure a good price to the growers who are engaged in gladiolus cultivation.

Keywords*:* bio-inoculants, soil health, gladiolus.

A Study on the Development of Gluten Free Noodles Based on Rice and Corn Flour.

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Abstract

Gluten, an essential structure-binding protein is responsible for noodle textural quality. Although important, gluten causes health problems to celiac disease sufferers. Thus, the aim of this study was to develop noodles using a gluten-free flour (rice and corn), xanthan gum and guar gum. The study was conducted in two phases: In the first phase, guar gum and xanthan gum were added together in the mixture of rice and corn flour. The two gums were added at different concentration(0%,1%,2%,3%,4%). Dough was made and then passed through noodle making machine for the formation of noodle strands. Then, the cooking quality test , texture analysis and sensory analysis of noodles was done. The results were compared with control (wheat noodles). The noodle sample which was having the results comparable with the control, was categorized as the final product. It was observed that in the noodle sample with 3% gum concentration, the guar gum together with xanthan gum successfully replaced gluten and all the results were comparable with the control sample. In the Second phase, proximate analysis of the final product was done. The final product was having a good amount of proteins and carbohydrates and hence it can be concluded that the developed Gluten free noodles can be consumed by individuals who exhibit allergic symptoms due to wheat gluten.

Keyword: gluten, celiac disease, gluten free flour, noodle, cooking quality test, texture analysis, sensory analysis.

Role of Psychrotrophic Bacteria in Composting of Organic Waste Fraction of Municipal Solid Under Temperate Climatic Conditions

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Abstract

Kashmir valley has a temperate climate and the management of municipal solid waste (MSW) becomes a great challenge due to un-conducive temperatures for microbes for decomposition. However, psychrotrophic bacteria have been isolated from these regions that could be used for rapid decomposition of organic solid wastes. Hence the present study was taken to isolate and characterize some cold active bacteria that would increase the rate of decomposition during low temperature conditions. By following serial dilution and spread plate technique a total of a total of 20 morphologically different bacteria were isolated at temperature of 10°C.Out of 25 isolates only 8 isolates showed enzyme producing potential by forming hydrolysis zones on different media at lower temperatures. The isolates were then screened quantitatively and it was found that only three isolates viz.I_1, I_3 and I_7 showed significantly higher enzyme activities. The isolates were identified on the basis of morphological, cellular and biochemical characteristics. The isolate I_1 belonged to genus *Bacillus*, I_3 belonged to genus *Pseudomonas* and the isolate I_7 belonged to genus *Bacillus*. Further on the basis of molecular characteristics the isolates were finally identified by 16SrRNA analysis as *Bacillus flexus* (accession no. MH**266216))**, *Pseudomonas florescence* (accession no. MH**266217**) and *Bacillus cereus* (accession no. MH**266220**) respectively. During in-vitro decomposition of wastes using different treatments of the isolates at the concentration of 5 x 10^7 cfu ml^{-1} *the treatment* **(I_1+I_3+I_7)** CW containing all the three bacteria viz. *Bacillus flexus, Pseudomonas florescence and Bacillus cereus* produced the compost with best nutrient quality. The treatment **(I_1+I_3+I_7)** CW resulted in significant increase in EC, total nitrogen, total phosphorus , total potassium and total sulphur in the final end product with values of 1.7dSm^{-1};1.73dSm^{-1} , 1.77% ;1.80% ,0.73%;0.710%, 0.66%;0.70% and 0.5%;0.51% respectively over the control .It was concluded that the isolates were outstanding in composting of waste at lower temperature and could be used as a new technology for the management of waste in cold regions. Further research needs to be done for the isolation of most efficient bacterial strains for composting of organic waste in lesser time.

Keywords: MSW, Psychrotrophic, Composting, Cellulases, Bacillus sp, 16SrRNA,

Prediction Performance of Height Diameter Models Under Different Sampling Methods

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Abstract

In this paper eleven Height Diameter models were considered with respect to samples taken from the different sampling techniques like simple random sampling (SRS), stratified sampling (STRS) and rank set sampling (RSS). Models were compared for estimating the mean stand height when fitted to data taken from Pinus (*Pinus wallichiana*) sample plots by SRS, STRS, and RSS with diameter class acting as strata and diameter at breast height as ranking variable. Fitting of height diameter models using nonlinear least square regression showed that all the parameters across all models were significant. In order to test the predictive performance of the models cross-validation technique was used in this study. Based on various selection criteria like AIC, RMSE, ME and Ad-R^2 ,it was found that models based on Rank set sampling method produce lowest RMSE, AIC, ME values and higher Ad-R^2 values than rest of two sampling methods.

Keywords: Height, Diameter, validation , Rank set sampling Pinus.

Expression Analysis of Maize gene(s) during *Bipolaris Maydis* Infection, Assessing their Role in Disease Resistance and Symptom Development

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Abstract

Bipolaris maydis is a serious fungal pathogen that causes southern corn leaf blight (SCLB), which cause significant yield loss. In the present investigation expression of maize genes was studied during early infection stages of *B. maydis.* Genes that we observed are β-1, 3-glucanase, which synthesizes PR protein against pathogen; PAL, the enzyme produced during biotic and abiotic stress in plants and key enzyme for phenyl propanoid pathway contributing disease resistance. Further, pheophytinase gene that acts as a chlorophyllase enzyme and related to chlorophyll degradation which may provide clue for foliar symptom development in maize plants after infection. Gene expression (GE) was studied by Real Time PCR at different time interval post inoculation – 0 hr, 24 hr, 48 hr, 72 hr and 96 hr for maize resistant SC7 (RI) and susceptible CM119 (SI) inbred line with pathogen and with their corresponding control Resistant (RN) and susceptible (SN) without pathogen. β-1,3-glucanase showed enhanced expression of RI with time and highest at 96 hr followed by 48 hr and it was higher than its corresponding check RN and both susceptible SI and SN. PAL showed up regulation at 48, 72 and 96 hr, and its GE was highest at 72 hr and RI was significantly more prominent then RN, SI and SN. Pheophytinase GE was down regulated at 72 hr and 96 hr. Among four combinations at 96 hr, lowest pheophytinase GE was recorded in RI. It indicated least degradation of chlorophyll due to reduced chlorophyllase enzyme activity in resistant line as compared to susceptible inbred line whereas activity of pheophytinase was more in inoculated and non-inoculated susceptible plants. This fact directly correlates with the symptom development of SCLB disease. Enhanced expression of PR protein and PAL enzyme at different time points in resistant lines indicated their association with the infection stages of *B. maydis* and response of resistance lines against disease establishment. Present study leads to the next course of investigation on whole transcriptome analysis of the various stages of host-pathogen interaction.

Impact of Dairy on Livelihood of Women Dairy Entrepreneurs

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Abstract

Agriculture and animal husbandry are two main pillars of Indian agriculture on which entire structure of village life rests. They are twin occupations, which from time immemorial have played a significant role in improving the rural economy. Dairy farming is a crucial component of Indian agriculture and it is more than wheat and rice crops put together. It has the highest potential of generating income and employment through augmenting productivity of milch animals. It is considered a 'treasure' of the Indian economy, particularly for the rural systems. It provides nutrition, draft animal power, organic manure, supplementary employment and a daily basis cash income. It is one of the promising sectors for entrepreneurship development in India. Livestock rearing provides employment especially self-employment to a substantial number of rural and urban population, many of whom are women who play a major role in the care and management of livestock. The emergence of women entrepreneurs and their contribution to the nation is quite visible in India. The women in business are a recent phenomenon in India. The spread of education and increased awareness are aiding women to spread their wings into areas which are monopoly to men. Women entrepreneur is defined as the woman or a group of women, who initiate, organize and operate a business enterprise. The Government of India has defined women entrepreneur as "an enterprise owned and controlled by women having a minimum financial interest of 51 percent of the capital and giving at least 51 percent of the employment generated in the enterprise to women" The competencies required for an entrepreneur can be acquired through training and development. One of the important areas of economic development is to bring forth latent talents and nurture a strong entrepreneurial spirit in individuals. This could be motivated through planned training activities. As the situation changes people also need to acquire the new knowledge, skills and attitude to cope up with the changing environment. Therefore, training has continued to be the most important device for developing individual's work efficiency.

Distribution pattern and space use of leopards in Kazinag National Park, Baramulla, Jammu and Kashmir

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Abstract

Understanding the spatial distribution of wildlife can help conservationists determine high-priority areas and enhance conservation efforts. This becomes particularly more significant when the species involved either has high conservation value or is involved in the human-wildlife conflict. This study represents first of its kind to study distribution and space use of leopards in Kazinag National Park Uri, Kashmir, using trail monitoring methodology. Trails (n=12) traversing different habitats of the study area were monitored regularly from May 2017- August 2018. Along with other important information, habitat characteristics and GPS locations of direct or indirect evidences of leopards were also recorded. Using the program ArcGIS, fixed normal kernel density estimations were produced on the basis of the distribution of leopard individuals, by using the index of abundance for the calculation. The Kernel Density Estimate (KDE) results identified an area of around 90 km^2 from Kazinag National Park used intensively by leopards. Utilization distribution map of leopards was prepared using KDE. The estimated UD described the intensity of leopard's space use through a bivariate probability density function and thus delineated intensely used area of leopards in the National Park. It is envisaged that the outputs of this study will assist in making better decisions for the conservation of this top carnivore. Further it paves the way for detailed studies on leopard ecology and human-leopard conflict in the area.

Keywords: Utilization distribution, Trail monitoring, Space use.

Morphogenetic Agents in Insect Control: An Appraisal

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Abstract

Chemicals that interfere with the growth and development of insects have been receiving major attention as potential means of selective insect control and such chemicals have been named as morphogenetic agents or Insect Growth Regulators. Major advances in this field resulted from the identification of Juvenile Hormones -1, -2, and -3, and the discovery that various terpenoid and sesquiterpenoid derivatives were more potent morphogenetic agents than the three known Juvenile Hormones. Several highly active compounds have emerged from recent research programs. Morphogenetic agents or Insect growth regulators (IGRs) are the insecticides that mimic hormones in young insects and disrupt how insects grow and reproduce (NPIC, 2015).Insecticides with growth regulating properties (IGR) may adversely affect insects by regulating or inhibiting specific biochemical pathways or processes essential for insect growth and development. Some insects exposed to such compounds may die due to abnormal regulation of hormone-mediated cell or organ development. Other insects may die either from a prolonged exposure at the developmental stage to other mortality factors (susceptibility to natural enemies, environmental conditions etc) or from an abnormal termination of a developmental stage itself. Several classes of chemicals contain compounds that possess growth-retarding and -inhibiting properties (Slama *et al*. 1974, Quraishi 1977). Insect growth regulators may come from a blend of synthetic chemicals or from other natural sources, such as plants. The chemical composition of hormones indigenous to insects is now being studied and used as a basis for developing analogs or mimics against insects. The similarities, however, in certain aspects of biochemistry among vertebrates and invertebrates may result in the limited development of IGRs. Environmental contamination also creates a hurdle as well as a challenge for industries to develop compounds that provide a more environmentally or ecologically sound insect pest control. IGRs should be applied as soon as susceptible life stage(s) are noticed, thoroughly covering all plant parts. Population regulation may take longer when generations overlap. Because of their specificity, these products are less harmful to natural enemies such as parasitoids and predators than conventional broad-spectrum insecticides.

