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International Web-Conference

On

New Trends in Agriculture, Environmental & Biological Sciences for Inclusive Development

(NTAEBSID-2020)

SOUVENIR

21-22 June, 2020

Venue:
By online mode (Jitsi Meet Video Conferencing App)

Organized by

Agro Environmental Development Society (AEDS), India
(www.aedsi.org)

Co-Organized by

National Agriculture Development Co-operative Ltd., Baramulla, India
(www.nadclag.in)

Babasaheb Bhimrao Ambedkar University (A Central University), Lucknow, India
(www.bbau.ac.in)

In Association With

Departamento de Biologia Molecular Biotechnologia, Universidad NacionalAutonoma de Mexico (UNAM) Mexico City, Mexico
(www.unam.mx)

Plant Pathology Research Institute, ARC, Cairo University Giza, Egypt
(www.arc.sci.eg)

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In The Service of Farmers
NADCL

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Co-operative Ltd., Baramulla, India
(Under Ministry of Cooperatives)
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Lucknow-226 025 (U.P.), India

Prof. Sanjay Singh
Vice Chancellor

No. HI/BBAU/VC-C/20
Date 15.06.2020

MESSAGE

It is a matter of great pleasure and appreciation that **Agro Environmental Development Society (AEDS)**, Majhra Ghat, Rampur; Uttar Pradesh, India is organizing International Web-conference on **"New Trends in Agriculture, Environmental & Biological Sciences for Inclusive Development (NTAEBSID-2020)"** in collaboration with National Agriculture Development Co-operative Ltd., Srinagar, J&K, Babasaheb Bhimrao Ambedkar University, Lucknow, U.P. India, Mexico and Plant Pathology Research Institute, Agricultural Research Center, Cairo University Giza, Egypt by online mode from June 21-22, 2020.

The whole world is steadily facing the pandemic of COVID-19 and thus there is a need to assess the immediate post COVID-19 challenges in agricultural sector and suggest mitigation measures to ensure sustainable food system in the post crisis period.

The topic of the web-conference is very relevant because multi-disciplinary interactions are more useful to take a holistic view of a problem. The present web-conference will certainly enrich knowledge of our students and researchers to meet the challenges of post COVID era.

I convey my best wishes for the successful completion of this conference.

(Sanjay Singh)

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MESSAGE

It gives me immense pleasure to note that the **Agro Environmental Development Society (AEDS) Rampur, Uttar Pradesh, India** & National Agriculture Development Co-operative Ltd., Baramulla, J&K, India are going to organize an international web-conference in association with Departamento de Biologia Moleculary Biotechnologia, Instituto de Investigaciones Biomedicas Universidad Nacional Autonoma de Mexico (UNAM) Mexico City, Mexico, Plant Pathology Research Institute, Agricultural Research Center, Cairo University Giza, Egypt and Babasaheb Bhimrao Ambedkar University, Lucknow, India on "**New Trends in Agriculture, Environmental & Biological Sciences for Inclusive Development** (**NTAEBSID-2020**)"schedule will be held on June 21-22, 2020 by online mode **(Jitsi Meet Video Conferencing App)**.

Agriculture is, indeed, one of the most ancient professions known from the beginning of civilization. However, it has taken unprecedented prominence today due to pandemic COVID-19 crisis and a progressive increase of world population- reaching more than 7 billion people- that makes necessary to improve our ability to supply food in view of assuring food security. Marked progress has been made in the various research fields of agricultural sustainability during the last few decades that could be translated for the welfare of humankind. I am sure that the "International Web-Conference" will expose scientific community and young scientist to the recent research developments in Agriculture and Environmental Sciences and promote advanced basic as well as applied research in the area.

I complement to the organizers for their endeavors and wish a grand success to the International web-conference.

(Dr. Jay Shankar Singh)
Organizing Chairman, NTAEBSID-2020

एग्रो एनवायर्नमेंट्ल डेवलपमेंट सोसाइटी (ए.ई.डी.एस.)
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MESSAGE

I wholeheartedly welcome to all the delegates and participants on the auspicious occasion of International Web-conference on "**New Trends in Agriculture, Environmental & Biological Sciences for Inclusive Development (NTAEBSID-2020)** is going to organize by Agro Environmental Development Society (AEDS), Majhra Ghat, Rampur, Uttar Pradesh, India by jitsi meet vedio conferencing app in collaboration with National Agriculture Development Co-operative Ltd., Baramulla, J&K, and Babasaheb Bhimrao Ambedkar University, Lucknow, India, Departamento de Biologia Moleculary Biotechnologia, Instituto de Investigaciones Biomedicas Universidad Nacional Autonoma de Mexico (UNAM) Mexico City, Mexico, Plant Pathology Research Institute, ARC, Cairo University Giza, Egypt, during June 21-22, 2020.

As we all know that at the present time the whole world is facing terrible pandemic of COVID-19 even after this AEDS is organizing aforesaid International Web-conference to keep the students, researchers and scientists encourage during this hard situation. Although the conferences are very broad, but the main focus of the society and conference is how to overcome the problems that are arising for the development of sustainable agriculture and how to strengthen agricultural production with the low expenditure.

I am very much thankful to our Chief Patron Prof. Sanjay Singh, Honb'le Vice Chancellor, BBA University, Lucknow, U.P, India and Dr. Jay Shankar Singh, Organizing Chairman and all the committee members of this conference for their valuable support and cooperation during this event.

I once again express my heartfelt gratitude to all esteemed Delegates and Participants for taking part and enhancing the dignity of this conference and sharing their views on different aspects of agriculture, environmental and biological sciences for the grand success of this conference.

Dr. Chhatarpal Singh
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Organizing Secretary, NTAEBSID-2020

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MESSAGE

This is a matter of great honour that Agro Environmental Development Society, Majhra Ghat, Rampur, UP, India has taken a new initiative in the hard time of COVID-19 and organizing the International Web-conference on "New Trends in Agriculture, Environmental & Biological Sciences for Inclusive Development (NTAEBSID-2020)" by online mode (Jitsi meet video App) during 21-22 June'2020.

On this auspicious occasion, I warmly welcome all the stake holders from India and abroad on a common platform in the era of information technology via virtual mode and sharing their ideas. The organization of such a mega event will provide us an opportunity to assemble the learned delegates coming from different parts of our country and abroad like Egypt, China, Nepal, Bangladesh, Mexico, Japan and Canada.

Organization of such mega event is impossible without team work. In this event we are indebted to the Chief Patron Prof. Sanjay Singh, Honb'le Vice Chancellor, BBAU, Lucknow, UP, India and other co organizers and associates for their kind support and cooperation. I sincere thanks to all the members of various committees for their valuable support and suggestions to make this web conference a grand success.

I am again delighted to welcome you all to this web conference for enjoyable and fruitful discussion and pray almighty to bless us for making this conference a grand success.

(Md. Nadeem Akhtar)
Organizing Director, NTAEBSID-2020

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Invited/Lead Lecture

Documentation and preservation of Indigenous Technological Knowledge in Agriculture for Sustainable Development

Narinder Paul, PS Slathia, Rakesh Kumar, AS Charak and GN Jha
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Abstarct

For nearly two decades, the World Intellectual Property Organization's (WIPO's) expert committee, known as the Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore (IGC), has been working to negotiate text-based legal instrument(s) for effective protection of the subject matters of genetic resources (GRs), traditional knowledge (TK) and traditional cultural expressions (TCEs), and their intersection with the intellectual property (IP) system. So far, the IGC experience reflects the intensity of the international process, geopolitical undercurrents and the power dynamics that characterize that process, especially as it relates to the subject of IP. Despite mixed responses across North-South geopolitical interests regarding the elongation of the IGC's deliberations and the continuing delay in the expected outcome from the forum, the latter has made substantive contributions to international IP law and policy making in relation to matters under its mandate. This paper identifies and explores the rationale for one of the major evolving contributions of the IGC, namely the notion of a tiered or differentiated approach to the protection of TK and TCEs. The paper concludes that the approach provides a broad policy framework, although its details are contingent on many considerations, which are better addressed at national and local levels.

Introduction

The WIPO IGC has a clear, but extremely difficult mandate to negotiate text-based instrument(s) for the effective protection of GRs, TK and TCEs within the IP system. WIPO's jurisdictional status as the host of the IGC is, in part, a fallout of the World Trade Organization's failure to include TK/TCEs in its negotiations and in the text of the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), as well as the increasing economic and trade importance of TK/TCEs and GRs. Given the historic interest of the United Nations Educational, Scientific and Cultural Organization in TK and related matters such as folklore (TCEs), the jurisdictional ambit of the WIPO IGC is limited to the ramifications of GRs, TK and TCEs in the IP system. However, in recognition of the overlapping, or fluid, nature of these subject matters across diverse international regimes, member states and experts are required to ensure and respect the synergistic relationship of the resulting instruments and relevant regimes. The difficulty of the IGC's task is not necessarily a factor of the contentious nature of the international IP policy-making process, the underlying ubiquitous geopolitical power relations or ideological schisms over knowledge governance. Neither does it lie in the institutional factor of WIPO's Committee process in the complex regime ecosystem in which those subject matters are engaged. Without question, those factors contribute to make the IGC's mandate a herculean task. However, in addition to these issues, perhaps the most critical feature underlying the difficulty of the IGC project is the enigmatic nature of TK and, certainly, TCEs. TCEs have been and remain a unified or inherent component of TK. At WIPO and other fora, TCEs have been demarcated from TK as a conceptual matter. Both TK and TCEs are pragmatic terms of convenience and compromise because they do not even capture the breadth of the complexities of the relationships and nuances implicated in the experiences of their custodians and the undergirding worldviews. Even in that inchoate and often contested expression, TK and

TCEs are sources of insights and invaluable knowledge for creativity and innovation that are scaled up through the agency of conventional fields of the IP system.

What is Traditional Knowledge?

Traditional knowledge (TK) is the information that people in a given community, based on experience and adaptation to a local culture and environment, have developed over time, and continue to develop. This knowledge is used to sustain the community and its culture and to maintain the genetic resources necessary for the continued survival of the community.Traditional knowledge includes mental inventories of local biological resources, animal breeds, and local plant, crop and tree species. It may include such information as trees and plants that grow well together, and indicator plants, such as plants that show the soil salinity or that are known to flower at the beginning of the rains. It includes practices and technologies, such as seed treatment and storage methods and tools used for planting and harvesting. TK also encompasses belief systems that play a fundamental role in a people's livelihood, maintaining their health, and protecting and replenishing the environment. TK is dynamic in nature and may include experimentation in the integration of new plant or tree species into existing farming systems or a traditional healer's tests of new plant medicines.
The term "traditional" used in describing this knowledge does not imply that this knowledge is old or un-technical in nature, but "tradition based." It is "traditional" because it is created in a manner that reflects the traditions of the communities, therefore not relating to the nature of the knowledge itself, but to the way in which that knowledge is created, preserved and disseminated. Traditional knowledge is collective in nature and is often considered the property of the entire community, and not belonging to any single individual within the community. It is transmitted through specific cultural and traditional information exchange mechanisms, for example, maintained and transmitted orally through elders or specialists (breeders, healers, etc.), and often to only a select few people within a community.

What are Intellectual Property Rights?

Intellectual property rights (IPRs) are the legal protections given to persons over their creative endeavors and usually give the creator an exclusive right over the use of his/her creation or discovery for a certain period of time. Intellectual property protections may include patents, copyrights, trademarks, and trade secrets. Intellectual property is codified at an international level through a series of legally binding treaties.

Traditional Knowledge holders and their concern about Intellectual Property Rights:

The knowledge of and uses of specific plants for medicinal purposes (often referred to as "traditional medicine") is an important component of TK. Once, traditional medicines were a major source of materials and information for the development of new drugs. In the 20th century, however, new sources for pharmaceuticals led to a decline in the importance of ethnobotany in drug discovery programs. However, new discoveries of potentially potent anti-cancer agents in plants (such as turmeric and taxol), as well as a rapidly growing herbal remedies market, has revived industry interest in traditional medicinal knowledge and practices. As interest in traditional medicine is rekindled, indigenous knowledge of the cultivation and application of genetic resources is becoming exploited at an alarming rate. World sales of herbal medicine alone were estimated at US$30 billion in the year 2000.Intellectual property rights should guarantee both an individual's and a group's right to protect and benefit from its own cultural discoveries, creations, and products. But Western intellectual property regimes have focused on protecting and promoting the economic exploitation of inventions with the rationale that this promotes innovation and research. Western intellectual property law, which is rapidly assuming global acceptance, often

unintentionally facilitates and reinforces a process of economic exploitation and cultural erosion. It is based on notions of individual property ownership, a concept that is often alien and can be detrimental to many local and indigenous communities. An important purpose of recognizing private proprietary rights is to enable individuals to benefit from the products of their intellect by rewarding creativity and encouraging further innovation and invention. But in many indigenous world-views, any such property rights, if they are recognized at all, should be extended to the entire community. They are a means of maintaining and developing group identity as well as group survival, rather than promoting or encouraging individual economic gain.

Problems experienced by indigenous peoples in trying to protect their traditional knowledge:-

Under intellectual property laws stem mainly from the failure of traditional knowledge to satisfy requirements for intellectual protections. Alternatively, where intellectual property protection could potentially apply to such knowledge, the prohibitive costs of registering and defending a patent or other intellectual property right may curtail effective protection. There has been a clear bias in the operation of these laws in favor of the creative efforts of corporations, for example, pharmaceutical and other industries in industrialized nations. Within the context of scientific progress, modern intellectual property laws have allowed these industries to monopolize the benefits derived from their use of indigenous knowledge with disregard for the moral rights and material (financial) interests of indigenous peoples themselves.

Many incompatibilities between TK and IPRs have begun to surface with the rapid global acceptance of Western concepts and standards for intellectual property. These incompatibilities appear when ownership of TK is inappropriately claimed or TK is used by individuals or corporations that belongs to local communities, primarily in developing countries. The term “biopiracy” is often used to describe the misappropriation of knowledge and/or biological materials from traditional communities.