Keywords: Morphogenetic agents, Insect hormones, Juvenile hormones, Insect control

Nano Pesticides: A New Frontier in Agriculture

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Abstract

Nanotechnology is science of manipulating materials at nano-scale. Among the latest technological advancements, nanotechnology occupies a central position. It has many applications in all stages of production, processing, storing, packaging and transport of agricultural products. In Agriculture, Plant pests are major factors in limiting crop yields. Conventional pest controlling methods include the use of over-the-counter pesticides in large quantity which consequently add an additional cost in crop production and also cause environmental and water pollution. Therefore there is a need to use limited amount of insecticides. Nanopesticides may help to limit their use. A nanotechnology approach, “nano-encapsulation” can be used to improve the insecticidal value of insecticide. In nano-encapsulation technique the nano-sized active pesticide ingredient is sealed by a thin walled sac or shell (protective coating). The efficacious approach in this regard is “controlled release of the active ingredient” that would greatly improve effectiveness and decreased amount of pesticide input and associated environmental hazards. For example “Halloysite” (Clay nanotubes) have been developed as cost effective carriers of pesticides. These will greatly reduce the required amount of pesticides as having extended release time and better contact with plants, reducing the cost of pesticides up to a great extent with minimum impact on environment. Another improvement in this sense might be the availability of nano-structured catalysts which will increase the efficiency of pesticides and insecticides and also reduce the dose level required for plants. Nano-silica has already been experimented to control agricultural insect pests. Physiosorptipn is mode of action of nano-silica. It gets absorbed through insect cuticular lipids hence leading to insect’s death by physical means. It is need of hour to inform public at large about its potential advantages at each step which will result in tremendous increase in public interest and acceptance. It is also critical to produce a trained future workforce in nanotechnology. Extensive studies are required to understand the mechanism for nano-materials toxicity and their impacts on natural environment. If we overcome these considerations, the bright and beneficial future is at doorstep of developing nations.

Keywords: Nanotechnology, Nanopesticides, Nano-encapsulation, Pesticides and Insect.

Mineral Nutrition Status of Plum Tree in Response to Various Nitrogenous Fertilization and Boron Cv. Santa Rosa under rainfed Conditions of Kashmir Valley.

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Abstract

The aim of the study was to examine the mineral nutrition status of plum tree in response to various nitrogenous fertilization and boron cv. Santa Rosa under rainfed conditions of Kashmir Valley. The experiment was carried out in a 7 year old private plum orchard near SKUAST-Kashmir, Shalimar Campus Srinagar, J&K during 2012 and 2013. Thirty six trees of uniform growth and vigour were selected for experimentation. The effects of four nitrogenous fertilizer treatments at different times of applications were studied on plum cv. Santa Rosa. The treatments were replicated thrice in Factorial Randomized Block Design. The result showed that mineral nutrient content of leaves were significantly influenced by various treatments and recorded highest leaf nitrogen content with urea 500g full dose in spring, maximum phosphorus and potassium was recorded under the treatment of calcium nitrate 1450g full dose in spring, magnesium and copper with urea 500g full dose in spring and zinc, iron and manganese were recorded with calcium nitrate 1450g full dose in spring during both the years. However, mineral nutrient content of fruits were also significantly influenced by various treatments and recorded maximum nitrogen and potassium content under urea 500g full dose in spring, phosphorus and calcium with calcium nitrate 1450g full dose in spring, magnesium under urea 500g + 50g borax full dose in spring. While as fruit micro nutrient content (zinc, manganese, copper and iron) were recorded under the treatment of calcium nitrate 1450g full dose in spring during both the years. Mineral nutrient status of the plum orchard during the present studies was significantly influenced by various nitrogenous fertilizer treatments. The maximum nitrogen, potassium, iron, copper, zinc and manganese were recorded under the treatment of urea 500g full dose in spring, while as maximum phosphorus, calcium were recorded under the treatment of calcium nitrate 1450g full dose in spring. Thus, it may be concluded that overall results indicate that among various sources of nitrogenous fertilizer calcium nitrate + boron can be considered as best fertilizer application in plum orchards for improving the mineral nutrient status of leaves, fruits and soil.

Keywords: Plum, source of fertilizers, time of fertilizer application and mineral nutrition status in leaves fruits and soil.

Effect of *Tribulus Terrestris* Herb on *In Vitro* Nutrient Degradability and Fermentation Attributes of Paddy Straw-Based Total Mixed Ration

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Abstract

The present study was carried out to assess the *in vitro* effect of *Tribulus terrestris* herb, at various levels of supplementation, on nutrient degradability and fermentation parameters in paddy straw-based total mixed ration (TMR). Three adult male sheep of 9 months of age, having approximately same weight and uniform conformation, were selected as the donors of rumen inoculum for the study. Paddy straw-based TMR was fortified with five levels of *Tribulus terrestris* at 1 (L_1), 2 (L_2), 3 (L_3), 4 (L_4), and 5 (L_5) percent DM while paddy straw-based TMR without supplementation of herb served as the control (L_0). The effect of herb on nutrient degradability was evaluated by *in vitro* dry matter digestibility (IVDMD), *in vitro* true dry matter digestibility (IV true DMD), and *in vitro* organic matter digestibility (IVOMD) while as effect on the fermentation attributes was determined by pH, Total Volatile Fatty Acid (TVFA), Ammonia nitrogen (NH_3-N), total nitrogen, Trichloroacetic acid precipitable nitrogen (TCA-pptN), and non-protein nitrogen (NPN) concentrations. The IVDMD, IV true DM, and IVOMD digestibility of paddy straw-based TMR was significantly higher ($P<0.05$) at L_2 level of supplementation of *T. terrestris.* Among the *in vitro* fermentation parameters, pH and NH_3-N were significantly lower ($P<0.05$) while others were significantly higher ($P<0.05$) at the L_2 level of supplementation. It was concluded that *T.terrestris* improved the nutrient degradability and fermentation characteristics of paddy straw-based TMR with 2% supplementation being the optimum level for the herb to be incorporated as feed additive.

Keywords: Digestibility, paddy straw, TMR, herb

Time Motion Study and Man Power Utilization in Chaffing and Distribution of Fodder in an Organized Dairy Farm

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Abstract

Time motion study of personnel in chaffing of fodder and its distribution to various categories of dairy animals was conducted at Livestock Research Center, National Dairy Research Institute Karnal without disturbing the routine activities of the farm to ascertain the labour requirement in fodder distribution in an organized farm. Fodder was chaffed with the help of chaff cutter and a four wheeler trolley attached to a tractor was used in the distribution of chaffed fodder to the animals in different animal sheds. Stop watch was used in recording of the time consumed in these activities. It was found that on an average 209±2.06 man-minutes were utilized in chaffing of 374±5.25 quintals of green fodder per day which on unit basis came as 6.45±0.18 man minutes per quintal of green fodder chaffed. Total man-minutes in transportation and unloading of 52.93±1.7 quintals of chaffed fodder to different animal sheds were 22.20±0.90 which on unit basis came as 0.43±0.02 man-minutes per quintal and 0.25±0.02 tractor- minutes per quintal. Similarly, total man minutes per quintal required in the distribution of bhusa and berseem were 0.86±0.05 and 2.35±0.12 respectively. Based on the amount of time spent per activity per day and by taking a standard eight hour duty per labourer per day, it can be ascertained by this study that one labourer can distribute approximately 131 quintals of fodder per day to animals.

Global Climate Change: Issues and Challenges

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Abstract

Climate change, also called global warming, refers to the rise in average surface temperatures on Earth Climatology, the science of Climate and its relation to plant and animal life, is important in many fields, including agriculture, aviation, medicine, botany, zoology, geology, and geography. Climate change is a major environmental challenge to the world today, with significant threats to ecosystems, food security, water resources and economic stability overall. Global energy consumption is dramatically increasing due to our quest for a higher living standard and increasing world population. Most of our energy comes from fossil fuel and burning of these fossil fuels causes environmental problems and in particular global warming. Changing environmental conditions, including rising temperatures caused by climate change, causes high levels of ozone that can affect the respiratory system and increases morbidity and mortality, particularly in sensitive groups of the population. More than 4.6 million people die every year due to air pollution and most is attributed to indoor pollution. Scientists have high confidence that global temperatures will continue to rise for decades to come, largely due to greenhouse gases produced by human activities. The Intergovernmental Panel on Climate Change (IPCC), which includes more than 1,300 scientists from the United States and other countries, forecasts a temperature rise of 2.5 to 10 degrees Fahrenheit over the next century. The IPCC predicts that increases in global mean temperature of less than 1.8 to 5.4 degrees Fahrenheit (1 to 3 degrees Celsius) above 1990 levels will produce beneficial impacts in some regions and harmful ones in others.

Keyword: *Climate Change, Global Warming, Environmental Changes, Ozone Layer Depletion.*

Synthesis of Copper Nanoparticles and Evaluation of its Efficacy Against *Sclerotium Rolfsii*

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Abstract

With the incessant increase in population, increase in demand of food is also rising appallingly. Plant pathogens (fungus, bacteria and virus) poses a major constrain in food production. Many control measures are used for the management of plant diseases, among them chemical control method is an effective practice. Recently nano science has emerged as an exciting field having its profound application in agriculture. In the present study, copper nanoparticles (CuNPs) were synthesised using chemical reduction method and characterised by using UV-VIS spectrophotometer and Transmission Electron Microscopy (TEM). The CuNPs were in the range of 15 to 75nm. Antifungal activity of CuNPs were investigated against *Sclerotium rolfsii* at two different concentrations *viz.,* 50 and 100 ppm using food poisoned technique. The CuNPs exhibited 30.41% inhibition at 50 ppm and 100% at 100 ppm, respectively. Although nanoparticles can be produced with a defined size and shape in a relatively short time period by chemical method that gives good result but it may be detrimental to the living beings and the environment as a whole because of its long residual activity. So, some novel strategies are needed to explore for synthesis of metallic nanoparticles. The nature has endowed us with diversified microflora which could be utilised in biological synthesis of metallic nanoparticles. Thus CuNPs were synthesised using the supernatant of pathogenic fungus *Fusarium verticilloides*. Initially the reduction of Cu particles was monitored using UV-VIS spectrum with a time interval of 24 hr consecutively for 6 days. A gradual increase in absorbance confirmed the reduction of size of Cu particles. CuNPs size was further confirmed using TEM that measured in the range of 7 to 83 nm. Evaluation of the efficacy of biologically synthesised CuNPs is under investigation against different phytopathogens.

Problems and Prospects of the Saffron Industry

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Abstract

The study identified the problems and prospects of the saffron industry. It found the presence of lengthy marketing channels. The primary data was collected from 201 respondents in the three saffron growing villages of Pampore namely Letpora, Ledhu, and Konibal based on the interview. Purposive-Stratified-cum-Proportional sampling framework was followed for selecting the respondents of the study. The One-way ANOVA was used to analyse the relationship between saffron income and size of landholdings. The test was significant, indicating a positive relationship between saffron income and the size of land holdings which means as the size of cultivable land increases the income of the growers also increases.

Keywords: problems, prospects, saffron industry, saffron income, size of land holdings.

Is Expression of Schizophrenia in North-Indian Population Associated with (CTG)(n) Repeat Alleles in NOTCH4 Gene???

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Abstract

NOTCH4 gene is a member of the NOTCH gene family that play a role in a variety of activity of developmental processes affecting the implementation of differentiation, proliferation and apoptotic programs influencing organ formation and morphogenesis. Also known as INT3, NOTCH3 and Sam3 in our study, it is a neurogenic locus notch homolog protein 4 precursor (Notch 4) (hNotch4). Showing linkage to chromosome 6, in the vicinity of the major histocompatibility complex (MCH), investigations by genome scans has brought to the fore several candidate genes at this locus. NOTCH4 gene (exon 1) is one of the studied genes. Human counterpart of the mouse mammary tumor gene- int-3, it is localized near the boundary of the HLA class II and class III regions.

Localized on chromosome 6p21.32, due to its chromosomal location and neurobiological roles, the human NOTCH4 gene is a candidate gene for Schizophrenia. It has been reported to be associated with Schizophrenia in some studies. Using linkage disequilibrium mapping of the human major histocompatibility complex (MHC) region in 1980s, Wei and Hemmings found that NOTCH4 was highly associated with Schizophrenia, the (CTG)n repeat in exon 1 of British parent-offspring trios. A Japanese case-control association and more recent American study reported that these polymorphisms, however, did not show significant associations. We carried a motif repeat expansion or Variable Number of Tandem Repeats (VNTR) study in the North Indian population. The polymorphic status existed in allele expression at Sam3 (NOTCH4) gene locus with (CTG)(n) repeat alleles in the range of 6-13 repeats observed in our Normal -Schizophrenia study sample. Our study sample showed no significant association of repeat expansion with Schizophrenia suggesting the association may be ethnic based.

Prevalnce, Isolation and Serogrouping of *Salmonella* Infections Isolated from the Reproductive Tracts of Layer Birds of Kashmir Valley

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Abstract

Present work was aimed to study the prevalence as well as serogrouping of *Salmonella* isolated from reproductive tracts of layers in Kashmir valley. Reproductive tract diseases were noted in 102 out of 908 (11.23%) layers comprising of Kashmir Commercial and Vanraja layers. Of the 102 affected reproductive tracts 31(3.41%) were affected with *Salmonella* infections. The *Salmonella* organisms isolated from the reproductive tracts were sent to National Salmonella and Escherichia Centre, Central Research Institute, Kasauli-173204 (H.P), for serogrouping. Among 31 *Salmonella* isolates,11 isolates belonged to *Salmonella enterica* serovar Enteritidis, 7 belonged to *Salmonella enterica* serovar Typhimurium and 6 to *Salmonella enterica* serovar Gallinarum, excluding 7 which were un-typeable (UT). Most prevalent serogroup was *Salmonella enterica* serovar Enteritidis (35.48%). It was followed by *Salmonella enterica* serovar Typhimurium (22.58%) and *Salmonella enterica* serovar Gallinarum (19.35%). Occurrence of *Salmonella enterica* serovar Enteritidis and *Salmonella enterica* serovar Typhimurium in our study indicated that poultry and the eggs could be a source of infection for humans in Kashmir valley and is indicative of flaws in poultry handling, as these serogroups may affect both humans and chicken.

Phytochemical Screening and the Toxic Effect of *Azadirachta Indica, Zingerber Officianalis* and *Annona Squamosa* Against White Fly, *Bemesia Tabaci.*

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Abstract

The present study was designed to evaluate the toxicity of different botanicals against the whitefly *Bemesia tabaci.* Methanolic and aqueous extracts of different plants (*Azadirachta indica, zingerber officianalis* and *Annona squamosa*) known for their medicinal value were prepared by soxhlet extraction which werethen evaluated for insecticidial activity against eggs and nymphs of *Bemesia Tabaci*at different concentrations. The results showed that the methanolic and aqueous extracts of *Azadirachta indica* showed high to moderate insecticidial activity against eggs and nymphs (79.00% and 100.00±0.1) followed by *Zingerber officianalis* (76.09% and99.12± *0.1) at 25 % concentrations after 72 hours of treatment respectively. The aqueous extract of Annona squamosa* showed least toxic effect (56.29 % and 50.00)at 5% concentration after 48 hours of treatment. A gradual increase in the mortality was found with the increase of concentration and duration of the treatment. The overall efficacy of the three pesticides against the survivorship was in the order of *Azadirachta indica>zingerber officianalis>Annona squamosa.* Hence, the extracts from these plants could be used as an effective and environmentally sustainable bio-insecticide for the control of whiteflies, *Bemisia tabaci*.

Keywords: Bemesia Tabaci,Mortality, Botanical Extracts, Azadirachta indica,zingerber officianalis, Annona squamosa

Phytochemistry and Pharmacological properties of Phyllanthus Amarus Schum. : A Review

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Abstract

Medicinal plants are important for human health by prevention of several human diseases. One of such medicinal plant species which used widely is *Phyllanthus amarus*. This herb is used as traditional medicine in many countries for more than 3,000 years. It is popular in indigenious system of medicine like ayurveda, siddha, unani homoepathy and is used for its hepatoprotective, antitumour, antidiabetic, antihypertensive, analgesic, anti-inflammatory and antimicrobial properties. The plant is also used in dropsy, jaundice, diarrhoea, dysentery, intermittent fevers, cold and has a good anti-viral activity against hepatitis B virus. *Phyllanthus amarus* has also served as lead for several experimental investigations that explored its phytochemical constituents and pharmacological uses. The Present review compiles traditional uses, phytochemical and pharmacological properties of *Phyllanthus amarus.*

Keywords: Phyllanthus amarus Schum., traditional uses, phytochemical and pharmacological properties.

Importance of Indigenous Technical Knowledge in Agriculture

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Abstract

An old African proverb states "when a knowledgeable old person dies, a whole library disappears." Indigenous technical knowledge is the information that people in a given community, based on experience and adaptation to a local culture and environment, have developed over years, and which is being continued to develop and evolve. It is the totality of all knowledge and practices, whether explicit or implicit, which are used in the management of socio-economic and ecological facets of life. Traditional farmers in India developed agricultural practices to successfully grow crops and raise animals in the highly diversified agroecological conditions with the help of locally available raw materials. The resource poor farmers with the help of highly efficient techniques that depend on locally available, low cost inputs get their livelihood. Most of these practices used in agriculture are highly sustainable. The practices for crop protection, field management used by traditional farmers are mostly cultural practices. These practices decrease the cost of cultivation of crops not only without adversely affecting yield but also by increasing the soil fertility. Traditional agricultural practice is very potent tool for improving the economic position of farmers and for banishing unemployment and underemployment, by better utilization of resources such as animals and machineries, water etc. Many studies revealed that, the farmers perceived that the cause of poverty in the form of indebted farmers, landless farmers, unemployed or only seasonally employed land labourers are all the direct or indirect result of a move towards modernization leaving traditional agriculture far behind. Thurston (1990) indicated that traditional agricultural practices must be understood and conserved before they are lost with rapid advancement of modern agriculture.

Influence of Nutrient Management Practices on Yield, Quality and Nutrient uptake in Scented Rice under Temperate Conditions of Kashmir

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Abstract

Field investigation entitled,“ Influence of Nutrient Management Practices on Yield, Quality and Nutrient uptake in Scented Rice under temperate conditions of Kashmir” was carried out at Mountain Research Centre for Field Crops, SKUAST-K Khudwani, Anantnag during 2012 and 2013. The experiment comprised of two scented rice varieties *i.e.,* Pusa Sugandh-3 and Mushkbudji evaluated under eight nutrient management practices *viz.* control, recommended fertilizer dose (RFD), RFD+5 t of FYM ha^{-1}, RFD+2.5 t of vermicompost ha^{-1}, 75% RFD+5 t FYM ha^{-1} , 75% RFD+2.5 t of vermicompost ha^{-1}, RFD+5 t of FYM+2.5 t vermicompost ha^{-1}, 75% RFD+5 t of FYM+2.5 t vermicompost ha^{-1}. The soil of the experimental site was silty clay loam in texture with neutral pH, low in available N and medium in available P and K. Between the varieties, Pusa Sugandh-3 recorded significantly higher values of yield attributes, grain yield, nutrient uptake and quality parameters as compared to Mushkbudj. However, Mushkbudj recorded higher 1000-grain weight and head rice recovery than Pusa Sugandh-3. The interaction between varieties and nutrient management practices in respect of grain yield was found to be significant. Pusa sugandh-3 recorded highest grain yield with the application of RFD+5 t FYM + 2.5 t of vermicompost ha^{-1} whereas, Mushkbudji recorded highest grain yield at 75% RFD+2.5 t of vermicompost ha^{-1} indicating a higher nutrient requirement for Pusa Sugandh-3. However, the quality parameters were enhanced in both the varieties with the application of 75% RFD+5 t FYM+2.5 t vermicompost ha^{-1}. Higher nutrient concentration and uptake for N, P, K, Zn and Fe was recorded in Pusa Sugandh-3 and Mushkbudji with the application of RFD+5 t FYM+2.5 t of vermicompost ha^{-1}. Application of RFD+5 t FYM+2.5 t vermicompost ha^{-1} in Pusa Sugandh-3, while 75% RFD+2.5 t vermicompost ha^{-1} in Mushkibudji revealed a yield advantage of 20.4 and 8.7 per cent over 100% inorganic fertilizer, respectively. Highest B: C ratio was recorded with RFD followed by 75% RFD+5 t FYM ha^{-1}. Studies suggest that 25% of fertilizer can be saved by the application of FYM or locally prepared vermicompost which is economically feasible as well as environment friendly.