With today’s rapidly globalizing IPR regime, situations of biopiracy are becoming increasingly evident. Until very recently, an American citizen owned a patent on the well known and commonly used Amazonian plant ayahuasca. Traditional Andean uses of maca (Lepidium meyenii) for increased fertility and the Indian use of neem as a pesticide have been patented in name of profit for Western companies. The specifics of these examples are complicated and technical, but it is not an understatement to suggest that many more discrepancies will develop between traditional knowledge and the IPR regime negatively affecting indigenous communities across all continents. A major concern is that Western corporations will continue to adapt, incorporate, build upon, or directly claim indigenous knowledge without acknowledgement or compensation for the communities that developed the knowledge.

However, there is good news. Intellectual property rights do not have to work against the needs and interests of traditional knowledge holders. In fact, intellectual property rights can actually benefit traditional knowledge holders by promoting both their material and moral interests. The key to realizing these benefits is in understanding how the intellectual property rights system works and the place that traditional knowledge can have in the system.

Possible Intellectual Property Protection Options for Traditional Knowledge:-

There are many IP protection options as well as other related options to protect genetic resources, biodiversity and traditional knowledge which include patents, trademarks, trade secrets etc.

Prior Informed Consent

The 1992 Convention on Biological Diversity (CBD) is an international treaty resulting from the Earth Summit in Rio de Janeiro where world leaders agreed on a comprehensive strategy for sustainable development. The CBD establishes three main goals in order to maintain the world's ecological resources: the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits from the use of genetic resources. To date, 179 countries have ratified this agreement. The Convention on Biological Diversity declares the obligation to obtain prior informed consent for access to genetic resources. The Bonn Guidelines (2002) further link genetic resources with traditional knowledge in the obligation to acquire in prior informed consent knowledge of and approval in advance for the use of one's resources

Prior informed consent is the approval in advance for the use of one's genetic resources and any associated TK. "Prior" indicates that the approval must come before access is allowed or others use the knowledge. "Informed" means that information is provided on how the resource and/or knowledge will be used. "Consent" means permission to use the resource or knowledge. Sufficient information should be provided to a community, either by the intellectual property office, or other party, regarding the aims, risks or implications of using the knowledge, including its potential commercial value. Consent must be manifested in an explicit way, for example in writing, by a clear verbal agreement, or some other means.

Does a community possessing TK legally have the right to prior informed consent if someone accesses its genetic resources and related TK and wishes to use them? The answer: maybe. If the country where the community is located has ratified and implemented the CBD, access to traditional knowledge should be subject to prior informed consent of the knowledge holders under Article 8 (j).

Perhaps an example is the best way to understand how prior informed consent works. Suppose a scientist is traveling in South America and begins to work with a community in the Amazon region. The scientist is particularly amazed when he observes the methods used by a local community to process and apply a local plant to heal wounds. The scientist, now aware of the genetic resource and local knowledge of its use, can do one of two things: he can do nothing with the knowledge or he can use the knowledge.

If the scientist does nothing, there is obviously no need to obtain prior informed consent. If the scientist wishes to use the resource or knowledge (publish the knowledge in a journal article, apply for a patent, etc.), he or she must obtain prior informed consent of the appropriate national authorities if that Amazonian country has implemented the CBD. Under the Bonn Guidelines, the local community itself should also have the right to deny access to the resources or use of the knowledge. If the country has not implemented the CBD, the scientist is not legally bound to obtain prior informed consent (unless some form of prior informed consent is required under sui generis protection mechanisms. However, most scientists today agree that it is a best practice to obtain prior informed consent for professional and ethical reasons, as well as to avoid challenge or criticism later on.

Sui Generis Protection Systems

Through the World Trade Organization (WTO), minimal intellectual property standards are now being quickly implemented on an international level. The WTO's 1994 Agreement on Trade Related Aspects of Intellectual Property (TRIPs), adopted two years after the CBD, creates some specific challenges for protecting genetic r esources and traditional knowledge. TRIPs requires member countries to provide patent protection for inventions in all fields of

technology, but also allows some exceptions from the patenting requirement, specifically plants, animals, and processes for their production. However, TRIPs does require member countries to grant protection for plant varieties. **What exactly is a sui generis system?** Sui generis literally means "of its own kind" and consists of a set of nationally recognized laws and ways of extending plant variety protection (PVP) other than through patents. TRIPs itself does not define what a sui generis system is or should be. And although TRIPs does not mention UPOV (International Union for the Protection of New Varieties of Plants), several countries believe that the UPOV convention meets the requirements for a sui generis system. However, countries do not have to join UPOV to implement a sui generis system to comply with TRIPs. A sui generis system might consist of some standard forms of intellectual property protections combined with other forms of protections, or none at all, for genetic resources. For example, a country could provide patent protections for inventions, plant variety certificates (PCV) for plant varieties or just certain varieties, and/or exclude plants from any form of intellectual property protection at all (although this could conflict with the compliance of TRIPs).

Identifying Knowledge and Applying Intellectual Property Protections

Locating and Identifying Traditional Knowledge: In order to protect or preserve traditional knowledge, it is important to be able to locate and identify this knowledge.

TK is found in:

- Daily activities including, among other things:
- Farming
- Gardening
- Animal breeding and care
- Food and nutrition
- Health Care and reproductive health
- Water resource use
- Spiritual and religious activities
- Folklore, songs, poetry, and theater
- Community records.

Although TK is mostly transmitted by word of mouth, some other forms of record keeping may exist. For example, maps, boundary markers (trees, poles, stones, etc.), drawings, paintings, or carvings, and many other forms.

- People working with the community, such as NGO researchers, academics, scientists, and development specialists who may have been collecting TK
- Secondary sources such as journal articles and books, unpublished documents, databases, videos, photos, museums, and exhibits.

Identifying Traditional Knowledge

An element of traditional knowledge for which intellectual property protections could potentially apply is called a knowledge claim. A traditional knowledge claim contains three essential components: a genetic resource, a preparation or process, and an end result or product derived from a preparation or process. The genetic resource is typically a plant. The process encompasses the various ways of using the plant for an end result. Processes may include methods of growing, harvesting, extracting, preparing, or applying the plant.

Identifying Who Holds the Knowledge

After identifying a traditional knowledge claim, the next step is to determine who the knowledge holders and stakeholders are for that claim. The knowledge holders are the people who hold and/or use the knowledge, and stakeholders are the people in the community with a direct interest the knowledge. When making a decision in relation to a specific

knowledge claim, one must consult all of the stakeholders of that claim (which is often the entire community and/or other communities as well) before making a final decision about how any intellectual property rights should be applied.

TK can either originate within a community or enter a community from the outside. If the knowledge is not originally from within the community in question, then it may not be subject to any intellectual property rights, and may already be part of the public domain. If the knowledge is from within the community, then the next step is to determine who holds the knowledge. The holder(s) of the knowledge can be an individual, multiple individuals, or the community as a whole The next step is to determine who uses or has access to the knowledge. Knowledge claims can either be held or practiced by no one, an individual, multiple individuals, a community, or people outside the community Any potential IPR options will depend on how many people are aware of the knowledge and who these people are. Based on these variables, a knowledge claim can be categorized into three groups:

1. known and used by an individual,
2. known and used by several individuals or a community, or
3. diffused broadly and in the public domain.

Identifying Intellectual Property Options

This exercise will help to identify possible options for the knowledge claim. The worksheets in this section help the reader to identify key cultural characteristics and community goals for a specific claim. This exercise will also help accent potential options, eliminate poor options, and identify potential conflicts between cultural aspects associated with the claim.

Determining Cultural Aspects

The scientific aspect of traditional knowledge is only one aspect of a larger culture of knowledge. For this reason, culture cannot be ignored when applying intellectual property rights to TK. Cultural aspects important to TK are described below in six general categories. Each category should be considered independently, and in any combination, when evaluating the place of a specific claim in its cultural context and in the intellectual property rights regime.

-Spiritual : This category consists of knowledge that not only has a useful or functional purpose, but also some form of spiritual, religious or sacred importance as well. Knowledge included in this category may include knowledge used during religious ceremonies, considered sacred within a community, known only by sacred and religious persons within the community, or not to be taken out of its religious context.

-Subsistence: This category consists of knowledge necessary for the basic survival of the community. Included within this category is knowledge used for food production or any knowledge vital for life and survival. To determine whether certain knowledge falls within the subsistence category, one should ask the following question: Without this knowledge, will it be considerably more difficult, or perhaps impossible, for the community to meet its needs for basic survival?

-Economic : This category consists of knowledge with strong ties to the economic survival or benefit of the TK stakeholders. This category includes knowledge used to produce products for trade, to perform services of monetary value, or to provide any other substantial economic support to the community.

-Traditional secret: This category consists of knowledge that is held as a secret among the community. Disclosing knowledge within this category to the general public would be culturally inappropriate. The knowledge can fall within other categories as well, for example,

the religious and sacred category or the subsistence category, but the most important feature of this knowledge is its secrecy.
-Medicinal: This category consists of knowledge used to cure or prevent medical ailments within a community. Regardless of whether or not the knowledge is individual, communal, or public, the knowledge is important for the overall health and welfare of a community.
-Historic: This category consists of knowledge that is of historic importance to the community. It may be related to the history of the community (for example, an origin myth), or a specific practice known or used by ancestors that is no longer practiced but still remembered.

Determining Community Goals
When evaluating a knowledge claim and determining potential options for protection, the goals and interests or the community are important to consider. Five categories are used in this methodology for determining community goals for a claim. They are:
-Profit: Commercializing and receiving financial gains or other economic benefits from TK.
-Dissemination for public good: Sharing TK in order to benefit others. This goal is particularly applicable to TK with medicinal or agricultural uses.
-Avoiding exploitation: In avoiding exploitation, it is the hope of the TK stakeholders that their culture and environment will not be usurped or harmed by outsiders. Control over knowledge, the way it is used, and its concurrent effects on the culture and environment important to the TK stakeholders.
-Avoiding inappropriate intellectual property claims: Avoiding intellectual property claims on community knowledge or resources by outsiders. The protection of moral and material interests is of primary importance.
-Preservation: Preservation of the traditional knowledge above other interests or desires.

Traditional Knowledge Digital Library:
India's Traditional Knowledge Digital Library (TKDL)(, a collaborative project between the Council of Scientific and Industrial Research (CSIR), and the Department of AYUSH3, is a home-grown effort to ensure patent offices around the world do not grant patents for applications founded on India's wealth of age-old TK. The idea to establish a TKDL came to the fore amid India's efforts to revoke the patent granted by the United States Patent and Trademark Office (USPTO) on the wound healing properties of turmeric, and the patent granted by the European Patent Office (EPO) on the antifungal properties of neem. These endeavors, while successful, proved extremely costly and time-consuming.
Around the time the TKDL was established in 2001, the TKDL expert group estimated that, annually, some 2,000 patents relating to Indian medicinal systems were being erroneously granted by patent offices around the world.

For a patent to be granted, an applicant must satisfy certain criteria as defined by national patent law, in particular, an applicant must prove that a claimed invention is novel and not previously known. Why then had patents been granted for so many applications relating to Indian medicinal systems? When patent examiners assessed these applications for patentability, the claimed inventions did not feature in the prior art searches carried out. They were, therefore, deemed patentable. At that time, however, much of India's traditional medicinal knowledge only existed in Sanskrit, Hindi, Arabic, Urdu and Tamil. These languages were neither accessible to nor understood by patent examiners working in the major patent offices to which the applications had been submitted.

The fact that so many patents had been wrongfully granted in the U.S. and Europe caused a great deal of national distress. The people of India felt that knowledge belonging to India was

wrongfully being taken away from them. On top of this, these "wrong" patents conferred exclusive rights to exploit the technology in the country in which patent protection was granted. This posed a very real economic threat to Indian producers and to their freedom to operate in foreign markets.

The TKDL has overcome language barriers and is bridging the gaps in TK information in major patent offices. Using information technology tools and a novel Traditional Knowledge Resource Classification System (TKRC), the TKDL has converted and structured ancient texts into 34 million A4-sized pages along the lines of a patent application. These have been translated into English, French, German, Japanese and Spanish.

Today, thanks to its TKDL, India is capable of protecting some 0.226 million medicinal formulations and at zero direct cost. Access to the database helps patent examiners root out those applications that clearly do not satisfy the novelty requirement at an early stage. Without a TKDL database, the process of revoking a patent can be a costly and time-consuming affair. It takes, on average, five to seven years and costs between 0.2-0.6 million US dollars to oppose a patent granted by a patent office. Multiply this by India's 0.226 million medicinal formulations and it is clear that the cost of protection, without a TKDL, would be prohibitive.

An innovative classification system

India's innovative TKRC is modeled on WIPO's International Patent Classification (IPC). It consists of some 27,000 subgroups for Ayurveda, Unani, Siddha and Yoga and, like the IPC, is indispensable for the retrieval of relevant information.

The TKRC has prompted the reform of the IPC – an essential tool in enabling effective search and examination of patent applications – as it relates to TK. The IPC divides technology into eight sections with approximately 70,000 subdivisions each of which is assigned a symbol consisting of Arabic numerals and letters of the Latin alphabet. Until 2005, only one subgroup – A61K35/78 – existed for medicinal plants, meaning that patent examiners were ill equipped to examine traditional medicine-based patent applications.

India took up the lack of recognition for traditional medicines in the IPC's Committee of Experts. Following the establishment of a five-nation 'Traditional Knowledge Classification Task Force' – comprising China, the European Union, India, Japan and the United States – the number of IPC subgroups relating to medicinal plants rose to 207 bringing about a fundamental and far-reaching reform of the international patent system. In 2004, it was agreed to link the TKRC's 27,000 subgroups to the IPC.

Connecting TK holders and patent examiners

The TKDL is a unique, proprietary database that integrates diverse knowledge systems and languages. It is based on 148 books of prior art relating to Indian systems of medicine, available at a cost of around US$1,000. The TKDL connects patent examiners around the world with these books of knowledge.

The TKDL is available to all patent offices that have signed a TKDL Access Agreement which has built-in, non-disclosure mechanisms to safeguard India's interests and counter any

possible misuse. Under such an agreement, patent examiners may use the TKDL for search and examination purposes only and its contents may only be revealed to third parties for the purposes of citation.

So far, India has signed TKDL Access Agreements with the EPO and the patent offices of Australia, Canada, Germany, the United Kingdom and the United States. Negotiations are also ongoing with the patent offices of New Zealand and Japan where agreement in principle has already been reached.

Global IP-watch systems

The national patent laws of most countries allow for third parties – any member of the public – to file a submission questioning the novelty and non-obviousness of a patent application before a patent is granted. There is a need, therefore, to ensure that patent applications that wrongly claim rights in prior art are readily identifiable so that such "third party observations (TPOs)" can be filed and made easily searchable. Global IP-watch monitoring systems have an important role to play in enabling the identification of published TK-related applications on which third parties – in accordance with the patent law of the country concerned – may file observations.

To date, the submission of TPOs has proven the only cost-effective way of preventing misappropriation of TK at the pre-grant stage. The TKDL database has enabled the submission of TPOs that have resulted in the successful opposition of hundreds of patent applications filed around the world. Without documenting and digitizing TK and making these databases easily accessible to patent examiners operating in the major languages of commerce, this would not have been possible.

The TKDL has an integrated global biopiracy watch system that allows monitoring of patent applications related to Indian medicinal systems. It enables effective detection of attempts to misappropriate this knowledge by third parties filing applications with patent offices around the world. It means that immediate corrective action can be taken, and at zero direct cost, to prevent biopiracy. India is the only country to date to have put such a system in place.

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Uterine Infections and Inflammation in Bovines: Recent Advances

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Introduction

The uterine infection involves contamination of uterus with pathogenic organisms *i.e*. their adherence to the endometrial mucosa, colonization or penetration of the epithelium and/or release of toxins resulting into establishment of uterine disease (Janeway *et al* 2001). The anatomical barriers comprising of vulva, vagina and cervix counter the ascending infections reaching to the uterus. Other physical barriers in the genital tract include the stratified squamous epithelium of the vagina, the columnar epithelium of the endometrium, the basement membrane of ovarian follicles and the zona pellucida of the oocytes. During gestation the uterus remains sterile but anatomical barrier is breached at parturition and both pathogenic and non-pathogenic bacteria gains entry into the uterus. This starts a cascade of events culminating to uterine infection, inflammation and finally uterine clearance. The level of microbial contamination and uterine contents favoring microbial growth along with status of immune response determines the future course of infection in the uterus (Noakes *et al* 2002). There are several mechanisms involving specific and non-specific immune responses that prevent opportunist pathogens from colonizing the uterus (Foldi *et al* 2006).Most of the uterine pathogens in the early postpartum are environmental contaminants, mainly Gram-positive and negative aerobes and anaerobes which gets gradually eliminated during the first six weeks postpartum. Although, numerous bacteria in a variety of combinations have been isolated, *Archanobacteriumpyogenes* either alone or in combination with other bacteria viz. anaerobic *Fusobacteriumnecrophorum*, *Bacteroidesspp.*and*Escherichia coli* are usually associated with infected uterus in cattle (Sheldon*et al*2004). Bacterial contamination of the uterus affects about 80 to 100% of dairy cattle within the first 2 weeks postpartum (Sheldon *et al*2008). Although uterine involution and mobilization of natural host defense mechanism (Hussain and Daniel 1991) progressively eliminate the microbial load, inspite of that, up to 40% of animals holds bacterial infection even after 21-28 days postpartum and are often subfertile (Sheldon *et al*2009a). The outcome of uterine inflammation to be pathological or physiological and whether it impairs fertility by the end of voluntary waiting period is deciphered by its timing, severity and duration (LeBlanc 2012). Establishment of uterine infection though complex, also depends on the endocrine environment as well as the immune response of the host. Progesterone from the first corpus luteum after parturition or possibly from adrenal steroids may contribute to the establishment of uterine diseases which very often precedes the onset of uterine diseases possibly by suppressing the uterine immune defenses.The scale of the consequences of infection varies with its severity, stage of postpartum period/estrus cycleand variations in management of herd health. The uterine infection hampers uterine and cervical involutionand causes infertility by disrupting the normal utero-ovarian functions (Herath*et al*2007).

New classification of uterine infections

Several systems have been described in the past to classify and define uterine infectionsbasedonclinical signs and severity of disease orassociated uterine pathological changesand is perplexed by stage of postpartum period and method of diagnosis employed (LeBlanc 2008). The latest adopted classification is mainly based on the degree of severity, histological depth of inflammation and clinical signs (Sheldon *et al*2019) and proposed the following Classification for standard use:

*Pyometra*is the chronic uterine infection characterized by the accumulation of significant purulent material in uterine lumen along with presence of a persistent corpus luteum and a closed or open cervix.Pyometra may be confined to luminal layers or may extend deeper, here no systemic illness is evident and the condition is most frequently associated with the luteal phase.

*Puerperal metritis*is characterized with an abnormally enlarged uterus and a foetid watery red-brown uterine discharge, associated with signs of systemic illness (decreased milk yield,

dullness or other signs of toxemia) and fever >39.5 °C, within 21 days after parturition. It is also referred as toxic puerperal metritis (acute septic metritis) in buffaloes.

Clinical metritis is characterized by an abnormally enlarged uterus and a purulent uterine discharge detectable in the vagina, within 21 days after calving.Metritis indicates that the infection extends into the deeper layers of the uterus with systemic signs of illness.

*Clinical endometritis*is characterized by the presence of purulent (>50% pus) uterine discharge detectable in the vagina 21 days or more after parturition, or mucopurulent (approximately 50% pus, 50% mucus) discharge detectable in the vagina after 26 days.

Subclinical endometritis (SCE)isdetermined on the basis of proportion ofneutrophils present in the endometrium in an otherwise healthy animal. SCE is diagnosed by presence of ≥18% neutrophils on 21–33 days postpartum in uterine cytology samples or >10% neutrophils at 34–47 days postpartumor ≥5 % thereafter and in normal cyclic animals (Sheldon *et al*2006). SCE is also referred as cytological endometritis considering the negative effects on reproductive performance by increased presence of PMNs in the endometrial lumen.SCE remains mostly undiagnosed and/or untreated as it necessitates the examination of endometrium for diagnosis. Consequently, it results into subfertility of dairy cattle mainly due to increased calving to conception interval, embryonic losses, longer inter-calving intervals and relatively greater culling rates.

Incidence of endometritis

Approximately 20% of cows are unable to resolve the inflammatory condition that occurs during the early postpartum period (Chapwanya*et al* 2009). Prevalence of endometritis ranging between 0 to 23.5% using different techniques for diagnosis(Barlund*et al*2008). The incidence of subclinical endometritis after parturition ranges between 37 to 74%.The uterine infection is the second most commonly reported reproductive disorder in buffaloes after inactive ovaries and is a common cause of infertility in bovine (Gautam*et al*2009).In Indian subcontinent, endometritis is a major cause of infertility in buffaloes especially because of high environmental temperature compounded with wallowing in muddy ponds, semi-solid nature of dung and loosely opposed vulvar lips (Rao 1997). Varied annual incidence of endometritis in buffaloes reported ranged from 20 to 75 % in Pakistani buffaloes,38.9%and 22.4% in Egyptian buffaloes and 33.2% to 47.9% in Iraqi buffaloes.These wide variations in reports of endometritis incidence might exist because of the variability in defining the disease condition and also its non-mandatory reporting.In India, the prevalence of uterine infections was reported to be much higher in buffaloes than in cows and varied between 24.7-34.8%.As buffaloes are more prone to dystocia they are more susceptible to the ascending uterine infections. Further about 25% of repeat breeding buffaloes were suffering from clinical endometritis in different farms of Punjab. Prevalence of subclinical endometritis is lower in open grazing system than in confinement systems, possibly due to less metabolic stress owing to their lower milk yield under grazing conditions compared to high-producing intensive systems. Thus, less-stressed cows could decrease the uterine bacterial load more efficiently compared to more-stressed cows (Madoz*et al*2013).

Advances in understanding of uterine defense mechanism in bovines

Bovine uterus serves multiple functions and is a sterile organ but uterine infections are detrimental for endometrial health and functions causing subfertility in domestic animals. Epithelial and stromal cell interactions are critically important for the endometrial function, with stromal cells affecting epithelial cells through release of soluble factors and turnover of extra cellular matrix.Endometrium forms the first line of defense against uterine infections (Herath *et al* 2009a) and it is the first to be affected during ascending uterine infections. The development of endometritis depends on the balance between the maternal immune response and the load and species of bacteria (Hansen, 2013). This balance can be tipped in favour of disease by risk factors such as weak immune system, retained placenta, dystocia and abortion etc. The innate immune system comprising of physiological barriers, humoral factors and

cellular mechanisms is mainly responsible for combating the uterine contamination. Uterine defense mechanisms act by several ways *viz*. anatomically; by the simple or pseudo-stratified columnar epithelium covering the endometrium: chemically by mucus secretions from the endometrial glands: immunologically; through the action of polymorphonuclear (PMN) cells and humoral antibodies. The endometrium needs a special mucosal immunity which continuously deals with several antigens, i.e. sperm, conceptus and microorganisms following both insemination and parturition. The changes in the endometrium i.e. inflammation and histological lesions that occur during uterine infection upset the endocrine functions of uterus and remain incompatible with the transport of spermatozoa, conception and modulates endometrial prostaglandin secretion, leading to embryonic losses, repeat breeding and infertility in domestic animals (Sheldon and Dobson, 2004).A certain degree of uterine bacterial contamination usually starts during or immediately after parturition and occurs in approximately 80-90% of dairy cows during the first two weeks after parturition (Sheldon *et al*2009b). Acycle of bacterial contamination, clearance and again re-contamination of the uterine lumen during the first weeks of postpartum occurs and most animals are able to clear infection during this period, but approximately 10-20% of them fails in the process and develops endometritis (Potter *et al*2010). Cows that had suffered from dystocia, retained fetal membranes, stillbirth, abortion, twining,metritis, male offspring and ketosis are at higher risk for developing endometritis (Galvão*et al*2012).An immune system must be capable of doing three things: recognition of a diverse array of pathogens, killing these pathogens once they are recognized and sparing host tissues. Once physiological barriers to uterus are breached, the presence of invading bacteria is quickly detected by specialized immune cells and cells of the endometrium and an inflammatory type of immune response is mounted to affect the bacterial clearance. Neutrophils are recruited from the circulation into the uterine lumen to eliminate bacteria. After elimination of the pathogenic organisms, inflammation subsides; neutrophils get limited to the fluid in the uterine lumen and are expelled by uterine contractions. The proportion of neutrophils relative to endometrial cells is an indicator of an inflammatory process and might be an important characteristic of subclinical endometritis. The phagocytic capacity of neutrophils isolated from peripheral blood increases whereas of those recovered from the uterus decline during the period from parturition to the third week postpartum in cows suffering from metritis or endometritis. The cause of this asynchrony between peripheral blood and uterine neutrophil activity could not be elucidated, but possibly chemotactic stimulus to the uterus might have got loweredby the reduced bacterial counts in the uterus and raised progesterone concentrations. It has been documented that receptors on endometrial cells and macrophages, called Toll-like receptors (TLRs), recognize highly conserved molecular patterns present on several classes of microbes, called pathogen-associated molecular patterns (PAMPs).PAMPs are essential for the survival of the microbe and, therefore, are not subject to variability, as changes in these structures are lethal to the microbe.

The PAMP are most important as far as uterine infections are concerned (Turner *et al*2012) and bacterial Lypopolysacchride (LPS) is the most studied PAMP. The bovine endometrium expresses TLRs 1–10, whilst purified populations of epithelial cells express TLRs 1–7 and 9, and stromal cells express TLRs 1–4, 6, 7, 9 and 10 (Kannaki*et al*2011). Endometrial biopsies or cytobrush samples from cows with uterine bacterial infection show increased expression of the TLRs (Cronin *et al* 2012). These reports confirm that endometrial TLRs are functional and form the first step in innate immune protection.TLRs are present on cell surface and intracellular compartments and induce intracellular signaling cascades to produce of inflammatory cytokines. The innate immune system, including TLRs, antimicrobial peptides (AMPs) and acute phase proteins (APPs) constitute an initial defense of the mammalian endometrium against microbes (Wira and Fahey 2004). The endometrial cells secrete cytokines and chemokines to direct the immune response and increase the

expression of AMPs. After contact with bacteria through TLRs, leukocytes or epithelial cells are stimulated to produce pro-inflammatory cytokines (such as IL-1β, IL-6 and TNF-α) and chemokines (such as IL-8, monocyte chemoattractant protein-1) and prostaglandin E_2. Most of these inflammatory mediators are soluble factors that are produced by one cell and act on another target cell to change its function; some consider these mediators as the 'hormones' ofthe immune and inflammatory responses.Potential candidates involved in physiological and pathological events in the bovine endometrium are the chemokines (CXC ligand-5, IL-8), interleukins (IL-1β, IL-6, IL-10), tumour necrosis factor-alpha (TNF-α), prostaglandin-endoperoxide synthase-2 (PTGS2) and haptoglobin.These mediators initially direct the inflammatory response by attracting and activating immune cells (particularly neutrophils and macrophages), inducing neutrophil/monocyte diapedesis and chemoattraction to the site of infection to phagocytize and kill invading pathogens and effective removal of microbes and damaged host cells.Later in the inflammatory process, anti-inflammatory cytokine mediators such as IL-10 and resolvins are released to minimize the deleterious effects of chronic inflammation, and topromote tissue repair and coordinate the timely resolution of inflammation. However, multiple cytokines are involved in inflammatory response, many have pleiotropic effects, and they often duplicate the functions of each other (Sheldon *et al*2017).The interactions of pro-inflammatory and regulatorycytokines leads to the control of the amplitude, relatively greater or lesser clinical symptoms and duration of inflammatory responseand hence the capacity to outcome uterine infection (Dadarwal et al., 2019).