Keywords: Mushkbudji, Pusa-Sugandh-3, Yield attributes, Quality, Vermicompost, FYM , RFD

Doubling The Farmers' Income Through Integrated Farming System

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Abstract

Livelihood security, nutritional improvement, agricultural sustainability and environmental safety have been major concern of Indian agriculture in context of small-farm holders representing more than 86% of farm families. Past experience has clearly demonstrated that the income from cropping alone is hardly sufficient to sustain the farmers' needs. The integrated farming systems (IFS) approach is considered to be the most powerful tool to enhance the profitability of farming systems, especially for small and marginal farm-holders. It can be concluded that diversification of existing farming systems with changes, addition or improvement of crop and livestock components and inclusion of horticulture are essential to improve on-farm income of small holders with environmental restitution. Diversification of existing farming systems clearly demonstrated the advantages in terms of production increase and employment generation. IFS paves way for meeting with the household demands of balanced food, improved recycling of nutrients and water besides increasing the on-farm employment for family. Recycling and intermittent use of products and by- products within the system could save in cost to the extent of 45% and even more.

Keywords: IFS, diversification, employment generation, profitability, nutrient recycling

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Egg Parasitism Caused by *Trichogramma spp*. against Aaize Stem Borer, *Chilo partellus.*

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Abstract

Pesent study was carried out to determine the numbers of egg batches and eggs per batch in the maize fields of selected sites of Indore. Moreover, discovery efficiency and parasitism efficiency was also determined. The result revealed that highest mean discovery efficiency rates of *Trichogramma spp.* was found from Mhow and was therefore having low parasitism per field and lowest mean discovery efficiency rate was recorded from Mangliya and was having high parasitism per field. There was generally a high variation in the numbers of egg batches and eggs per batch among the sites surveyed. The predominant parasitoid species was *Trichogramma spp*. This study showed that although egg parasitoid species diversity was higher, egg parasitism was considerably lower in selected sites of Indore.

Keywords: *Trichogramma spp,* discovery efficiency, egg parasitism. parasitism efficiency.

Influence of Integrated Use of Manures and Fertilizers on Physico-Chemical Properties of Soil as well as Yield and Cost of Cultivation of Coconut

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Abstract

A field experiment was conducted during 2014-15 and 2015-16 in a thirty years old coconut garden of cultivar Pratap at the farm of Asond block, Central Experiment Station, Wakawali, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Tal.- Dapoli, Dist.- Ratnagiri (M.S.). The experiment was laid out in Randomized Block Design comprising ten treatments replicated thrice. The treatments were applied in three splits (*viz*., Stage I- June, Stage II- October and Stage III- February) in a year. The soil were collected periodically before fertilizers application and analyzed for different physico-chemical properties (*viz*., pH, EC and organic carbon). The yield of the each palm was recorded throughout the year under experimental plot. The year wise yield was worked out and analyzed statistically.

The application of RDN through FYM at 25 kg/palm/year + Neem Cake at 15 kg/palm/year + Vermicompost at 6 kg/palm/year (T_{10}) recorded significant increase in pH, EC and organic carbon content in soil of coconut orchard. Also the physico-chemical properties of soil found to be improved during second year over the first year of experimentation. The application of RDF + Azadirachtin + Micronutrients through briquettes (Treatment T_5) received highest yield along with maximum net return and B:C ratio. Therefore, it is concluded that the application of RDF along with Azadirachtin and Micronutrients through Konkan Annapurna Briquettes in three splits (i.e. June, October and February) is beneficial for increasing the yield of coconut with maximum profit.

Keywords: INM, Coconut, Soils, Physico-chemical Properties, Yield and Maharashtra

Survivality of Bio-agents in Presence of Organic Amendment in Soil

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Abstract

The population of four bioagents i.e. *Trichoderma harzianum, Trichoderma viride, pseudomonas fluorescens* and *Bacillus subtilis* and the effect of three organic amendment viz., farm yard manure, vermicompost and mustard cake on survival of bioagents.significantly higher in three amended soil as compared to un amended control. The four respective bio-agents were enumerated in selective media at monthly interval up to 180 days of soil application of bio-agents. The recovery of this bio-agent was found at 30 days after application as compared to initial stage i.e. immediate after soil application. The survival of the bio-agent was relatively better in mustard cake amended soil as compared to farm yard manure and vermicompost amended soils. The population of *T. viride* was considerably less in unamended soil as compared to amended soils. The population of *P. fluorescens* was considerably higher in amended soils as compared to control i.e. unamended soil. The population of this bacterium in soil gradually decreased from 30 days of soil applications onwards up to 180 days. Survival of the bacterium was higher in mustard cake and vermin-compost amended soil as compared to soils amended with farm yard manure. Statistical analysis of data revealed that A perusal of the data showed that mustard cake and vermicompost was slightly better for survival of *B. subtilis* in comparison to farm yard manure. The survival of *B. subtilis* was relatively less in unamended control in comparison to amended soils.

Keyword: Bio-agents, Trichoderma harzianum, Trichoderma viride, pseudomonas fluorescens and Bacillus subtilis, organic amendment, survival, population

Appraisal of Paper Making Potential of Selected Non-Wood Species of Lesser Himalayas of Kashmir Valley Employing Alkaline Peroxide Pulping.

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Abstract

Present study was carried out to explore the potential of *Datura stramonium* and *Amaranthus hybridus* species as an substitute renewable resource for pulp industry to overcome the adverse impact of climate change due to cutting down of forest resources for paper making. Ash, lignin, hot water, 10% NaOH, alcohol-benzene solubilities and holocellulose content of both the test species were evaluated. Chemical analysis of liquor of test species include pH, total solids, COD and color was also determined. The characteristic strength properties of standard sheets of 60 gsm pulp determined includes tensile strength (Nm/g), tear index (mN.m /g), burst index (KPa m^2/g) and double fold number. Final results shown that pulp developed from *Datura stramonium* and *Amaranthus hybridus* stalks has hopeful future in pulp and paper sector as standby to forested treasures. It was also found that Cellulose content was higher in *Datura stramonium* species and ash and lignin content was found in *Amaranthus hybridus*. While comparing the two test species it was revealed that *Datura stramonium* having much auspicious prospective. Use of these renewable nonwood floral species in pulp production will help in curbing adverse sway of climate change.

Keywords: *Amaranthus hybridus*, chemical pulping, *Datura stramonium*, Liquor analysis, Proximate analysis, Strength properties.

Adaptability and Yield Potential of Quinoa (*Chinopodium Quinoa*) as a Food Crop Through Some Fertilizer and Sowing Date Manipulations Under Cold Arid Climatic Conditions of Ladakh

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Abstract.

Quinoa is the traditional Andean seed crop which is been cultivated in Peruvian and Bolivian Andes for more than 7000 years. It is well adapted to grow under unfavorable soil and climatic conditions and has high nutritional value. Keeping in consideration the Ladakh climatic conditions, the field experiment was carried out at High Mountain Arid Agriculture Research Institute, SKUAST-Kashmir, Ladakh, India, during 2016 and 2017. Ladakh has the unique climatic conditions, The temperature in summer rises to 30^{0}C while the winter temperature go down to -40^{0}C. Intensive sun light, high evaporation rate, strong winds drought and salinity are most common. The experiment with four nitrogen levels(0, 75,100,and 120 Kg ha^{-h}) and three date of sowing(24 th May,8th Jun and 22th Jun) was evaluated for Plant height(cm), days to maturity, Test weight, Harvest index and yield ha$^{-h.}$ Results indicated that 125 kg N ha^{-h} with date of sowing at 8th of jun is the best best treatment combination with highest yield(14.97 q ha in 2017 and 14.45 q ha^{-h} in 2016) where as the lowest yield was obtained in the treatment with 0 kg N ha^{-h} with date of sowing at 24th May yield (4.66 q ha^{-h} in 2016 and 4.86 q ha^{-h} in 2017) under Ladakh climatic conditions.

Keywords: Quinoa, Nitrogen level, Sowing date, yield, yield components and ladakh

Novel Binding-partners Interacting with Alpha-1- Syntrophin (SNTA1) Protein In Human Breast Cancer Cell Lines

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Abstract

Alpha 1 syntrophin (SNTA1) acts as an adapter protein that links DGC and various other components of cell signalling cascades. Earlier studies have revealed differential expression of SNTA1 in human cancers implying its likely role in cancer pathology. Furthermore, it has been proposed that SNTA1 forms a complex with several other proteins, dynamically regulated by phosphorylation and has a critical role in regulating actin cytoskeleton organization. Although the role of SNTA1 in muscle cells has been intensively explored, the exact function and molecular interactions of SNTA1 protein in other mammalian tissues as well as its emerging role in tumerogenesis, cell migration and/or metastasis remains elusive. Due to the dearth of knowledge in this field, a lot remains to be done in this area of research and our work would be a step in this direction. By combining the pull-down approach (CO IP) with liquid chromatography-tandem mass spectrometry, we have done a study to identify the potential novel binding proteins of SNTA1 in breast cancer cell lines. Co immunoprecipitation experiments were done using SNTA1 antibody. Certain novel binding proteins of SNTA1 have been identified using LC-MS/MS analysis and data analysis was done using Proteome Discoverer software suite version 2.2. In our preliminary data, we have identified some novel interacting partners of SNTA1, which have been shown to play a vital role in metastasis and cellular proliferation. Further validation experiments need to be done to validate some of the important identified novel binding partners of SNTA1. The information generated from our study would pave the way for further investigations into the role of SNTA1 in breast cancer development/progression and points towards a possible use of SNTA1 protein as a marker in cancers.

Effect of *Zinc* and *Boron* Application on Growth and Yield of Onion (*Allium cepa* L.)

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Abstract

A field experiment was conducted at Vegetable Research Farm, Maharajpur, Department of Horticulture Jawahar Lal Nehru Krishi Vishwavidyalaya, Jabalpur (M.P.) during *Kharif* season of 2016-17. The experiment comprises of six treatment combinations *viz*., $T_{1=}$ Soil application of Zinc Sulphate @ 10 kg/ha, $T_{2=}$ Foliar application of Zinc Sulphate @ 0.5%@ 30 and 45 DAT, $T_{3=}$ Soil application of Borax @ 10 kg/ha, $T_{4=}$ Foliar application of Borax @ 0.25% @ 30 and 45 DAT, $T_{5=}$ Foliar application of micronutrient mixture (Fe-2.5%, B-0.50%, Zn-3.0%, Cu-1.0%, Mn-1.0%) @ 0.5% @ 30 and 45 DAT, $T_{6=}$ Control (without micronutrient). Foliar application of micronutrient mixture @ 0.5% @30 and 45 days after transplanting was found superior over other treatments in terms of total bulb yield (212.06 q/ha), marketable bulb yield (201.47 q/ha) and B:C ratio 2.09. Dry matter yield of leaves and bulbs was recorded maximum 12.96 and 13.15 respectively in treatment T_4.