Recent diagnosticapproaches

Inspite of various available methods, the diagnosis of endometritishas been a challenging task due to lack of universally accepted disease definition and a simple, effective diagnostic method at field level.Various techniques employed for the diagnosis of endometritis include per-rectal examination, vaginoscopic examination, endometritis clinical score, pHof genital mucus,white side test, trans-rectal ultrasonography, uterine biopsy, endometrial cytology andultrasonographyetc.Amongst these bacterial isolation and uterine histopathology by biopsy are tests with acceptable results to diagnose endometritis.The sustained presence of inflammatorycells and increase of cytokines alters the uterine environment so that embryonic development is not optimal for pregnancymaintenance (Jackson et al. 2012). It therefore, is important to treat SCE in a timelymanner to achieve optimal reproductive efficiency.In last decade, diagnosis and treatment of SCE has been a focus of research as normally it remained undiagnosed and causes huge economic loses in the dairy sector. Hence, application of diagnostic cytology of endometrium for confirmation of SCE in bovinehas increased considerably. Endometrial cytology provides a valid reflection of endometrial health for different inflammatory conditions of uterus. As acute inflammation is mainly characterized by the action of PMN cells, the influx of neutrophils into the endometrium (stratum compactum) and uterine lumen from the circulation occurs. The three sampling methods reported in literature for endometrial cytology are uterine swab, cytological brush (cytobrush) and uterine lavage. A technique for endometrial sampling that yields many well-preserved cells representing a large uterine surface area without causing harm to the reproductive tract is required for consistent and reliable cytological results. Cotton swabs are more likely to distort cells and are not recommended forcytological examination. Although uterine lavage harvests cells from a larger uterine surface area and provides a more representative sample of luminal contents than does either a swab or a uterine biopsy, it may cause irritation to the endometrium, contains more leukocytes and artefacts and is a time consuming procedure, with a possible failure to recover flushing media. Currently, quantitative evaluation ofcellular population (% polymorphonuclear cells, PMN) in the uterine cyto-smears is a widely accepted means to identify cattle orbuffalo with SCE (Sheldon, 2020). Different threshold values of PMNsin uterine samples have been reported by various workers with higher percentage of PMNs being indicative of subclinical

endometritic condition in the postpartum period. The % neutrophils of 18 between 20–33 DPP, 10% between 34–47 days and 5% at 40 to 60 days postpartum in uterine cyto-smearsare indicative of SCE (Wagener*et al*, 2017). Also, endometrial cytology is currently considered as the reference test for endometritis because of its potential todiagnose both clinical and subclinical cases. Although there are fewer studies on cytological examination of endometrium during estrus cycle in bovine. The physiological infiltration of PMN to the endometrium along the stages of estrus cycle did not (PMN% in cytobrush not altered) affect the diagnosis of SCE in clinically healthy cows (Madoz*et al* 2013).Endometrial cytology samples stained with Modified Wright-Giemsa (Diff-Quik) and a specific PMN staining dye (i.e.naphthol-AS-D-chloroacetate-esterase) yielded a good agreement between PMNs percentage (*pc ¼ 0*.84, 0.78, 0.89) but Diff-Quik was indicated as a comparatively fast, easy and high-quality technique for endometrial cytology (Pascottini*et al*2015).Endometritis (clinical or subclinical) diagnosis carried out by determining the average of PMNs in the 10 fields resulted in same efficiency as that obtained by calculating the total percentage of PMN in 150 cells per slide. Melcher *et al*(2014) probably for the first time evaluated six different counting techniques in endometrial cytology for diagnosis of SCE and recommended counting of 300 cells in a meandering pattern or 100 cells in 10 high power fields per slide as a method of choice to evaluate PMN percentage.Persistence of inflammation indicated by increased proportion of PMNs in the endometrium in the absence of bacteria has been suggested as the primary characteristic of subclinical endometritis.Results from many recent studies indicated that there is greater relative mRNA abundances of pro-inflammatory cytokines (specifically, IL-1β, IL-8 and TNF-α)in the endometrial tissue of cows and buffaloes diagnosed with clinical or subclinical endometritis. From the last decade, many international research groups are working on developing a reliable diagnostic method at the point of care as well as effective/safe treatment for the hidden but economic loss causing problem of subclinical endometritis in bovines.

Conservation and Domestication of Picrorhiza kurrooa

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Abstract

Picrorhiza kurrooa Royle ex Benth (family Scrophulariaceae), a medicinally revered herb, grows in the Himalayan region at ranging from 3000-5000m and rhizomes are used extensively in traditional as well as modern medicinal systems of south Asian country for various immune-related diseases. Its conservation and domestication has recently gained unprecedented importance because of the large gap of demand and supply resulting into it's over exploitation, adulteration and contamination which has led to inconsistent supply of the quality raw material and ultimately threat to its efficacy and existence. Picroside-I and picroside-II, are known marker bioactive metabolites responsible for the therapeutic effects of kutki. The research aimed to Conservation and Domestication of *Picrorhiza kurrooa*, a Threaten Medicinal Plant Species through Assessment of Its Chemical Variability grown in Karnali Province of Nepaland to identify the chemically superior accessions in terms of the bioactive marker compounds. All together 93 samples from 31 accessions were collected. The rhizomes were shade dried, milled, defatted, and extracted with hot methanol. The methanol extract was analyzed by TLC densitometric technique and picroside-I and picroside-II were quantified using the method validated according to ICH, 1995 guidelines. Separation and quantification of picroside-I R_f (0.55) and picroside-II R_f (0.41) was achieved

on precoated silica gel $60F_{254}$ aluminium plates using mobile phase chloroform-methanol (75:25, v/v). Pure picroside-I and picroside-II required for quantitative determination were isolated from column chromatography of ethylacetate fraction of methanol extract obtained from the rhizomes. The variability in the contents of the bioactive marker constituents with the altitude was observed. Picroside-I, picroside-II and kutkin were found to be in the range of 2.47-4.69%, 1.84-8.91%and3.57-11.37% respectively. Significant variation in the content of picroside-II with altitude was observed but not in case of Picroside-I. Based on this investigation, 6 chemically superior accessions were identified for their conservation and mass multiplication. This is the first report on the HPTLC assessment of picroside- I and picroside-II in the accessions grown at different altitudes of Karnali Province in Nepal and identification of the chemically superior accessions.

Keywords:*Picrorhiza kurrooa*, HPTLC,Picroside-I, Picroside-II

Impact of climate change on weed dynamics

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Abstract

There is an ever-growing consensus that the earth's climate is changing. The record of atmospheric CO2 indicated that there was a 20 % increase from 311 ppm in the mid-1950s to 375 ppm in 2001. The Inter-Governmental Panel on Climate Change have suggested, as a conservative estimate, 700 ppm by the end of the century. Numerous studies have concluded that an elevated CO2 concentration generally favours the vegetative growth of C3 plant species over those with C4 pathways. However, not all crops are based on C3 pathways and not all weeds are C4 based. Hence, while the above concept is relevant for C3 cereals such as rice, which compete with C4 grassy and broad-leaved weeds, this situation is not universal. There are many C4 crops of economic significance, such as maize, sugarcane and sorghum which have competition from important C3 weeds, for example, *Chenopodium album*.

Another important climatic factor is atmospheric temperature which is regarded as an important indicator of weed species distribution in a geographical area. Increased temperature strongly affected the biomass accumulation by annual grass species during their reproductive phase as compared with the vegetative phase, and such effects are more pronounced in C3 than C4 plants. The uptake and translocation of herbicides in plants and their persistence in soil will also be affected by rising temperatures. Under rising temperature, weeds with C4 photosynthesis pathway have a competitive advantage over crop plants possessing the more common C3 pathway.

Similarly, variation in rainfall pattern and increased aridity consistent with a warming climate could alter weed distribution and their impact on crop production. Under prolonged drought spells, C4 and parasitic weeds like *Striga hermonthica* will thrive better. Under excess water environments, weeds such as *Rhamphicarpa fistulosa* will be favoured. A change in rainfall patterns would favour hydromorphic weeds while prolonged drought spells will benefit C4 over C3 weeds. Increased rainfall frequency and intensity will have an adverse effect on uptake, retention, and activity of soil-applied herbicides. Increasing aridity and drought will increase herbicide volatilization, and, moreover, frequent rain showers will reduce the "rain

safe periods" available for herbicide application in a given cropping system posing multidimensional challenges for weed management.

Agriculture for Sustainable Development

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Abstract

For nearly two decades, the World Intellectual Property Organization's (WIPO's) expert committee, known as the Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore (IGC), has been working to negotiate text-based legal instrument(s) for effective protection of the subject matters of genetic resources (GRs), traditional knowledge (TK) and traditional cultural expressions (TCEs), and their intersection with the intellectual property (IP) system. So far, the IGC experience reflects the intensity of the international process, geopolitical undercurrents and the power dynamics that characterize that process, especially as it relates to the subject of IP. Despite mixed responses across North-South geopolitical interests regarding the elongation of the IGC's deliberations and the continuing delay in the expected outcome from the forum, the latter has made substantive contributions to international IP law and policy making in relation to matters under its mandate. This paper identifies and explores the rationale for one of the major evolving contributions of the IGC, namely the notion of a tiered or differentiated approach to the protection of TK and TCEs. The paper concludes that the approach provides a broad policy framework, although its details are contingent on many considerations, which are better addressed at national and local levels.

Scope and potential sources for bioactive compounds from marine algae

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Abstract

Marine organisms comprise almost half of the worldwide biodiversity. Marine resources are being considered the largest remaining reservoir of beneficial natural molecules that might be utilized as functional constituents in the food and medicinal sector. The research on marine natural products for their bioactive potential has expanded in recent years. The marine bioactive compounds are organic compounds produced by various marine organisms. It provides significant structures, novel and useful/therapeutic agents that are not available in terrestrial resources. Among them marine algae are considered as a tremendous source of bioactive compounds which have a broad range of biological activities including antibacterial, antifungal, antioxidant and antiviral properties. The diverse collection of bioactive compounds can be enabled from the extracts of marine micro and macro algae. The marine micro algae such as Chaetoceros, Isochrysis, Nannochloropsis, Chlorella,

Skeletonema, etc are being used mainly as feed for larval stages of bivalves, shrimp and certain fish species and also reported to produce variety of bioactive secondary metabolites substances such as PUFA, sterols, proteins and enzymes, vitamins, pigments, etc with diverse biological activities including against many pathogenic bacteria such as E. coli, Staphylococcus, Vibrio, Aeromonas, etc. Marine macro algae are considered as an enormous source of bioactive compounds as they are able to produce a variety of secondary metabolites includes carotenoids, terpenoids, steroids, amino acids, phlorotannins, phenolic compounds, halogenated ketones, cyclic polysulphides, etc as characterized by a broad spectrum of biological activities such as antibacterial, antifungal, antiviral, antitumorals, antioxidant and antiinflammatories. The macro algae such as Cystoseira, Ulva, Gelidium, Kappaphycus, etc were examined for antibacterial and antifungal activities against many human pathogenic bacteria and yeasts. Moreover, marine algae covers and goes through the most studied applications in areas so immense as human and animal nutrition, therapeutics, and aquaculture are discussed in this review.

Keywords:Bioactive compounds, Marine algae, Macro algae, Micro algae, natural products

Influences of Plant Growth Promoting Actinobacteria in Sustainable Agriculture Development of Tomato Plant (*Solanum lycopersicum*) with their Genomics and Metabolomics Approach

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Abstract

Biotic stresses such as damage done by pathogenic bacteria and fungi are amongst the common unfavorable conditions that have significantly exaggerated agricultural productivity. Endophytic microorganisms are present inside of the plant's tissues without causing any apparent disease symptoms. Endophytic actinobacteria play an important role in the growth promotion and development of the host plant by producing enormous quantities of novel bioactive natural products. In the present investigation, endophytic actinobacterial isolates were obtained from *Rhynchotoechum ellipticum* and screened for their PGP potential. The isolate *Streptomyces* sp. strain BPSAC147 showed significant antagonistic activity against plant fungal pathogens and producing IAA phytohormone, solubilization of phosphate, producing siderophores and extracellular enzyme-like cellulase, amylase, and xylanase. Further, the potent strain was evaluated for their *in-vivo* PGP and biocontrol potential on *Solanum lycopersicum* L. seedlings under greenhouse conditions. Measurements of total chlorophyll content revealed very high differences between strain BPSAC147 inoculated tomato plants and some infected by a fungal pathogen. Moreover, the potent isolate *Streptomyces thermocarboxydus* was selected based on PGP potential to perform a whole-genome sequence that consists of 7.39 MB with a G+C content of 72.22% containing 6929 protein-coding genes. Interestingly, 13 BGCs for putative secondary metabolites were found based on the antiSMASH. The methanolic and ethanolic extract of *Streptomyces* isolate was detected a few PGPR compounds, polyketide, and terpene compounds based on the metabolomics approach. These findings suggest that strain BPSAC147 can be used as inoculum to inhibit the *Fusarium* wilt disease in tomato crops and also produce various secondary metabolites based on BGCs analysis that is useful to sustain the plant growth.

Hence, the isolate could be used as PGPR based product in sustainable agriculture development.

Keywords:*Streptomyces*; *Solanum lycopersicum* L.; Biotic stress; PGPR; antiSMASH; Metabolomics.

Feature Based Repurposing Technique for FDA Approved Drugs Targeting SARS-CoV-2 M^{pro}

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Abstract

Aims: Novel Coronavirus (CoV) is the main etiological virus responsible for pandemic in 2019-2020 commenced in Wuhan. The viral disease is highly contagious in nature and it had spread in 210 countries. The precautionary measures are limited to social distancing and isolating the infected to avoid the person to person transmission. Currently there is no any treatment available for the disease and the discovery of new drug or the effective therapeutics is intensive, time taking and laborious process. Currently the effective way to treat the pandemic is discovery of therapeutically potent drugs from existing library of drugs termed as repurposing or repositioning of drugs or pre-existing molecules.
Materials and Methods: In this study a feature based model was developed using the reported compounds which have potential to inhibit the SARS-CoV-2. This model was validated and used to screen the library of FDA approved drugs to identify top 66 drugs targeting the viral Main protease (Mpro) which is validated through docking experiments.
Key findings: Out of 565 drug library top 66 drugs were identified to interact with Mpro with higher binding scores as compared to known drugs used for development of feature based model. The study reveals the identification of HIV reverse transcriptase, Protease, Anticancer agents and folate inhibitors as potentially interacting with viral protein.
Significance: A rational approach of feature based drug repurposing validated through docking might help in finding the needles in haystack for the SARS-CoV-2 pandemic.

Antifungal activity of Some Plant Essential Oils against Post-Harvest Pathogens of *Carica papaya* L.

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Abstract

Black rot (*Aspergillus niger*) and Fusarium rot (*Fusarium oxusporum*) are post-harvest diseases in papaya resulting in relatively high postharvest losses. Losses in fruit result from improper methods of harvesting, packaging, transportation and storage.The objectives of the present investigation were to identify post-harvest pathogens in papaya fruits, test in vitro antifungal effect of essential oils against fungal pathogens of papaya fruit and develop a relatively safe, disease control strategy. Both of the test fungi were

treated with the essential oils of *Cinnamonium tamala*, *Mentha spicata*, , *Eucalyptus citriodora* ,*Cymbopogoncitratus* and *Artemisia indica* using poisoned food technique with concentration of 10µl/ml, 5µl/ml, 2.5 µl/ml, 1.25 µl/ml and 0.625 µl/ml. The control combination was potato dextrose agar with no oils added. For papaya, all the EOs showed a significant reduction in the growth of test pathogen, with the mentha oils causing the greatest reduction in growth of both test fungi. Among these EOs most effective were found to mentha oil of concentration 5 µl/ml and 10 µl/ml with 75.81% and 91.94% for *A. niger* and 88.15% and 90.74% for *F. oxysporum* respectively. Thus according to this investigation, it could be suggested that essential oils could make them an excellent treatment for controlling postharvest diseases of papaya fruits.

Key words: Antifugal activity, EOs, Post-harvest, *Fusarium oxysporum*, *Aspergillus niger*

Design, Development and Validation of Decision Support System for diseases management of scab

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Abstract

Apple Scab, caused by *Venturia inaequalis* (Cke.) Wint. (anamorph *Spiloceapomi* Fr.), is considered to be one of the most important fungal diseases of apple, which occurs almost every year in severe epidemic form under favourable environmental conditions wherever apple is cultivated. In India, the disease causes significant economic losses in the states of Jammu & Kashmir and Himachal Pradesh each season, and has been prevalent in Uttarakhand hills, the 3rd largest apple growing state in the country. Yield losses during epidemic years in 1996 2008 and 2013 in the Gangotri fruit belt of Distt. Uttarkashi went up to 70 per cent. The main reason for the heavy infection appeared to be the high inoculum level from the previous season. Continuous wetting periods resulted in moderate to heavy infection in orchards with high infection potential during the summer period of the growing season Scab is generally controlled by calendar-based fungicide applications regardless of the presence of ascospores of the causal fungus, *Venturia inaequalis*, in the orchard. Weather conditions especially rainfall, duration of leaf wetness and temperature vary at different altitudes in the Himalayan region, where apple is cultivated. Therefore, understanding the timing and intensity of environmental conditions that trigger ascospore release may provide useful information to growers who use fungicides to protect their trees from new infection. The Chamba-Mussoorie, Almora, Pauri, Tehri, Nainital and Bageshwar fruit belts were apparently free of scab.

In Gangotri fruit belt, defoliation in apple trees started around mid August and continued for nearly 65 days. Maximum leaf fall (82%), however, was observed during the period October 15th - November 15th after which trees were completely defoliated. The present findings reveal significant relationship between the time of leaf fall and leaf decomposition, which plays important role in maturation and discharge pattern of ascospores. The leaves which fell earliest in the season, showed maximum reduction in leaf weight and area. It could therefore concluded that earlier the leaf fall better the decomposition of apple leaf litter during the over wintering stage. The formations of pseudothecia and ascospore discharge were associated mainly with late autumn (October) infection. The maximum pseudothecia and ascospore production was observed in the 1996 2008 and 2013 and least in 2001 and 2002. Maximum ascospores productivity was recorded at petal fall and fruit set stage of apple with ascospore productivity of 1, 23,000/ml and thereafter declined gradually.

In most of the years, the relationship between ascospores productivity and primary infection of scab was found to be much higher (>90 %). The pseudothecial formation takes 32 to 48 days more after sexual reproduction at temperature around 8 to 10°C and this process completes between January to February every year in Garhwal Himalayas. The observation revealed that 96 per cent pseudothecia were mature at green tip stage during 2nd week of March at Purola-Naugao, Tuni-Chakarata, and Tal-Talwari fruit belts (1700-2000 m asl) while at Gangotri and Auli-Joshimath fruit belts (2100-2600 m asl) the pseudotheciastarted becoming mature at late pink bud stage. The ascospore emission period was 64-78 days and mean numbers of cumulative degree days for 50 and 95 per cent spore release from these observations were 456 and 960.

Ascospore maturation peaked between pink bud and fruit set stages and was completed by fruit set stage or shortly thereafter (6 – 10 meteorological weeks). To improve spraying efficiency with reduced fungicides use, reliable scab warnings are helpful. Weather data were recorded using microprocessor-based orchard environment monitor, RSS – 412 apple scab predictor and µMETOS scab warning device. The total infection periods were observed in each year periodically from March till August at the Gangothri valley area of Uttarakhand. Data accumulated over 10 years were analyzed for validation of Mills criteria to establish its relevance in rescheduling fungicide applications under monitored spray programme. On examination of the primary infection period of 17 years data from Gangotri fruit belt, some differences were observed between our results and Mills table for ascospores infection. The observation revealed 2 day (light infection), 1 day (moderate infection) and 1 day (severe infection) delay in symptom expression under orchard conditions. The regression analysis was used to describe relationship between Mills infection criteria and our light, moderate and severe infection period data of Uttarakhand hills for symptom appearance in orchards.

At present, PAD is a useful tool to forecast the total amount of inoculum in an orchard and has been shown to effectively improve apple scab management. We studied different inoculum levels under Garhwal Himalayan conditions, where reduced spray program could be used after petal fall for the management of scab.PAD, that has great impact on disease development in the following season, varied from 610 to 682368 in the various orchard of Gangotri fruit belt. The PAD value was low during 1999 to 2001 (612 – 2192 ascospore/m^2) and medium during 2002-2006 (4262 - 37848 ascospore/m^2) due to the fact that the springs were early, dry and not more favorable for ascospores maturation. In epidemic years, the PAD values were high because of the favourable weather conditions and increase of inoculum accumulation. The scabbed lesion and leaf litter density were approximately more than twice in Gangotri fruit belt in 1996, 2008 and 2013. PAD involves the elimination of unnecessary early-season sprays in orchards where the inoculum is below a specified level. PAD values were 50 times higher in the poorly managed orchards than in the integrated managed orchards.

DSS are nowadays used in many sectors such as medicine, in business, management and in agriculture to help the farmers decide what to do, where and when. Apple disease control advisory (ADCA), a computerized decision support system for managing scab, was procured from Austria and tested over 10 years in 5 fruit valley of Garhwal Himalayas of India. In orchards managed according to advisory information, a significant increase of yield was obtained relative to the common management policy. The environmental conditions varied from location to location, and Mills infection periods ranging from 19–47 were recorded from April to September every year revealed that number of infection periods varied from year to year depending upon the weather conditions. Warnings are issued mainly via a call in telephone, SMS, WhatsApp, Agriculture Govt. department, and broadcasted through

radio stations. In addition, growing season kisan mela, press releases and newsletters are issued via the extension workers of University and Govt. department.

Bioefficasy of endophytes against the wilt complex in pomegranate and groundnut

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Abstract

Endophytes are the microorganisms that reside inside healthy plant tissues without causing any detectable disease symptoms to the host. Of the nearly 3,00,000 plant species, that exist in the earth, each plant is the host to one or more endophytes. Since the discovery of world's first billion dollar anticancer drug, Paclitexel (Taxol) from *Pestalotiopsis microspora* , a fungus that colonizes the Himalayan yew tree, without causing apparent injury to the host plant, interest is growing in endophytes. Natural compounds ranging from crop protection to human welfare have been isolated from this alternative source of endophytes. Several anticancer, antibiotic, antimycotic, antiviral, antioxidant, nematicide, insecticide and immunosuppressive compounds have been reported from endophytes. They also improve the growth and yield of crops under various stressed conditions.

Wilt complex is an important disease in pomegranate (caused by *Ceratocystis fimbriata* and *Fusarium oxysporum*) and groundnut (caused by *Rhizoctonia solani* and *Sclerotium rolfsii*). Totally 69 fungal and 32 bacterial endophytes were isolated from different parts of pomegranate and 106 fungal and 35 bacterial endophytes were isolated from groundnut. These endophytes were evaluated both under *in vitro* and *in vivo* conditions against the wilt complex pathogens. Fungal endophyte, LFDwAC-7 (*Nigrosporasphaerica*), TLFE-7 (*Chaetomium* sp.), and TSFE-7 (*Nigrospora sphaerica*) and bacterial endophyte, RBBeJa-3 (*Bacillus megaterium*) were very effective in managing wilt complex and enhancing the growth promotion activity in groundnut.Fungal endophyte, LF30 (*Trichoderma harzianum*) SF33 (*Trichoderma asperellum*) and bacterial endophyte, SB 3 (*Bacillus vallismortis*) were very effective against *C. fimbriata* and *F. oxysporum* in pomegranate both under *in vitro* and *in vivo* conditions with increased plant growth.

Key words: Endophytes, Wilt complex, Bioefficasy, *Ceratocystis*, Pomegranate, groundnut

Possibilities and Strategies of Mushroom Business in Covid-19 Scenario

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Abstract

Mushroom has been part of our human diet since time imperial. They were used as food even before man understood the use of other organisms. Undoubtedly, mushrooms were one of man's earliest foods, and they were often considered an exotic and luxurious food reserved for the rich. Edible mushrooms are often described as vegetables or herbs, but they are actually fungi. People consume the edible ones for the exotic yet subtle flavour, the nutritional benefits as well as for the medicinal purposes. It can make a valuable dietary addition through protein and various micronutrients and coupled with their medicinal properties. Mushrooms can play an important role contributing to the livelihoods of rural and urban dwellers, through food security and income generation. It can profitably be started by landless farmers, unemployed youths and other entrepreneurs. It requires less land as compared to other agricultural crops and is basically an indoor activity. Therefore, mushroom cultivation is not only of economic importance but also has important role to play in integrated rural development programme by increasing income and self employment opportunities for village youths, woman folk and housewives to make them financially independent. Edible mushrooms are often described as vegetables or herbs, but they are actually fungi. People consume the edible ones for the exotic yet subtle flavour, the nutritional benefits as well as for the medicinal purposes. In the Covid-19 scenario, unemployment is increasing rapidly both in developed and developing countries. In this situation, self-employment can be one important way to increase employment rate for small and marginal poor farm households for generating employment; and earning extra money. They can easily cultivate mushroom in their home yard because it requires small piece of land where mushrooms can be grown. Mushroom cultivation is highly combinable with a variety of other traditional agricultural and domestic activities and can make a particularly important contribution to the livelihoods of the disabled of women and the landless poor who with appropriate training and access to inputs can increase their independence and self-esteem through income generation.

Pest Management Modules against insect pest complex in okra

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Abstract

Field studies were conducted to determine the comparative effect of different pest management modules *viz*., integrated module (M1), bio-intensive module (M2) and chemical module (M3) tested for two consecutive years (2017-18 and 2018-19) against major insect pests of okra including jassids (*Amrasca biguttula biguttula*), whitefly (*Bemesia tabaci*) and shoot and fruit borer (*Earias vittella* and *E. insulana*) and also assessed their effect on natural enemies on insect pests of okra (*Abelmoschus esculentus*). Maximum mean population of insect pests was recorded in control, while it was minimum on okra fields treated with integrated module (M1) comprising installation of yellow sticky traps and pheromone traps followed by spraying of Azadirachtin @ 3-5 ml/l after 30 Days After Transplanting (DAT), flonicamid 50WG @ 0.4 gm/l 10 DAFS (Days After First Spraying), thiacloprid 21.7 SC @ 0.6 ml/l 10 DASS (Days After Second Spraying), rynaxypyr @ 0.3 ml/l 10 DATS (Days After Third Spraying) and Spiromesifen @1ml/l at 10 DAFS (Days After Fourth Spraying) and their need based rotation was most effective in reduction of jassids, whitefly (YVMV incidence also) and shoot and fruit borer infestations. It was followed by chemical module (M3) and bio-intensive module (M2). Population of natural enemies' *viz*. lady bird beetles,

Chrysoperla spp and spiders was minimum in chemical module treated fields compared to bio-intensive module and integrated module treated fields. In terms of yield, integrated module and chemical module were superior and comparable. Based on overall results, it can be inferred that though all the tested integrated, chemical and bio-intensive modules were statistically equally effective in terms of recording lower incidence of jassids and fruit borer in okra, the integrated module maintained superiority in terms of highest percentage of reduction of fruit borer and lowest incidence of YVMV which can be profitably exploited for pest management in the present context of environmental safety.

Spent mushroom substrate: application and management

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Abstract

Mushrooms are delicate, nutritional and medicinal fruit bodies of fungus which are used as an important ingredient of human dishes. It contains protein, minerals, vitamins and essential amino acid. Mushroom industries does not only produce edible mushroom but also produces virtually in-exhaustible supply of a co-product called spent mushroom substrate (SMS). SMS is substrate produce after the mushrooms have been harvested. It is a soil-like material which represents the composted substrate remaining after harvesting of mushroom fruit bodies. This substrate consisting of numerous mushroom fungus threads i.e. mycelia are further biochemically modified by the enzymes into a simpler and more readily digestible product. SMS are produced in huge amounts, and raises concern about its processing as it can't be left as it is, to create a mass of pollution. Mushroom mycelia present in SMS can produce a group of complex extracellular enzymes which can catabolise lignocellulosic wastes in order to minimize pollution. Mushroom mycelia help to restore the changed environment which is resulted from pollution. Saprotrophic, endophytic, mycorrhizal, and even parasitic fungi/mushrooms can be used in mycorestoration in the following ways: mycofiltration (using mycelia to filter water), mycoforestry (using mycelia to restore forests), mycoremediation (using mycelia to eliminate toxic waste), and mycopesticides (using mycelia to control insect pests). Considerable amount of lignocellulosic material still remain available in the spent compost in addition to the mushroom mycelia and other products formed by the metabolic action of the mycelium.