Keywords: Onion, Boron, Zinc, Micronutrients

Effectiveness and Storability of Vegetables in Zero Energy Cool Chamber for the Women Vegetables Growers of Dungarpur District – A Case Study

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Abstract

Agriculture in India is characterized by small and marginal farmers and they constitute nearly 80 percent of the total land holdings. The cultivation of multiple crops under small land holdings results in regular production of lesser quantities of vegetables, which the farmers cannot take to the market regularly, leading to a distress local sale of produce through the middleman. Facilities to store the produce for a shorter period and taking a bulk of commodity to the market would be viable option for them. The Zero energy cool chamber could be the best alternative to such women farmers having smaller holdings specially for short term on farm storage of perishable without any recurring expenditure on energy source, as it works on the principle of evaporative cooling. The present study on the effectiveness and storability of vegetables in zero energy cool chamber (ZECC) head proved its usefulness in extending storability and shelf life of vegetables, with reduction in temperature up to 9ºC and increase in relative humanity by 18 percent could be achieved inside the chamber. The ZECC proved useful in storage and vegetables with minimum Physiological Loss in Weight, decay and the freshness was retained for 10 days in green leafy vegetables, 8 days in bottle guard, ridge guard, bhindi, 11 days in brinjal, bitter guard, radish, carrot 10 days and 90 days in callocacia and yam.

Keywords: Physical loss in weight (PLW), effectiveness, storability, zero energy cool chamber (ZECC).

Effect of Fertility Levels, Biofertilizers and Organic Manure on Fodder Yield of Sorghum and its Residual Effect on Barley

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Abstract

A field experiment was conducted on clay loam soil at Instructional Farm, Rajasthan College of Agriculture, Udaipur during two consecutive *kharif* season of 2014 & 2015 and *rabi* seasons of 2014-15 & 2015-16. The objectives were to assess effect of fertility levels, biofertilizer and organic manure on yield of fodder sorghum and to evaluate the residual effect of these on succeeding barley crop. The results showed that single cut sorghum fertilized with 100% RDF (80 kg N+40 kg P2O5 + 40 kg K2O) gave higher crop productivity in terms of green (36.02 t ha^{-1}) and dry (11.34 t ha^{-1}) fodder yield representing increases of 6.0, 12.4 and 7.3, 15.7 per cent over application of 75 and 50 % RDF, respectively. Dual inoculation of sorghum seed with *Azotobacter* + PSB significantly improved green and dry fodder yield by 6.3, 8.3 and 8.8, 9.4 per cent over single inoculation of PSB and Azotobacter, respectively. Consequently manuring with vermicompost produced highest green and dry fodder yield by 35.6 and 11.1 t ha-1 over no manure, respectively. The results of residual effect of fertility level revealed that application of 100 % RDF to fodder sorghum crop had residual effect on barley resulted highest green and dry fodder yield representing increase of 13.5 and 2.4 q ha^{-1} over 50 % RDF, respectively. The barley crop under residual effect of vermicompost significantly improved growth and productivity in terms of green & dry fodder yield as compared to no manure. The magnitude of increase was 9.2 & 5.2 per cent, respectively.

Keywords: fodder yield, sorghum, barley, residual effect, fertility levels, biofertilizer, organic manure

A Study on the Effect of Type and Level of Various Emulsifying Salts on the Quality of Processed Paneer

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Abstract

This investigation was undertaken with aim of evolving a product that emulates the western processed cheese and is readily acceptable to domestic consumer. The study involved the determination of suitability of type and levels of various emulsifying salts for achieving desirable characteristics in processed paneer. The data revealed that the type of emulsifying salts (ES) had no influence upon chemical composition of processed paneer except for Dipotassium Phosphate (DPP) where in ash content was significantly higher than other samples. Level of ES did, however, elicit variations in most of the constituents. Moisture decreased while protein, fat and ash increased with increasing levels of ES. The type and level of ES both had a significant influence upon all physico-chemical characteristics of processed paneer. TSC (Trisodium Citrate) induced lowest meltability followed in order by DSP (Disodium Phosphate), STPP (Sodium Tri Polyphosphate). Free fat values were significantly lowest in TSC followed in order by DSP, DPP and STPP. Expressible serum values were significantly lowest in STPP followed in order by DSP, DPP and TSC. Titratable acidity values of TSC and DPP were comparable among themselves whereas they were significantly higher than in STPP and DSP which in turn had comparable values among themselves. pH values of TSC and DPP were comparable among themselves whereas they were significantly lower than in STPP and DSP which in turn had comparable values among themselves. Electrical conductivity values of TSC and STPP were comparable among themselves whereas they were significantly lower than in DSP and DSP which in turn had comparable values among themselves

Keywords: Emulsifying Salt, Level, Physico-Chemical, Processed Paneer, Quality, Type

Breed Clustering Analysis of Six Indian Cattle Breeds Using Genome-Wide SNP Data

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Abstract

Population structure and diversity analysis form an important part of genetic structure studies in livestock populations. Genomic breed clustering is an important approach to study population genetic structure based on genotypic data. In the present study, 50K SNP genotypic data pertaining to the total of 83 animals belonging to six *indicine* cattle breeds were used to assess genomic breed clustering amongst them. The six breeds included Hariana (10), Kankrej (10), Tharparkar (12), Red Sindhi (10), Sahiwal (17) and Gir (24). These were arranged in different datasets and a separate dataset was prepared with combined data of all six breeds (dataset A). After processing the data for inclusion thresholds and quality filters, only polymorphic markers with definite chromosomal coordinates were left. Further analysis in terms of polymorphism proportion, average MAF values and chromosome-wise marker coverage parameters was done. Chromosome-wise marker coverage depicted the efficient distribution of SNP variant markers across the whole genome. All the breeds of dataset A were exclusively clustered in ADMIXTURE programme into separate clusters except Red Sindhi population. With PCA based approach, diverse nature of individual populations and stratified breed-group clustering along two axes was evident with three breeds stratified separately and the rest three positioned in a single cluster. Sufficient levels of variation of single dimensional nature were explained by first two principal components in each dataset. The Indian indigenous cattle breeds were thus found to maintain efficient population genetic structure amongst them.

Keywords: Admixture, clustering, *Indicine*, PCA, PLINK, SNP

Significance of Crop Simulation Models in Predicting the Incidence of Pests in Agricultural Crops

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Abstract

The problems of agriculture are gradually becoming more intense due to increasing food demand led by population growth, stagnation in farm productivity, mounting yield losses due to multiple pests, increasing vulnerability to global environmental changes and the need to reduce emission of greenhouse gases. Productivity of crops grown for human consumption is at risk due to the incidence of pests, especially weeds, pathogens and animal pests. Crop losses due to these harmful organisms can be substantial. Tools and techniques are needed to assist in developing strategies that can lead to higher food production and prevent crop production losses. Several dynamic crop growth simulation models such as CERES, WOFOST, SU-CROS, and APSIM have been developed during the last few decades.

Crop growth simulation models based on crop ecological and physiological processes, and coupled with pest damage mechanisms, are useful tools for analyzing the interaction of pests with other biophysical components of agro-ecosystems. The use of simulation models in pest management started with the development of single species population dynamics models in the late 1960's. Pest management research is required to produce practical tools for developing tactics and strategies for pest management. Simulation models help to produce such tools and decision models. They are used for various applications, such as rationalizing pesticide use, pest risk analysis, pest zonation, analysis of climate change impact on pests, and assessing the effect of transgenic crops on the environment.

Researchers used these simulation models as indicators for pest management purposes. They applied these models to estimate economic injury levels(EIL) for bean leaf beetles on soyabeans. Similarly a generic crop pest simulation model was used to validate yellow stem borer,*Scirpophaga incertulas* Wlk., damage mechanism on two rice cultivars, Pusa Basmati 1 and Ratna. Crop growth model was used to stimulate the effect of Russian wheat aphid,*Diuraphis noxia* damage on winter wheat at Fort Collins and Akron,Colorado state, USA. These models are holistic, knowledge based international tools for worldwide and local applications. Crop model help us in assimilating knowledge gained from experimentation. It helps to understand and foresee the behavior of biological systems on the basis of fundamental level of incorporation. It offers dynamic, quantitative tools for analyzing the complexity of agricultural systems.

Keywords: crop simulation models, pest prediction

Problems and Prospects of Saffron Marketing in Kashmir Valley

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Abstract:

The study on the ‘‘Problems and Prospects of Saffron Marketing in Kashmir Valley’’ is undertaken to examine the various problems faced by the saffron trade in Jammu and Kashmir in general and growers in particular. The study identifies the main marketing channels involved in the marketing of saffron viz-a-viz grower preference to such channels. Moreover, it estimates marketing costs, marketing margins and price spread. The year 2017 is the reference year. By and large the year was normal. The primary data was collected from 221 selected respondents in the sampled villages of Pampore namely Letpora, Ledhu and Konibal based on a well administered and semi-structured interview schedule. Interview with saffron associations, cooperative societies and experts in the field of agriculture and marketing also proved helpful for the present study. Purposive Stratified-cum-Proportional sampling framework was followed for selecting the respondents of the study.

The present study observed the presence of large number of intermediaries in the marketing of saffron. Majority of the growers (small) dispose of saffron through dalals and local traders. Channel-V (grower-dalal & local traders -firm-wholesaler-retailer-consumer) is most popular marketing channel followed by channel-IV, III, VI, I and II respectively. Comparison between the channels reveal that channel-V is most popular marketing channel in case of small growers who usually sell their produce through dalals and local traders. Large saffron growers sell their produce through channel-III (grower-firm-retailer-consumer). That is to say that large saffron growers sell their produce through firms and firms sell it to retailers, who enjoy maximum share in consumer’s rupee. There are lengthy marketing channels in saffron due to which grower’s share in consumer’s rupee remains very low. Moreover, it is found that choice of marketing channel is highly dependent on income of saffron growers and the saffron income and production varies according to the size of land holding. Saffron plays a significant role in the economy of Jammu and Kashmir. There is lack of research and development (R&D), low capacity/Knowledge of saffron stakeholders and growers are ignorant of the marketing channels and market structure of saffron. Saffron is the most expensive agricultural product and a good example of profitability, sustainability, cultural and social values, and high labour demand. Adulteration has hit the saffron industry very hard. Jammu and Kashmir State needs good industrial support for saffron processing and rejuvenation of saffron industry. The present study will prove a catalyst in renovating saffron industry in the Kashmir valley and in transforming this sector into a successful business venture.