SMS is a rich source of nutrients, which make it well suited for plant growth and for preparing nutrient rich compost with organic wastes. Spent mushroom manure is used as a fertilizer as it contains few heavy metals and more organic matter. This helps in the amendment of soil and act as a soil conditioner. SMS has high cation exchange capacity also, which makes it capable to hold nutrients in the soil and to retain slow mineralization rate quality as an organic matter.

The addition of SMS in the nutrient poor soil leads to improvement in soil texture, water holding capacity and nutrient status. The addition and mixing of SMS in soil does not have any adverse effect on its alkalinity, rather, its amendment in soil leads to increase in both pH and organic carbon content. SMS contain 1.9% nitrogen, 0.4% phosphorus and 2.4% potash.

Moreover, SMS are used in the growth of another edible mushroom and as fodder for livestock.

Untapped potential of horticultural resources of North-eastern region: Issues and Concerns

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Abstract

The North eastern region of India is considered as one of the richest reservoir of genetic variability and diversity of horticultural crops. Considerable diversity exists among these species including variation in plant type, morphological and physiological characteristics, adaptability and distribution among the horticultural crops in this region. This region harbours more than one third of the country‘s total fruit diversity. The region is considered as original home of citrus species. Among the citrus species, a number of under exploited species like *Citrus macroptera, C. medica, C. indica, C. megaloxycarpa* are found to be grown extensively in this region without any commercial cultivation. In banana, in addition to cultivated triploids, *Musa acuminata* and *M. bulbisiana* diploids are found in semi wild state. *Musa flaviflora* is localized in Manipur and Meghalaya. Many allied species of mango like *Mangifera sylvetica* and *Mangifera foetida* are found in wild in Tripura, Manipur, South Assam and Mizoram. There are several distinct types of pineapple *viz.* Joldhap, Bakhat, Ravanmuria belonging to the queen group is also available. Different types of jackfruit *viz.Artocarpus heterophyllus, Artocarpus chaplasha, Artocarpus lakoosha* are available in the region. In addition to commercial fruits, the region is also known for its rich genetic resources of underutilized and under exploited fruits viz. *Aegle marmelos, Artocarpus heterophyllus, Artocarpus lackoocha, Averrhoea carambola, Baccaurea ramiflora, Citrus medica, Citrus macroptera, Citrus grandis, Dillenia indica, Elaegnus latifolia, Elaeocarpus floribundus, Emblica officinalis, Ficus semicordata, Garcinia cowa, Passiflora edulis, Phylanthus acidus, Spondias pinnata, Syzigium jambos, Tamarindus indica, Terminalia chebula* and many more.
Although the region is considered as natural home for many of the horticultural species, but of now, the genetic resources of horticultural crops are under the threat of extinction. Large-scale urbanization, changing attitude and taste of peoples and developmental projects are the reasons due to which most of the horticultural resources of this region are decreasing. To safeguard the existing diversity of these high demanding crops, systematic exploitation, collection, characterization, multiplication, and conservation of these valuable resources are urgent need. Development of propagation and multiplication protocol along with cultivation practices is also imperative. There is need to maintain them in field genebanks, as well as *in vitro* gene bank. Further, there is a need to launch a global level network programme for conservation and sustainable use of these important crops

Section (B)
Oral/Poster Presentation

Antineoplastic effect of methotrexate formulated in soybean oil nanoemulsion on the HeLa cervical cancer cells and A549 non-small lung cancer cells

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Abstract

Methotrexate (MTX) is the most widely used chemotherapeutic agent in the treatment of several solid tumors. However, it has certain limitations in clinical use due to its adverse side effects. The main objectives of the current study were to formulate MTX in ananoemulsion containing soybean oil (SOY-NE) and to assess its antitumor activity in HeLa cervical cancer cells and A549 non-small cell lung cancer cells. The cytotoxic effect of the MTX-loaded SOY-NE (SOY-MTX) was evaluated by the MTT assay while its mechanism of cell death was identified by the light microscopy and DAPI stain. According to the light dynamic scattering measurements, the z-average diameters of the nanosuspensions for SOY-NE have sharply increased from 103.8 ± 5.32 nm to 149.2 ± 149.2 nm when loaded with MTX. The surface charges of the dispersed nanodroplets for SOY-NE and SOY-MTX expressed as zeta potentials were -2.50 ± 0.783 mV and -6.36 ± 0.674 mV, respectively. It has been found that incorporating MTX into SOY-NE has improved its cytotoxicity effect in both tested cell lines. The IC_{50}'s of MTX-SOY were (15 ± 0.100) µM and (18.00 ± 1.31) µM in HeLa and A549 cells, respectively. Signs of apoptosis were seen in the light microscopy and DAPI-stained-cells images. Combining MTX with SOY-NE has ameliorated its antitumor efficacy in the cancer cells.

Keywords:Chemotherapeutic Agents, Z-Average Diameter, Zeta Potential, Antitumor Activity, cell inhibition.

Topotecan Delivered in Nanoemulsion Based on Natural Oils as a Novel Approach in Treating Cancer

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Abstract

Topotecan (TOPO), an inhibitor of topoisomerase I, is the single-agent therapy of choice of many complicated types of cancer but is associated with serious toxicities. The aim of this study was to incorporate TOPO in new nano carrier system that contains natural oils like sesame (SO), avocado (AO), and jojoba (JO) oils in order to minimize its effective dose and thereby its side effects. Nanoemulsions (NEs) were formulated by high pressure ultrasonication technique and physically characterized by ultraviolet-spectrophotometer and zeta-sizer. The cytotoxic effect of the NE formulas, with and without the loading of various concentrations of TOPO for 24 hours was determined in vitro in four different cell lines;

MCF-7 breast, HCT116 colon, A549 lung and HeLa cervical, using crystal violet assay for viability determination and commassi blue staining for cellular morphology assessment. According to the physical characterization experiments, all of NE formulations were stable and significantly decreased in size from (115.20-211.80 nm) to (74.68-191.10 nm) after TOPO loading. Significant reduction was observed in TOPO half maximal inhibitory concentration from (53.64, 31.78, 25.31 and 20.98) for TOPO dissolved in distilled water to (7.42, 10.07, 10.01 and 12.94) for TOPO in SO NE, to (5.16, 9.78, 4.69 and 11.9) for TOPO in AO NE and to (5.47, 9.92, 5.04 and 13.83) for TOPO in JO NE in HeLa, HCT116, MCF-7 and A549 cells respectively. In conclusion, incorporation of TOPO in all of the three NEs potentiated its cytotoxic effect in the entire cancer cells tested in this study.

Multiplex PCR assay for simultaneous detection of *Phytophthora, Pythium* and *Fusarium* associated with foot rot and yellowing of black pepper

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Abstract

Black pepper**,** (*Piper nigrum*), perennial climbing vine of the family *Piperaceae* is native to the Malabar Coast of India and is one of the earliest spices known to mankind. Foot rot incited by *Phytophthora,* the Stramenophilic hemi-biotrophic pathogen is the most devastating disease of black pepper with the reported crop loss to the tune of 30% amounting an annual loss of 118 to 904 tonnes. Recent studies indicated the association of two species of *Phytophthora* (*P. capsici* and *P. tropicalis*) with foot rot disease. Yellowing incited by*Fusarium solani f. sp. piperis is considered as another important soil-borne disease which has the potential to* reduce the economic life of vines from 20 to 6-8 years and the productivity per vine from 3.0 to1.5 kg. Recently, another oomycete pathogen, *Pythium* was reported to be associated with yellowing and wilt affected black pepper plants. *P. deliense, P. cucurbitacearum* and *Pythium* sp. were found to be associated and of which *P. deliense* was the predominant one. Yellowing symptoms, often confused with nutrient deficiency, damage incited by biotic factors like foot rot disease, nematodes and also due to mechanical injury to roots. Hence, it is highly imperative to accurately identify the contributing factor in order to execute appropriate management measures to prevent crop loss. In this study, a multiplex PCR assay was developed to simultaneously detect these pathogens at genus level. Primers were designed from the conserved region of ITS and a multiplex PCR was developed by manipulating the annealing temperature and primer as well as $MgCl_2$concentrations. The assay could successfully detect the pathogens and does not show any cross reaction with other fungal pathogens of black pepper. Hence, the developed multiplex PCR assay will aid in early diagnosis of the cause of black pepper yellowing leading to timely adoption of management strategies.

Keywords: Black pepper, foot rot, yellowing, multiplex PCR, detection

A Study on Crop Based Differential Diversified Farming Systems and its Impact on Farmers Livelihood in both the Hilly and Terai Region of North Bengal.

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Abstract

An environment plays a major role in the livelihood and economy of farmers practicing subsistence agriculture, livestock, forestry, plantations and allied activities which are the major activities in both the hilly and terai region of North Bengal. In such, diversified farms are more resilient to market shift, provide protection against climate change and provide more competitive environment as a strategy to ensure livelihood security through employment generation, poverty alleviation and conservation of natural resources. Hence, this paper has explored and study the crop based differential Diversified Farming Systems (DFS) practiced by the farmers in hilly and terai region of North Bengal and its reflection at farmers' livelihood situation alongside. **For this purpose, primary data of 320 farmers were collected from both the regions (160 farmers from each region) with the use of stratified random sampling procedure.** In hilly region, it has been observed that 85.62% of the farmers were practicing vegetables cultivation, followed by field crops (83.12%), goatery (83%), dairy (58.75%), spices (53%), agro-forestry (39%), piggery (37.5%), fruits (23%), floriculture (11.87%), beekeeping (10.62%), plantation (9%), land shaping (6.25%) and poultry (5.62). On the other hand in terai region, it has been observed that 95.62% of the farmers were practicing vegetables cultivation, followed by field crops (93.13%), goatery (91%), dairy (46.87%), plantations (38.75%), agro-forestry (23.12), spices (23%), fruits (14.37), land shaping (12.50%) and poultry (7.5%). Relating it to farmers' livelihood situation, Livelihood of farmers has been found at a higher level in hilly region as compared to terai region of North Bengal. It may be attributed to the DFS being a good source of income for better livelihood. The further analysis has concluded that about 61% livelihood level of farmers adopting DFS is determined by personal cosmopolite sources, mass media exposure, net farm income, annual expenditure, awareness level, economic motivation & innovation proneness.

Keywords: Diversified Farming Systems, Farmers Livelihood, Hilly & Terai regions.

Biochar and its effects on different physico-chemical properties of soil- a review

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Abstract

Biochar- a pyrolised product of biomass in absence or low oxygen environment) due to its inherent properties has a great ability to improve different soil properties. When used as a source of soil amendment it can act as a tool to mitigate climate change, reduce soil greenhouse emission and sequestrating carbon. As world population is increasing and rapid industrial development is taking place, the soil quality and fertility is degrading day by day due to several anthropogenic activities. In recent years a keen interest has been developing to rehabilitate the low fertility soils to improve crop yield and sustainability. Biochar is gaining much attention in recent times as when used as soil amendment it can improve soil fertility by retaining nutrients and potentially enhancing nutrient bio availability. In this present investigation a number of review(1997-2017) from varied sources like periodicals, original research articles, book chapters etc. were collected and an attempt has been made tom discuss and summarize the effects of biochar on various soil properties which will ultimately provide an opportunity to increase crop production and improve soil health. It is very crucial to correct the soil acidity and prevent acidification of soil for sustainable agricultural production. When applied to acidic soils biochar has the capacity to ameliorate acidic soil. Biochar has a great impact on other chemical properties of soil like cation exchange capacity (CEC), nitrogen use efficiency etc. Biochar can enhance nitrogen use efficiency and reduce nitrate leaching from soil. CEC can be increased through biochar application. In addition to these biochar also influences different physical properties of soil. Soil amended with biochar shows greater soil aggregate stability. Bulk density is reduced by applying biochar to the soil. An innovative approach in the scientific development are needed to understand the key role of biochar in enhancing soil fertility and crop production while the type and amount of biochar required to be applied is another important area which needs further efforts and concerns. The present investigation will enhance our understanding about the effects of biochar on different physic-chemical properties of soil.

Keywords:Biochar, soil acidity, nitrogen use efficiency, soil aggregate stability

Effect of integrated weed management in growth & productivity of *kharif* Rice (*Oryza sativa*) & succeeding Lathyrus (*Lathyrus sativas*) in red & lateritic belt of West Bengal

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Abstract

A field experiment was carried out during the year 2014 & 2015 to study the effect of integrated weed management in growth & productivity of *kharif* Rice (*Oryza sativa*) & succeeding Lathyrus (*Lathyrus sativas*) at agricultural farm of PSB (Institute of Agriculture) Visva-Bharati, Sriniketan, Birbhum, West Bengal which lies in the sub-humid subtropical lateritic belt of West Bengal. The experiment comprising of eleven treatments was laid out in a randomized block design with three replications. In *kharif* season, the prominent weeds were *Echinochloa colona* and *Digitaria sanguinalis* among the grasses; *Cyperus iria* and *Fimbristylis miliacea*among the sedges and *Ludwigia parviflora*, *Monocoria vaginalis* among the broadleaved weeds are found in my experiment plot. Application of Metsulfuron-methyl + chlorimuron-ethyl 4 g a.i/ha (3 DAT) along with one hand weeding (25 DAT) effectively controlled the grasses, sedges and broad-leaved that was enhanced the plant height, CGR, yield and net return of rice & yield components of lathyrus witch was statistically at par with the application of Pretilachlor 1.0 kg a.i/ha (3 DAT) + one Hand weeding (25 DAT).