Nesting Behavior, Foraging and Domiciliation of Bumblebees in Kashmir Valley

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Abstract

Bumble bees belong to the genus Bombus of the family Apidae, order Hymenoptera. These insects rank among the most abundant and conspicuous of flower visitors in alpine, temperate and arctic environment of the northern continents. There are two hundred and fifty known species of bumblebees present on global basis (Williams *et al*., 2009) and out of which 27 species are reported from Kashmir only (Raina *et al*. 2012). Bumble bees are social insects, which means that many individuals, all biologically related to one another, live together, forming a colony. Bumble bees are key pollinators of crops and wildflowers across the country like tomato, eggplant, strawberry, etc. The value of bumble bees as pollinators of wild and cultivated plants is increasingly appreciated. They possess may advantages over honey bees as pollinators such as they are active at temperatures near 5°C while as honeybees at 15-18°C, they are active on cloudy, foggy, and rainy days and will fly in winds of up to 64km/hr. Also Bumblebees pollinate flowers through a method called “buzz pollination”, a rapid vibrating motion which releases large amounts of pollen onto the bee (Buchmann, 1983). Kashmir valley as being owner of diverse bumble bee population there is a greater scope for recruiting this amazing pollinator for pollination of various fruits and vegetables for maintaining productivity and good quality produce, which will add to the economy of the valley but Bumble bee population is decreasing at alarming rate due to many reasons like spread in agriculture at the expense of natural vegetation and indiscriminate use of pesticides and fungicides. Strategies like providing them refuge and enough foraging opportunities, placing the bee nests at many locations in the orchard may provide them a proper place for nest building and mass rearing and timely release of bumble bees compatible with floral phenology (TRIPOL) will help in their conservation and will improve their pollination efficiency.

Keywords: Bumblebees, Pollination, Buzz, agriculture.

Effect of Conservation Practices on Sediment Yield and Soil Loss

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Abstract

Soil erosion is the major land degradation process in India. The increase in population and growing demand for agriculture products or intensive dry land has generated changes in land use and resulted in erosion and land degradation. Soil erosion rates are accelerated by tillage and the low vegetation cover. There are various conservation methods by which we can reduce sediment yield and soil loss. These methods mainly aim either to decrease the erosive energy of water or to decrease soil erodibility by altering surface soil characteristic and surface cover. Conservation practices involve covering the soil to prevent exposure to raindrop impact, increasing soil characteristic to reduce runoff and the stability of soil. Different vegetative covers differ in their effect of the interception of rainfall and on runoff yield. Forests not only intercept the rainfall through their canopy and reduce the direct impact of rain drops on the soil but also increase the water stable aggregates and improve the water infiltration capacity of soils. Cultivated fallow gives the maximum and most dangerous rate of runoff and soil loss. Among different vegetative barriers including Vetiver, Napier, Jatropha and Agave, Vetiver proved to be most efficient vegetative barrier in conserving soil and water. It decreased runoff by 20.3% and soil loss by 51.4% compared with the control. Mechanical soil and water conservation measures are required for controlling soil erosion, retaining maximum rainfall within the slope and safe disposal of excess runoff from the top to the foot hills of India. Mechanical methods of conservation are terracing and building structures and are often used in extreme degradation.

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Study on Effect of Different Non-Genetic Factors on Production and Reproduction Traits in Sahiwal Cow

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Abstract

The present investigation was carried out to see the influence of various non-genetic factors on first production and reproduction traits of Sahiwal cows. The data was collected from the calving record of 1067 Sahiwal cows maintained at Animal Genetics and Breeding Division, NDRI Karnal, that have completed their first calving spread over a period of 60 years i.e. from 1958 to 2018. The first lactation traits included in the study were 305 milk yield, Total milk yield (TMY), Lactation length, Service period, Dry period and Calving interval. The data was classified into twelve periods and four seasons of calving and sire wise. The analysis of data was done using Mixed Model Least Square Analysis to see the effect of non-genetic factors sire (random), periods and season of calving (fixed) effects on different first lactation traits. Overall least square mean for different first lactation traits under study were 1860.89 ± 45.23Kg, 2000.84 ± 50.43Kg, 274.19 ± 5.35days, 159.66 ± 3.31, 196.17 ± 4.50days, and 396.78 ± 3.68 respectively. The study revealed that there is no significant effect of period and season of calving on dry period, lactation length and total milk yield (TMY) only season of calving had significant effect on calving interval, service period and 305 milk yield. The heritability of first lactation traits under study were 0.40 ± 0.10 , 0.32 ± 0.10 , 0.33 ± 0.09, 0.02 ± 0.06 and 0.04 ± 0.06 respectively.

A Study on Awareness about Zoonotic Diseases Among Livestock Farmers in 2014 Flood Affected Areas of Kashmir Division in J&K State

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Abstract

A study was conducted to gather information related to awareness about Zoonotic diseases in three severely flood affected districts of Kashmir division viz Pulwama in South, Srinagar in central and Bandipora in north of Kashmir. Four affected villages were randomly chosen from two flood affected blocks where from 10 livestock farmers from each village were randomly chosen making a sample size of 240 respondents for the study. Variables selected for the study included the awareness about zoonosis and knowledge about existence of specific zoonotic diseases. Data was collected through structured interview schedule developed for the purpose. The findings revealed that more than half of the livestock owners had awareness about disease transmission between humans and animals. About 43.75% respondents had Knowledge about existence of Foot and Mouth disease followed by awareness about bird flu (24.17%). The trend with respect to awareness level was observed to be as FMD>Bird-flu>Rabies Brucellosis> Bovine Tb respectively. However a major good number of respondents (26.25%) perceived milk as a possible source of contamination for any disease outbreak followed by aerosol route of transmission and Direct contact was perceived to be the least source of contamination for any disease outbreak. The overall picture revealed that the awareness level with respect to existence of specific zoonotic diseases and knowledge about possible source of contamination was very low and the need of the hour is to create awareness amongst the livestock owners in the study area regarding the same.

Keywords: Zoonosis, Livestock, Awareness level, contamination, Knowledge

Reproductive Versatility in Legumes: The Case of Tripping in *Indigofera Tinctoria* L.

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Abstract

The members of subfamily papilionoideae (faboideae) of the family leguminosae display a unique architecture in terms of their corolla, the latter being distinguishable into a vexillum (standard), a keel enclosing the reproductive parts and two wing petals fastened to the keel within. The architecture of wing keel complex is such that it acts as a landing platform for most species of the insects particularly the bees which help in the pollination of these species. The present communication deals with the role of a bee i.e., *Apis* sps. in tripping and hence in the pollination of the flowers of *Indigofera tinctoria* L., a dye yielding plant belonging to subfamily papilionoideae. Although this plant is visited by a large number of insects belonging to orders Hymenoptera and Diptera but out of all these insects, Apis sps. are very unique because apart from their role in anthesis, they seem to be playing an important role in the pollination of the flowers of this species. Opening of the flowers (expansion of standard) of this species initiates on its own, but for the completion, it is dependent on this insect. In an experiment, out of a large number of flowers tagged for anthesis, about 94% flowers completed their anthesis only with the help of this insect, while the remaining 6% opened on their own. Whenever this insect visits the flowers, it lands on the wing-keel apparatus, pierces the base of the apparatus that results in releasing of the enclosed stamens and carpel from the grip of the wings and keel. Species is largely autogamous, however only 2% fruit is set if the flowers are not visited by insects. Insect visited flowers result into 70% fruit set.

Keywords: Vexillum, Corolla, Keel, Diptera and Anthesis.

Advanced Technology of Fertilizer Uses for Crop Production

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Abstract

Increased agricultural productivity usually comes from effective adoption of improved technologies and combination of all the production factors as fertilizers: types and rates, methods and modes of application, soil conditions, variety, irrigation water etc, results in an increase in yield. Among these factors, the contribution of fertilizers plays an important role in enhancing the yield of crops. Fertilizer use has not only provided additional nutrients and energy to the cropping systems, but has supported a continuous increase in annual crop production. Combining fertilizer use with advanced science and technology, improved management in crop production, and a favourable policy environment plays a vital role in meeting the needs of farmers. Facing pressure to both increase yields and improve the environment, a new strategy is required to bring attention on improving fertilizer use efficiency. Considering the fact that most crop production systems particularly in India are highly required to be intensified with high fertilizer input. Site and crop specific fertilizer management, Customised fertilizers, fortified fertilizers and Urea Briquette in UDP technology, fertigation, foliar spray, eco–fertilization etc. will be the answer for deriving maximum benefit out of applied fertilizers with respect to maintenance of soil fertility and quality, environmental safety and to ensure food security etc. Several system research tools relating to information technology have become available for fertilizer management. With the introduction of geographic information systems (GIS), global positioning systems (GPS) and remote sensing (RS) researchers/farmers are able to refine nutrient/fertilizer recommendation models to the site and crop specific. This goal can only be reached with advances in soil science and fertilization technology. Develop advanced technology to improve fertilizer use efficiency, such as slow release fertilizers, site specific nutrient management, UDP technology, GIS, GPS, RS and fertigation technology, customized and fortified fertilizers, etc. Developing best management practices with fertilization, irrigation, cultivation and other management practices necessary to increase the use efficiency of fertilizers.

Keywords: Advanced technology, Customized and fortified fertilizers, Crop and site specific conditions, Crop production.

Effect of Chickpea and Linseed Intercropping System on *Helicoverpa Armigera (Hubner)* Incidence and Yield in Chickpea

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Abstract

The gram pod borer *Helicoverpa armigera (Hubner)* is most important pest of chickpea. Lot of pesticides are uses for control this pest but they not only leaves harmful residues but also effect on non target organisms and environment, pest resurgence and development of resistance to insecticides. Use of intercropping has been found to be not only eco-friendly but provide higher economic return. By adoption of intercropping, problems of incidence of insects and pests are greatly reduced.

Therefore, a field experiment was conducted at Research farm, RARI, Durgapura, during 2015-16 and 2016-17 in randomized Block Design with three replications and eight treatments viz.- **T1-** Sole chickpea , **T2-**Sole linseed, **T3-**Chickpea +Linseed (3:1), **T4-** Chickpea + Linseed (4:1), **T5-**Chickpea + Linseed (5:1), **T6-**Chickpea + Linseed (3:2), **T7-**Chickpea + Linseed (4:2), **T8-**Chickpea + Linseed (5:2) to assess the influence of intercropping on the incidence of *Helicoverpa armigera (Hubner)* and yield of chickpea. The lowest percent pod damage was found in treatment No **T-6** (6.12%) and followed by **T-7** (6.89%), **T-8** (8.22%), **T-3**(10.43%), **T-4** (12.73%),**T-5** (14.03%), and **T-1** (22.75%). **Key words:** Chickpea, pod borer, *Helicoverpa armigera,* intercrop.