Keywords: *Metsulfuron-methyl+chlorimuron-ethyl, pretilachlor, transplanted rice, weed management.*

Insect cell culture in Entomological research

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Abstract

The isolation of cells from insect tissues and their successful growth in artificial culture situation is referred as cell culture. Building on earlier research, insect cell culture began with the successful establishment of one cell line from pupal ovarian tissue. The field has grown to the extent that, now over 500 insect cell lines have been established from many insect species representing numerous insect orders and from several different tissue sources. These cell lines are used as research tools in virus-vector relationship, production of bio-insecticides, haemocyte migration, symbionts associated with insects, genetic engineering studies and screening programs designed to discover new insecticide molecules. Virology research is revealing fundamentally new information on virus - host cell interactions. Research is leading to the development of high-speed screening technologies that are essential in the search for new insect pest management tools. Hence increasing interest among the scientists for adoption of insect cell culture technologies in the field of Entomology.

Key words: Cell cultureandEntomology

Effect of different concentrations of Plant Growth Retardant on Growth and Yield attributes of Mango cv. Amrapali under eastern coastal regions of Indian

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Abstract

Mango is one of the profitable fruit crops preferred by growers on account of its huge popularity among Indian consumers. It is one of the choicest fruits crops due to its excellent flavour, aroma, taste and has been designated as the 'king of fruit crops'. The crop performance is good under eastern coastal areas of India. Amrapali is a preferred variety of the region because of its precocity and regular bearing habit. However, the growth of the plant is vigorous under the humid tropical condition of the region as a result the plant grows profusely at the expense of flowering which sometimes results in lower yield thus resulting in lower profit in the season. To combat the issue, plant growth retardant (Paclobutrazol) is used which suppresses the excessive vegetative growth and promotes flowering by striking a balance between the vegetative and reproductive growth of the plant. In this experiment various concentration of paclobutrazol available in the trade name of Lagan (Paclobutrazol 23% SC) was evaluated on the growth and yield attributes of mango cv. Amrapali. The plant growth parameters *viz.*, height, average canopy spread, canopy volume, shoot internodal

length and leaf area reduced progressively with increasing concentrations of Paclobutrazol (PBZ). The Shoot inter nodal length was minimum (2.47 cm) when PBZ was applied at the conc. 4 ml/ m canopy spread. The panicle size also reduced considerably with paclobutrazol application. The flowering intensity increased dramatically with PBZ application. The highest flowering intensity of 76.4 per cent was observed with PBZ application @ 4 ml/ m canopy spread as against the control (without PBZ application) with 57.47 per cent. Consequently, yield also increased with PBZ application. However highest yield (43.97 kg/tree) was obtained with application of PBZ @ 1 ml/ m canopy spread. The PBZ application at different concentrations had no significant effect on physico-chemical properties of fruit.

Keywords: Mango, Paclobutrazol, growth and yield

Front Line Demonstration: A Technology tool to enhance the Millets yield of North Karnataka

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Abstract

Small millets are more nutritious and have a lower glycemic index than rice and wheat, but factors like lack of improved varieties, agronomical packages and practices as well as unorganized seed system are constraining production and productivity. Therefore, the present study was carried out to know the yield gaps between improved practices and farmers' practices under Frontline demonstration on little millet and foxtail millet were carried out by ICAR-Krishi Vigyan Kendra, Hanumanamatti, Haveri district of North Karnataka to assess the impact of adopting improved package of practices over farmers' practice on the yield and economics of millets during *kharif* season from 2013 to 2019. Higher yield of little millet was recorded under improved practices which were ranged from 13.60 to 18.00 q. ha^{-1} which was 18.70 to 28.57 per cent higher than farmers' practice. Similar trend was noticed in foxtail millet which was showed 14.50 to 21.00 per cent higher grain yield over farmers' practice during all the five years. The average technological gap for grain yield in little millet and foxtail millet ranged from 7.00 to 15.00 q. ha^{-1} and 4.00 to 12.30 q. ha^{-1}, respectively over the five years. Highest gross return of Rs. 43,484 ha^{-1}, Rs. 35,656 ha^{-1} of net return with highest B:C ratio of 5.56 were obtained across the five years for millets under improved practices as compared to farmers' practice.

Keywords: Millets, Yield gap, Front line demonstration, improved practice, Farmers' practice

Influence of Foliar Application of Pulse Magic on Seed Yield and Economics of Pigeonpea

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Abstract

Pigeonpea is extensively grown in northeastern dry zone of Karnataka and it occupies a unique position in every cropping system of this zone. Crop Productivity of pigeonpea being low in the north-eastern dry zone of Karnataka and this is due to several reasons. One of the main important and major reason is flower drop and poor seed setting. To reduce this problem and to enhance productivity of pigeonpea Krishi Vigyan Kendra (KVK), Kalaburagi, has introduced a product known as Pulse Magic (consists of nutrients and Plant growth regulators) as foliar spray. Foliar spray was carried out during 50% flowering stage and 15 days after 1st Spray. The result indicated due to foliar spray of Pulse Magic were higher number of pods per plant (212.91), pod weight per plant (78.08g), pod length (5.63cm) and test weight (12.48g), compared to control (120.82, 48.70g, 3.9cmand 9.45g, respectively). Due to increase in yield attributes higher seed yield was obtained (1442 kg/ha), as compared to control (1182 kg/ha). Consequent upon higher yield, higher net returns (Rs.53903/ha) were obtained in Pulse Magic sprayed plot compared to control (Rs.35647/ha).

Keywords: Pigeonpea , Economics, Yield attributes and yield

Response of Nitrogen, Phosphorus and Potassium on available nutrients in high density apple cv. Silver Spur under temperate conditions of Kashmir

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Abstract

A field trial was conducted during 2015-16 at the experimental field of Division of Fruit Science Sher-e-Kashmir University of Agricultural Sciences and Technology. The trail was conducted to observe the effects of Nitrogen, Phosphorus and Potassium on available nutrients, which consisted of 10 treatment combinations with different levels of Nitrogen, Phosphorus and Potassium. Investigation revealed that highest available nitrogen (311.6 kg ha^{-1}) was recorded in T_4 treatment with 105g N, 35g P_2O_5 and 150g K_2O. Highest available phosphorus (21.08 kg ha^{-1}) was recorded in T_7 treatment with 85g N, 45g P_2O_5 and 150g K_2O. Highest available potassium (248.44 kg ha^{-1}) was recorded in T_{10} treatment with 85g N, 35g P_2O_5 and 180g K_2O. Highest exchangeable calcium (588.33 ppm) was recorded in T_4 treatment with 105% N, 35g P_2O_5 and 150g K_2O. Highest exchangeable magnesium (131.88 ppm) was recorded with 85g N, 35g P_2O_5 and 150g K_2O (T_3 treatment). Highest available sulphur (10.99 ppm), highest available zinc (0.76 ppm), highest soil copper (1.24 ppm), highest available manganese (19.99 ppm), highest available iron (36.81 ppm) was recorded in T_4 treatment with 105g N, 35g P_2O_5 and 150g K_2O.

Keywords: Nitrogen, phosphorus, potassium, magnesium, calcium, zinc, copper.

Assessment for potentiality of new cultivars of Buck Wheat (*Fagopyrum esculentum* Moench) at Uttar Dinajpur District, West Bengal, India

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Abstract

The experiment was conducted during the years of 2019 and 2020 at the Instructional Farm of Uttar Dinajpur Krishi Vigyan Kendra, Chopra, Uttar Dinajpur, West Bengal, during the Rabi season of 2019 and 2020. "Assessment for potentiality of new cultivars of Buck Wheat (*Fagopyrum esculentum* Moench)at Uttar Dinajpur District, West Bengal" in Terai region of west Bengal, on sandy loam soils under sub-tropical par-humid to tropical humid climate of *terai* region of West Bengal, with the following treatment combinations T_1 = Local variety, T_2 = VL-7, T_3 = Himpriya and T_4= PRB-1.Buckwheat (*Fagopyrum esculentum* Moench) is an ancient Asian crop now widely grown around the world. Even though it is an underutilized crop, it remains important for food security in the temperate and hilly regions of countries in East Asia, East Europe and the Himalayan region (Arora, 1995). Buckwheat is useful as a green manure crop for renovation of low-productivity land because it grows well on such land and produces a green manure crop in a short time (Marshall and Pomeranz, 1982). It is grown mainly in the Raiganj, Islampur subdivision of Uttar Dinajpur district and some pockets of Dakshin Dinajpur, Cooch Behar, Darjeeling and Kalimpong Districts. Traditionally, Buckwheat local variety is grown without using any fertilizer in mid-land to high-land condition preferably rabi season during the December-January. From the economic point of view, maximum yield were found PRB-1 variety than local variety and recorded higher B:C ratio. The yield of PRB-1 was significantly influenced by the other variety during rabi season 2019 and 2020. The highest seed yield of 17.85 q ha^{-1}, Starch content and no. of seeds per plant, no. of branches was recorded under the PRB-1 (T_4) treatment followed by VL-7 (T2) 16.5 q ha^{-1} .

Keywords: Buckwheat, Yield, Starch, no. of branches.

A review on the impact of abiotic stress on plant growth and crop production

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Abstract

Abiotic stress includes extreme temperature, salinity, drought, waterlogging, etc. highly influenced the plant growth in affected area. Abiotic stress reduced the development of plant which ultimately results in reduction in yield. Agricultural crops are highly influenced by abiotic stress which is due to the continue change of climate and deterioration of environment caused by human activity. Plants activities such as photosynthesis, flowering, pollination, transpiration, etc. affected by different abiotic stress experienced by plants at these stages. High temperature results in increase in transpiration rate which cause water stress in plant cell. Similarly, high salt condition in the root zone affects the osmotic potential of plant root cell which results in exosmosises in plant root cell. Waterlogging condition decreases the

respiration rate of roots and produces methane gas which is a major gas responsible for climate change. However, to overcome the effects of abiotic stress, plant has developed a number of physiological and cellular changes in their life mechanism. Also, efficient resource management helps in reducing the impact of these abiotic stresses on crop. However, these management practices being long drawn and cost effectives, there is a need to develop simple and low cost strategies for abiotic stress management.

Keywords: abiotic stress, high temperature, photosynthesis, transpiration, cellular changes, etc.

Effect of bio- fertilizer on flowering, and corm parameters of gladiolus cv. American Beauty

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Abstract

An investigation was carried out to study the influence of biofertilizer on flowering and cormparameters in gladiolus (Gladiolus grandiflorus L.) cv. American Beauty. An experiment with Randomized block design (RBD) with the application of bio-fertilizers Azotobacter, Phosphobacteria, Azospirllium, (Azotobacter + phosphobacteria), (Azospirillum + Phosphobacteria), respectively. The results showed that minimum days taken to spike initiation (48.67 days), maximum diameter of 2nd floret (9.14 cm), number of florets per spike (10.86), number of spikes per plant (2.90), number of spikes per hectare (398065.70), number of corms per plant (2.59), the weight of corms per plant (74.00 g), the weight of cormels per plant (11.92 g), size of the corm (5.86 cm), nitrogen (1.84%), phosphorus (1.09%) and potash (2.02%) contents in leaf was found with the application of Azospirillum +Phosphobacteria (T6). So, in this experiment Bio-fertilizer has been identified in order to increase soil fertility and crop production in sustainable farming.

Keywords: Bio-fertilizer, plant growth, flower quality, nutrient uptake, Gladiolus

Pharmacognosy studies of *Waltheria indica* L. of the family Sterculiaceae

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Abstract

All plants produce chemical compounds as part of their normal metabolic activities, and they synthesize a curious variety of phyto chemicals. Some of the bioactive substances that can be derived from plants are flavonoids, alkaloids, carotenoids, tannin, antioxidants and phenolic compounds. They are all having medicinal importance and used as crude drugs in traditional medicine. The knowledge of the action of a drug can be utilized successfully only when the identity, physical nature and chemical constituents of the drug are well known, and pharmacognosy supplies this information. Pharmacognostic studies ensure endorsement of the plants and reproducible quality of herbal products which will shove to wellbeing and effectiveness of natural products.Pharmacognostic parameters include determination of number of stomata (mm^{-2}), stomatal index, total number of epidermal cells (mm^{-2}) and type of trichomes in leaf. Physicochemical studies like ash analysis and moisture contents, fluorescence analysis, extractive values andinorganic mineral analysisverify the identity of plant, the quality and purity of crude drug,Therefore the morphology, macroscopic, microscopic, physical and physiochemical studies of *Waltheria indica* L. of the family Sterculiaceae was carried out in order to know its Pharmacognostic importance.

Keywords:*Waltheria indica,* Pharmacognosy, morphology, physical characters, crude drugs and physico chemical.

ICT for Reaching the Unreached Farmers with Farm Technologies in Quandary of COVID-19 Pandemic

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Abstract

COVID-19 pandemic has changed the way of life in every sphere of human being. Due to social distancing, restriction on movement and phobia, the natural movements of people are restricted. Agricultural Extension System is also facing the problems in execution of its different extension methods, mostly the farm and home visit, training, and so on. Under this context Information and Communication Technology (ICT) can play important role in farm technologies dissemination and reaching the unreached farmers in virtual mode and underpin the extension delivery system. The ICT tools those can contribute in technologies dissemination under the context of COVID-19 pandemic are mobile apps, WhatsApp, Facebooks, Twitter, Youtube, different virtual meeting platform (viz. Zoom,webex, Jitsi Meet, Goolge Meet, Google Duo). The foremost benefit of ICT agriculture rather e-agriculture is to improve quality information availability and record keeping for further use. For better access for new agricultural approaches, effective production strategies, making market link, getting banking and financial services, mobile based communication tools would play a vital role in smart agriculture. Mobile app based crop management as well as soil management tools for all most all type of crops and soil condition are gaining popularity day by day. In dry-land areas, need based efficient water management information tools and in the areas of degraded fertility by excessive use of fertilizer, site specific nutrient management

tools can be familiarized by ICT. The inevitable contribution of ICT in agriculture is early warning system and weather forecasting which in turn reduces the climatic risk in production for farmers. Virtual demonstration of cultivation practices, various sowing techniques, methods of seed treatment, use of chemicals by the help of machines, insect-pest management, easy and short harvestingtechniques, even land preparation for succeeding crops can enhance practical knowledge on farming activities.However, to make it successful, quick expansion of mobile network in remote areas should be done, equipped grassroots extension functionaries to become IT savvy, connect market with farmers on online mode and organise online training for farmers should be conducted frequently.