Polyploidy as an Important Tool Exploited by *Artemisia Nilagirica* (C.B. Clarke) Pamp. to Expand its Populations In North-West Himalayas of J&K, India

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Abstract

Artemisia L. is a cytologically flexible and medicinally important genus of tribe Anthemideae of family Asteraceae. A total of 45 species of the genus have been reported in India (Karthikeyan *et al*., 2009). Present study is based on a species of this genus namely *Artemisia nilagirica* (C.B.Clarke) Pamp., an inhabitant of NW Himalayas depicting this flexibility in a beautiful way. Five populations of this species have been tagged at different areas of J&K located at variable altitudes ranging from 332-1705masl. These include Jammu, Rajouri, Poonch, Kud and Bhaderwah. Details of sex-expression, meiotic system, mitotic system and reproductive output have been studied for each population. Among the five populations scanned, a total of four cytotypes could be recovered with chromosome numbers as 2n=18,32,34 and 54 which corresponds to diploidy, aneuploidy and hexaploidy in this species. The aneuploid and polyploid races exhibit anomalies like laggards, bridges and chromosome fusions during meiosis. All these have a considerable effect upon the sexual reproductive efficiency of these populations. On open pollination, percentage healthy seed set averages maximum in the stable diploid population of Bhaderwah i.e. 61.43% and minimum in the plants of aneuploid population of Jammu i.e. 15.45%, while on bagging percentage seed set is very low in all the populations and all the seeds formed are shrivelled.

This species is highly flexible, capable of generating variations through both meiotic and breeding system. The spread of these variations does get retarded by low seed set. Little amount of variability that survives and adapts is maintained and ramified asexually by rootstock. All this contributes to the widespread distribution and dispersal of this species from high altitudinal ranges to foothills and plains of North West Himalayas of J&K, India. The presentation will elaborate on the details of these studies.

Keywords: *Artemisia*, chromosome, diploid, polyploidy, reproductive efficiency, rootstock

Epidemiological Study of Neonatal Calf Diarrhea

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Abstract

Descriptive and case-control epidemiological studies were carried out to understand the epidemiology of Neonatal calf diarrhea (NCD) in organized farm of SKUAST-Kashmir i.e. MLRI Mansbal, unorganized area i.e. selected villages of district Ganderbal and clinical cases presented to teaching Veterinary Clinical Complex, FVSc & AH Shuhama, Alusteng. Overall 42 calves were enrolled for the study and consisted of healthy (N=10) and diseased/ diarrheic (N=32) calves. The results indicated high percentage (80%) of diarrhea in calves of less than 30 days age compared to 20% in calves aged 30-45 days. Diarrheic calves (cases) had 6.000 times higher odds than the controls of having had the history of less than 30 days age. The occurrence of diarrhea was more in male calves (63%) compared to female calves (37%). Further the body weight (Kgs) of healthy calves was significantly ($P<0.05$) higher compared to diseased calves. Diarrheic calves (cases) had 6.4167 times higher odds than the controls of having had the history of less than 25 Kg body weight. Most of the cases of NCD were observed during spring season followed by autumn and winter. Comparison of epidemiological parameters like colostral intake, housing, frequency of cleaning of animal house, udder cleaning and teat dipping revealed no difference between healthy (control) and diseased groups (Cases). Stocking density was comparable in healthy and diseased groups. Fecal samples including both normal and diarrheic calves were screened for the presence of *E. coli, Salmonella, Cryptosporidium*, and *Eimerian* oocysts. The pathogen-wise occurrence of diarrhea indicated an absence of Cryptosporidium-associated diarrhea in neonatal calves. The results obtained with respect to Attitude score (ATS), Fecal Consistency Score (FCS) and severity of dehydration indicated 50 percent of diarrheic calves with ATS of 2 (calf that stood after stimulation and with moderate suckle reflex), FCS of 2 (loose/semi-formed feces) and moderate dehydration (2-4 sec).

Keywords: Neonatal calf diarrhea, Epidemiology, *E. coli*

Effect of Different Manures on Organic Seed Production in Garden Pea Cv. Arkel

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Abstract

An experiment was conducted under AICRP on vegetable crops in the field of Horticulture cum instructional farm, consequently three year *i.e*. 2015 to 2017, to evaluate the possible effect of organic manure with different combination as a soil application on the vegetative growth and seed yield of pea cv 'Arkel'. The experiment was carried out under randomized block design (RBD) with three replication. The important parameters encompassed in the study were plant height (cm), length of pod (cm), number of seed pod^{-1}, number of pod plant^{-1}, average weight of pod^{-1} (g), weight of pod plant^{-1} (g), shelling %, 100 seed weight(g), seed yield (Kg ha^{-1}), straw yield (Kg ha^{-1}). Although all the treatments showed a positive effect on growth and seed yield but, T_6 revealed most significant influence on all parameters under study as compared to T_1. Therefore, soil application is suitable way to feed the pea crop to enhance the growth, and seed yield.

Keywords : Pea cv. Arkel, Organic manure, Growth and Seed yield

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Effect of Feed Withdrawal (8 Hours) on Performance of Broiler Chicken

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Abstract

A feeding trial was conducted to evaluate the effect of daily feed restriction for 8 hours on performance of broiler chicken for a period of 42 days. 160 day old commercial broiler chicks were randomly distributed into five treatment groups comprising of four replicates with eight chicks each. The five treatment groups were as follows: T1 group in which birds were fed diet adlib throughout the experimental period; T2 group in which feed was restricted during pre-starter phase (0-10 days); T3 group in which feed was restricted during starter phase (11-25 days); T4 group in which feed was restricted during finisher phase (26-42 days) and T5 group in which feed was restricted daily for eight hours during the entire experimental period (0-42 days).

There was a significant ($P<0.05$) reduction in body weight as well as feed consumption in the birds in which feed was withdrawn daily for 8 hours for a period 0-42 days (T_5) when compared with other treatment groups (T_1,T_2, T_3 and T_4). However, there was a non significant ($P>0.05$) difference in feed conversion ratio among the treatment groups. It may be concluded that feed conversion efficiency of broiler chicken was not affected by the time duration of feed restriction and could be a viable option for economic poultry production.

Effect of Incorporation of Bovine Colostrum in Broiler Chicken Diets on Performance Parameters

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Abstract

A biological trial was conducted on 192, three days old commercial broiler chicks, distributed randomly into four treatment groups of 4 replicates of 12 birds each, reared for a period of 35 days. Control group T_1 was offered basal diet without any additive. T_2, T_3, and T_4 were fed diets supplemented with 1, 1.5 and 2 % colostrum/kg feed respectively. Diets supplemented with Bovine Colostrum resulted in significantly higher body weight, body weight gain and lower FCR. There was, however, no significant effect on feed consumption. It was concluded that bovine colostrum could be incorporated in broiler diets @ 2% for better body weight at market age and lower FCR.

Keywords: Broilers, Bovine Colostrum, Performance.

Man-Animal Dissension in Himalayan Wildlife

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Abstract

Due to constant Human interference in the boundary of wildlife habitat results into serious disagreement due to space crisis in their natural habitat which also favors towards wildlife crisis. Wild Bioresources of Kashmir Himalaya is constantly under threat from Anthropogenitic activities in the wildlife flora and fauna which often results into conflicts between human and wild species. Human habitat interference in the wild for extraction and exploiting of medicinal plant, fodder, food and timber results in to man-animal dissension. Wild flora and fauna of Kashmir Himalaya is under constant crisis for nearly 6-7 decades, due to bioresources extraction from wild by human settlements near it and animals are responding to the trespassers, a rise of conflict with humans is inevitable. Human-carnivore conflicts are visible dominantly within the Kashmir due to attacks by Leopards, wild brown or black bear and snakes etc. which is likely due to habitat interference and maintenance of livestock among nomads living near wildlife. The data collected from premium medical institutes of Kashmir convey that the human-animal conflict claimed nearly 51 human life and 601 injuries and killing of some 800 domestic animals during 2015 to 2017. The present study revealed that the wild flora and fauna of Kashmir Himalaya is under catastrophe it's observed that wildlife resources extraction and exploiting from the wild by humans is the main contention in Man-animal conflict.

Keywords: - Human-animal conflict, extraction, wildlife, bioresources, species, habitat.

Women Entrepreneurship and Their Role in India

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Abstract

Entrepreneurship is the key to India's development. It is important as it utilized local resources, employment and rural development. It is a general belief in many cultures that the role of women is to build and maintain the homely affairs like task of fetching water, cooking and rearing children. Since the turn of the century, women development is an essential part of human resource development and the status of women in India has been changing due to growing industrialization, globalization, and social legislation. With the spread of education and awareness, women have shifted from kitchen to higher level of professional activities. The role of Women entrepreneur in economic development is inevitable. Now-a-days women enter not only in selected professions but also in professions like trade, industry and engineering. Women are also willing to take up business and contribute to the Nation's growth. There role is also being recognized and steps are being taken to promote women entrepreneurship. Women entrepreneurship must be moulded properly with entrepreneurial traits and skills to meet the changes in trends, challenges global markets and also be competent enough to sustain and strive for excellence in the entrepreneurial arena. However, the development of women entrepreneurship is very low in India, especially in the rural areas. Entrepreneurship amongst women has been a recent concern. Women have become aware of their existence their rights and their work situation but women of middle class are not too eager to alter their role in fear of social backlash. The progress is more visible among upper class families in urban cities in India.

Keywords: Women entrepreneurship, Challenges, Women development

Pollen-A Potential Method of Genetic Resources Conservation in Fruit Crops

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Abstract

Preservation of pollen grains is a useful technique in fruit crops, it can be considered as an effective method by means of conserving biodiversity within a small space. This technique is also helpful for breeding of monoecious fruit plants, which are flowers at different time. Storage of pollen grains is quite useful for increasing options for researchers in breeding programmes. It can be achieved by different means such as preservation in chemical or organic solvents, preservation with the help of low temperature and ultra low temperature (in liquid nitrogen at -196 ºC) for long term storage. Especially the preservation of pollen grains at ultra low temperature (temperature of -150 to -196 ºC) has been considered as one of the effective methods of long term pollen storage. Under cryogenic conditions all metabolic activities of a biological systems, which permitting maintenance of pollen viability for long term.

Keywords: Pollen, Biodiversity, Liquid Nitrogen and Temperature

Determinants of Technical Efficiency in Saffron Growing Farms of District Pulwama: Post National Saffron Mission Scenario

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Abstract

Saffron popularly known as golden spice is a low volume high priced legendary crop being cultivated in Kashmir valley dating back to 500 B.C. But this crucial sector that once flourished and for which Kashmir valley was famous all over the world, has squeezed due to diminishing productivity (yield per hectare) and declining acreage. Keeping in view the deteriorating situation vis-à-vis social, economic and cultural importance of this legendary crop, the National Saffron Mission (NSM) funded by Government of India in collaboration with Government of J&K was launched during 2010-11 to revive the saffron cultivation by introducing new technologies and improved farm management practices. To what extent NSM has been able to arrest the deteriorating trends is an issue of interest to the researchers and policy makers.

In this paper an attempt has been made to make an empirical estimation of farm level technical efficiency and its determinants across a sample of 390 saffron growing farmers in District Pulwama. The technical inefficiency implies the inability of the farmer to achieve the maximum possible obtainable output under a given set of conditions. Thus the ratio of the actual output to the potential output is referred to as technical efficiency in the literature on efficiency. The major finding of the study is that technical efficiency of the sample farms ranged between 14 per cent and 93 per cent with an average value of 59 per cent. There is ample evidence that majority of farms are operating below the potential output due to technical inefficiency. As such with the judicious use of existing resources and technology, it is possible to increase the production of saffron by more than 40 per cent. The analysis also reveals that in about little less than half of the sample farms (46%), the technical efficiency values lie below the average efficiency level and as such these farms could reduce their input resources by 40 per cent to produce the same level of output through better practice of current technology.

This paper stresses upon the role of the government in human resource development to achieve this feat for the farmer experience, education and extension contacts have been identified as powerful efficiency augmenting factors. This is in view of the fact that in our sample study it has been found that saffron farming is predominantly in the hands of old aged farmers associated with very low level of schooling resulting into low level of human capital; as such young, educated and unemployed youth should be motivated to adopt saffron farming as full time venture or else mere spending of the resources in upgrading the technology without making an efficient use of existing technology may actually prove to be more expensive.

Traits Enhancing Grain Yield of Rice Under Alternate Wetting and Drying (AWD) Under Favourable Climate

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Abstract

Water resources, both surface and underground, are shrinking and water has become a limiting factor in rice production which necessitates the development of alternative rice systems like alternate wetting drying (AWD) and direct seeded rice (DSR). Their wide dissemination combined with suitable improved rice varieties that best respond to local agro ecology has promising prospect in closing wide yield gap. The AWD system of irrigation is one of the most common water saving technique in practice which deals with problem of water shortage in irrigated rice cultivation and has the potential to contribute to more sustainable and effective water and energy use. In AWD, producer allows the rice field to dry intermittently during the rice life cycle rather than having the field continuously submerged. An experiment was conducted to evaluate four rice genotypes against two local checks (Govind and HKR-48) to identify stable high yielding genotypes with yield contributing traits better suited to AWD across variable ecosystem during 2016 at CCS HAU Rice Research Station, Kaul. Water saving upto 25 % was achieved without significant yield penalty under the AWD system. Longer sunshine hours during reproductive stage contributed to higher grain yield through better photosynthesis and grain filling. Optimum rains at intermittent intervals contributed to the vegetative growth and more tillering. Genotype IR 95780-43-1-1-1 was suitable under both AWD and submergence as it gave higher grain yield than local check Govind which was contributed by yield contributing traits like tillers/m^2, harvest index and 1000 grain weight. It also yielded numerically higher than another check HKR-48 (5312 kg/ha) under both the conditions. Genotype IR 97046-39-2-1-2 gave highest grain yield with the same yield contributing traits than local check in controlled condition. Genotypes IR 95870 43-1-1-1 (6719 kg/ha) and IR 97046 39-2-1-2 (7031 kg/ha) yielded significantly higher than local check Govind (3906 kg/ha) in submerged condition. Hence on the basis of overall performance, genotype IR 95780- 43-1-1-1was found stable in yield and shall encourage the farmers for cultivation to adopt AWD. For other genotypes yield did not differ significantly indicating that AWD could considerably enhance crop water use efficiency.

Self Incompatibility Studies in Almond (*Prunus Amgydulis* Dulcis.)

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Abstract

The present investigation was carried out with the objective of identification of *S* alleles in almond associated with self incompatibility at molecular level. Six sets of primers including three pairs of degenerate primers, one pair of general incompatibility primers, one pair of self specific primer and one set of multiples primers were used to study s allelic variation in nine almond varieties. The six set of primers amplified a very diverse range of incompatibility alleles in the nine varieties under study. The allele sizes amplified by different primers ranged from 350-450, 250 to 1700 and 600 to 1000 bp in first, second intron and general *S* allele primers respectively. Primers used in this study were able to identify 54 alleles in nine almond varieties. The varieties that had most self incompatible alleles were (S1) in six genotypes and (S10, S7, S16, S17 and S27) in four genotypes. The alleles amplified among nine varieties of almond using five primers were used to make dendrogram for comparing genetic distances. The cluster analysis showed that varieties in which common *S* alleles were amplified were grouped in same clusters. The lowest genetic distance 0.4 was observed between Non Pariel and IXL, whereas the highest distance was recorded between Pranyaj and California Paper Shell. *S* allele identification is important for designing crosses and for choosing parents for breeding self compatible cultivars suitable for monoculture orchards which reduces the need for pollinators and pollinizers.

Keywords: *Almond, Degenerate Primers, PCR, self incompatibility, S alleles*

Acknowledgement: SERB is highly for providing the fellowship as (N-PDF)

Effect of Dietary Utilization of Different Phytobiotics Along with Vitamin-C and Chitosan on Growth Performance in Fingerlings of *Cyprinus Carpio Haematopterus* (Amur Carp)

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Abstract

The present study was carried out to evaluate growth promoting effect of *Allium sativum*, *Curcuma longa*, *Tinospora cordifolia*, *Withania somnifera*, Vitamin C and chitosan on the fingerlings of *Cyprinus carpio haematopterus*. The fingerlings weighing 33.0 ± 2 g were distributed randomly into four treatment groups T_0, T_1, T_2 and T_3 of 25 fishes each in triplicate. Four Isoproteinous experimental diets were prepared by mixing rice bran, deoiled mustard oil cake, deoiled soybean cake and vitamin-mineral mixture. The phytobiotics, Vitamin C and Chitosan were incorporated into diet as [Diet (D_1) with control feed + 2.5 gm of garlic + 2.5 gm of guduchi + 2.5gm of turmeric +2.5 gm of ashwagandha. Diet (D_2) with control feed + (2.5 gm of each plant) + 25 mg Vitamin C. Diet (D_3) with control feed + (2.5 gm of each plant) + 2.5 gm Chitosan] .T_0 group fishes were fed with D_0 diet, T_1 with D_1, T_2 with D_2, T_3 with D_3 @ 5% body weight per day for 102 days. The water quality parameters were regularly monitored. Fingerlings fed with diet D_3 achieved higher Net weight gain (NWG 17.49 ± 0.2461 g), specific growth rate (SGR 0.197 ± 0.0018 %), gross conversion efficiency (GCE 0.7478±0.0019) and better feed conversion ratio (FCR 1.337 ± 0.0057) as compared to other treatments. The obtained results indicated that T_3 was the best treatment which realized significant ($P<0.05$) increase in parameters related to growth performance. The results indicate that Phytobiotics along with vitamin C and chitosan has very good growth promoting effect and does not have any adverse effect on health of *Cyprinus carpio haematopterus* in culture system.

Keywords: *Specific Growth Rate, Feed conversion ratio, Phytobiotics, chitosan.*

A Review of Market Led Extension; Issues Challenges and way forward.

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Abstract

India is an agrarian country with about 60% of its population mainly depending on agriculture. The green revolution in 1970's increased the production of foodgrains and soon india became self sufficient in food grain production, but with the time it was realised that the green revolution resulted in glut production and farmers received lower returns. So the focus of extension services changed from production led extension to Market led extension for building up the capacity of the Agricultural system towards increase in productivity cum profit maximization through the new trend of extension services. Under WTO, the globalization/liberalization of market demands farmers at all levels to transform themselves from production and selling in the domestic market to producer cum seller in the wider market scene to realize the optimum returns on their investments. The need for market led is of necessity by the paradigm shift of present Agriculture scenarios which calls for conversion of the sector into profit oriented business. FAO estimates that 32 percent of all food produced in the world were lost in 2009 due to lack of post-harvest operation among others (Lipinski, B. et al.2013).Similarly, 13% of Gross Domestic Product was reported loss yearly in India due to loss of food grains (Manipadma Jena, 2013). Existence of many middle men has also Resulted into less return on farmer's investment as well as high cost paid by the consumer. However this loss can be minimized by the Market Led extension approach through adequate supply of information by SWOT analysis of the market, establishing market and agro proce- ssing linkages, direct marketing, and capacity building in terms of improved production and post-harvest operation such as proper handling, grading, standardizing, value addition, packaging as well as storage and transport system (Ahmad Nafees and Slathia, 2011). Hence, this paper discusses the prospects andchallenges of market led extension in view of 21st century scenario for capacity building of farmers, extension functionaries' stakeholders, and also for policy recommendation towards holistic sustainable agricultural development.

Keywords: Market Led Extension, capacity building, Sustainable Agriculture, Liberalization and post-harvest operations.

Use of High Pressure Processing in food processing

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Abstract

High Pressure Processing (HPP) is a cold pasteurization technique by which products, already sealed in its final package, are introduced into a vessel and subjected to a high level of isostatic pressure (300–600MPa/43,500-87,000psi) transmitted by water. Pressures above 400 MPa / 58,000 psi at cold (+ 4ºC to 10ºC) or ambient temperature inactivate the vegetative flora (bacteria, virus, yeasts, moulds and parasites) present in food, extending the products shelf life importantly and guaranteeing food safety. When using high pressure processing, microorganisms are destroyed, but covalent bonds do not break and the effect on processed food is minimal. In addition, the positive effect consists of the avoidance of excessive thermal treatments and chemical preservatives. High Pressure Processing respects the sensorial and nutritional properties of food, because of the absence of heat treatment, and maintains its original freshness throughout the shelf-life. High pressure has a small effect on low-molecular-weight compounds such as flavor compounds, vitamins, and pigments compared to thermal processes. Therefore, the quality of high pressure pasteurized food is very similar to that of fresh food products.

Keywords: Cold pasteurization, covalent bonds, isostatic pressure, microorganisms, shelf-life.

Preparation and Characterization of HPA-MMT Composite as a Mild Recyclable Catalyst

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Abstract

The pure HPAs (homogeneous liquid phase) as catalysts are advantageous due to their low volatility, low corrosiveness, high acidity, activity and flexibility, the drawback lies in their low surface area (1–10 m^2/g) and the problem of separation from the reaction mixture. To overcome the above mentioned problems to be more effective for catalytic reactions, HPAs are usually impregnated on different porous materials. The type of carrier, its textural and structural properties influence the thermal stability and the catalytic activity of Keggin-type heteropolyacids. Clays have been reported to act as catalysts or catalyst supports because of their layer structure, high surface area, pore volume, pore diameter and higher surface acidity. Thus clays can be used as an efficient support for HPAs and it is believed that uniform dispersion of HPAs on porous clay support with high surface area increases the overall acidity and catalytic activity of the composites. High activity of vanadium-containing HPAs and the property of clays as catalyst support prompted us to explore the activity of vanadium substituted TPA supported on clay as a heterogeneous catalyst for the various organic reactions.

Keywords: Catalyst, HPAs, Heteropolyacids, Impregnated.