Key Words: Farm technology, COVID-19, ICT, Mobile App, Virtual demonstration

Effect of dormancy breaking chemicals on growth and development of gladiolus

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Abstract

Freshly harvested gladiolus corms and cormels have dormancy which varies with size of planting material and it disappears with time. Presently the most reliable method of breaking dormancy is by keeping corms/cormels at 4-5 °C in cold storage for a period of 2-3 months. But in the modern era of intensive cultivation many times, dormancy become the limiting factor for year-round cultivation. Storing the corms in cold storage increases the labour involved and cost of cultivation. Therefore, an experiment was planned with thiourea (1.0 %, 2.0 % and 3.0%) to evaluate the effect on growth and development of gladiolus. The maximum plant height (122.0 cm), spike length (99.5 cm) and rachis length (60.9 cm) was recorded in cv. Phule Ganesh with 2.0% Thiourea treatment. The variation in leaf length, leaf width and number of leaves per plant was found to be non-significant with all the treatments. The maximum floret diameter (10.1 cm) was found in cv. Yellow Stone at 1.0% thiourea treatment. The maximum number of florets per spike (20.5) was found in cv Phule Ganesh in control followed with 1.0% thiourea treatment in cv. Yellow Stone (18.3).

Therapeutic potential of protease inhibitors: a review

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Abstract

Protease inhibitors (PIs) are of very common occurrence. They are widely distributed in all living forms such as microorganisms, plants and animals. Plant PIs (PPIs) are generally small proteins that have mainly been described in storage tissues such as tubers and seeds, but have also been found in the aerial parts of plants. They are in

particular effective against phytophagous insects and microorganisms. A number of inherited diseases like emphysema, epilepsy, neurotic oedema, AIDS, and Netherton syndrome are caused due to abnormalities in protease inhibitors. Protease inhibitors are one of the prime molecules with highly proven inhibitory activity against insects, pests and are used as bioinsecticides by developing transgenic plants. Proteases have an important role in many signaling pathways and represent potential drug targets for diseases ranging from cardiovascular disorders to cancer, as well as for combating many parasites and viruses. Although inhibitors of well established protease targets such as angiotensin-converting enzyme and HIV protease have shown substantial therapeutic success. A brief review of scope of therapeutic uses of protease inhibitors is carried out.

Keywords: Protease Inhibitors, Therapeutics, Target Proteases, Plants, Review.

Genetic variability on Beachpea (Vigna marina) collected from Andaman and Nicobar Islands for salt tolerance using SSR markers

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Abstract

Beachpea (*Vigna marina*) is a halophytic wild leguminous plant present throughout the tropical and subtropical beaches of the world. As QTLs identified for salt tolerance in *V. marina* along with its crossability to other *Vigna* species, the present study has been undertaken to assess the genetic variability to utilize them in pulse breeding programs. Totally, 20 *Vigna* species [15 genotypes of *V. marina* collected from Andaman and Nicobar Islands during August to December, 2018 and five varieties of *Vigna* species as check (three blackgram as IPU-02-43, LBG 752 and VBN 7; two greengram as LGG 544 and TARM 1)] were used. Molecular characterization using 7 SSR markers specific to salt tolerance, only four found with amplification. Number of alleles detected primer^{-1} ranged from 1 to 3, whereas, size of alleles ranged from 100 to 325bp. PIC values ranged from 0.05 to 0.57 with an average of 0.33. H_e values ranged from 0.375 to 0.612. Two SSR loci (CEDG087 and CEDG007) revealed higher PIC and H_e values than 0.40 and 0.50, respectively. Three major clusters, Cluster I, II and III obtained at Jaccard's similarity coefficient value of 0.48 through UPGMA method of cluster analysis. It grouped mungbean and urdbean (Checks) in Cluster I (04) and II (01), whereas, all *V. marina* genotypes in Cluster III (15) and it was further divided into two sub-clusters as Sub-cluster IIIa (05) and IIIb (10). PCoA analysis explained about 85.93% of genetic variation present among genotypes by first three most informative principal coordinates and also confirms the pattern obtained under cluster analysis. This study indicated the effectiveness of SSR marker in separating cultivated *Vigna* species from wild *V. marina* on basis of salt tolerance.

Keywords: Beachpea, Cluster analysis, Genetic variability, Salt tolerance, SSR marker, QTL

Studies on genetic divergence for yield and yield attributes in tomato (S*olanum lycopersicum* L.)

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Abstract

The field experiment was conducted at P.G Research Farm, College of Horticulture, SKLTSHU, Rajendranagar, Hyderabad in Randomized Block Design with three replications using 23 genotypes during kharif, 2018. Based on Mahalonobis D^2 values, the 23 genotypes were grouped into ten highly divergent clusters. Cluster I was highest number with 11 genotypes followed by Cluster IV with 3 genotypes then by Cluster II with 2 genotypes. However, the cluster III, V, VI, VII, VIII, IX and X were solitary with one genotype in each cluster. The maximum intra-cluster distance was recorded within cluster III (102.28) and the maximum inter- cluster distance was between cluster X and VIII (597.76), indicating the existence of wide genetic variability. Based on mean performances, cluster X registered maximum plant height (133.63 cm) and highest number of primary branches (8.13). The cluster IV had the early days to first flowering (29.92 days) and cluster X registered high number of fruits per plant (48.63). The cluster VII registered highest average fruit weight (87.15 g) and fruit yield per plant was highest in cluster II (2.28 kg). The cluster X registered high TSS (7.47 ^{0}Brix) and high content of ascorbic acid (36.11 mg/100g). Lycopene content was maximum in cluster V (3.96 mg/100g), whereas, beta-carotene was highest in cluster VIII (2.16 mg/100g). Based on cluster mean analysis, the superior and genetically divergent genotypes can be used in crop improvement programme in tomato.

Keywords: Genetic diversity, Clusters,Tomato, *Solanum lycopersicum*, Yield and Yield attributes

Planting Geometry and Nutrient Management on Growth and Yield of Sunflower (*Helianthus annus* L.)

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Abstract

A field experiment entitled “Planting Geometry and Nutrient Management on Growth and Yield of Sunflower (*Helianthus annus*L.)” was carried out during *spring* season of 2018 at Research Farm of Tirhut College of Agriculture, Dholi, RPCAU., Pusa, Bihar, India to investigate the effect of planting geometry and nutrient management on growth and yield of Sunflower. The experiment was laid out in factorial randomized block design with three replications. Treatments comprised two parameters *viz.*, planting geometry including 60 cm × 22.5 cm, 60 cm × 30 cm and 60 cm × 45 cm and fertilizer levels including 75 % RDF, 100 % RDF, 125 % RDF, and 133 % RDF. The test crop was Sunflower. The soil of the experimental plot was calcareous in nature having pH 8.09 and EC is 0.19dSm^{-1}. It was

moderately fertile being low in organic carbon (0.45%), available nitrogen (193.2 kg/ha), phosphorus (12.6 kg/ha) and potassium (95.64 kg/ha).Planting geometry and fertilizer level treatments significantly influenced growth parameters, yield attributes and yield of sunflower, viz., Plant height (cm), Plant dry weight (g/plant), head diameter (cm), 100 seed weight (g), seed yield (q/ha), stalk yield (q/ha), harvest index (%) and total nutrient uptake (N, P&K).Among the planting geometry treatments, P_1 (60cm x 22.5cm) recorded higher plant height, P_3 (60cm x 45cm) recorded higher plant dry weight, head diameter and test weight; and the maximum seed yield (26.46 q/ha), stalk yield (33.44 q/ha) and harvest index (43.88%) recorded in the treatment P_2 (60cm x 30cm) and the lowest seed yield (23.73 q/ha) was recorded in the treatment of P_1 (60cm x 22.5cm). The highest Net returns (66523 ₹//ha) was obtained in the treatment P_2 (60cm x 30cm) and lowest (56087 ₹//ha) in the treatment of P_3 (60cm x 45 cm). The highest B: C ratio (1.63) was recorded in the treatment P_2 (60cm x 30cm) and lowest (1.37) was in the treatment of P_1 (60cm x 22.5cm). (Total nutrient uptake (N, P & K) recorded in the treatment P_2 (60cm x 30cm) and the total uptake by crop was found non-significant). However the effect of planting geometry treatments on pH, EC and available N, P and K was found to be non-significant.

Among the fertilizer treatments, F_4 (F_2 + 33% higher NPK) recorded higher plant height, Plant dry weight, head diameter and test weight, seed yield (27.14 q/ha), stalk yield (32.91 q/ha) and harvest index (44.50%), and lowest plant height, plant dry weight, head diameter and test weight, seed yield (21.71 q/ha), stalk yield (30.28 q/ha) and harvest index (41.67 %) in the treatment of F_1 (75 % RDF). The highest Net returns (67370 ₹//ha) was obtained in the treatment F_4 (F2 + 33% higher NPK) and lowest (50225 ₹/ha) in the treatment of F_1 (75 % RDF). The highest B: C ratio (1.58) was recorded in the treatment P2 (60cm x 30cm) and lowest (1.31) in the treatment of F_1 (75 % RDF). Total nutrient uptake (N, P & K) was recorded in the treatment F_4 (F_2 + 33% higher NPK). However the effect of fertilizer treatments on pH, EC and available N, P and K was found to be non-significant.

Keywords: Sunflower, Growth, Planting Geometry, Nutrient Management

Appropriate Strategy to Overcome the Constraints of Drip Irrigation System in Panchayat Samiti, Jhotwara, District Jaipur (Rajasthan)

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Abstract

The Indian population continuously increasing which demand more food grain production to fill vagaries of population. Therefore, to meet the projected food demands of 21st century and to harvest maximum benefits from every unit of available land, reproduce and other critical inputs needs to be exploited. Water is the most precious natural source, vitally important for agricultural development and day-to-day living of human beings. In the changing agricultural scenario world over and shift towards precision farming, drip irrigation happens to be the technology capable of providing more efficient utilization of water. Drip irrigation is basically precise and slow application of water in the form of discrete continuous drops, sprayed through mechanical devices called ‘emitters’ in to the root zone of the plants.

The study was conducted in Jhotwara panchayat samiti of district Jaipur (Rajasthan). Fifty per cent (8) Gram Panchayats where maximum number of drip irrigation sets installed

were selected. Two villages from each selected Gram Panchayats were selected randomly. Ninety six farmers were selected from sixteen selected village by using of random sampling technique through proportional allocation to be size of sample. The study show that the among the important suggestions offered by the drip irrigation adopters to overcome the constraints faced in adoption of recommended improved practices of drip irrigation system , "Provision of sufficient subsidy to reduce initial installation cost" (91.66 per cent) which was prioritized at top level. Whereas the least priority was given to the appropriate strategy i.e. "Control on nepotism and favoritism in installation of drip sets on subsidized rate" (55.20 per cent).

Phytochemical analysis of selected marine algae from the different coastal location of Tamil Nadu (India) for beneficial bioactive compounds

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Abstract

Characterization of phytochemicals from the marine algae provides the development of new drugs against disease-causing agents. Lately, researchers have described the marine algae for its sources like minerals, bioactive compounds, and vitamins, which could be used for animals as well as humans for their health care applications. In the present study, the marine diatom of *Skeletonema costatum*, marine macro algae such as *Ulva fasciata*, and *Kappaphycus alvarezii* were collected from the different coastal areas of Tamil Nadu and screened for phytochemicals. The marine diatom, *S. costatum* was mass cultured, shade dried, then the macro algae also shade dried and later used for extraction using ethyl acetate. The shade dried algal powders and crude extracts were used for phytochemical analysis through SEM-EDAX and TLC methods. SEM-EDAX analysis has shown the total elemental profiles such as C, O, Na, Mg, Si, Cl, K, Ca, etc from each alga whereas, the TLC methods have exposed the various non-volatile compounds such as Rf value of 0.02 to 0.98 from the marine algae. Based on these analyses, it could be concluded that the marine algae of *S. costatum*, *U. fasciata*, and *K. alvarezii* have exhibited its various bioactive compounds, which may be useful for animal and human health care products, especially against pathogenic diseases.

Keywords:Bioactive compounds, Marine algae, Phytochemical analysis, SEM-EDAX, TLC

A review on nutrition value of Amaranth (*Amaranthus caudatus* L.): The crop of future

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Abstract

From the past 20 years, little progress has been achieved in reducing child malnutrition food insecurity and hunger. To address these problems, increased consumption of leafy vegetables is promoted as sources of both bio-active compounds and micronutrients. Amranthus is one of the crop, which has been rediscovered as a promising food crop in form of leaf and seed, mainly due to its resistance to drought, heat, diseases and pests, and the high nutritional value of both seeds and leaves. The seeds are small and lent cellular or oval in shape. The grain is high in fibre and low in saturated fats, factors which contribute to its use by the health food market. The oils obtained from amaranth are important because they contain oleic, linoleic and linolenic fatty acids. The lipid fraction of amaranth also contains compounds with antioxidant potentials, such as tocopherols, which act as scavengers of lipid peroxyl radicals.It also contains several classes of flavonoids and anthocyanins, as well as other phenolic constituents. It is high in protein content which contains essential amino acids that are good for human nutrition. It contains a high level of lysine and sulphur-containing amino acids like cysteine. Amaranth has become popular among patients with celiac disease because it does not cause allergic reactions in the intestinal mucosa.Quantification of bio-active compounds of Amaranthus seed oils like squalene, β-sitosterol and α-tocopherol will help enhance its use for human consumption as a nutraceutical.Leaves and succulent stem are good sources of iron, calcium, vitamin A and vitamin C.In view of the enormous nutritional benefits of the crop, there is a definite need for its genetic improvement to develop high yielding varieties with high content of desired quality traits.

Keywords: Amaranth, Quality traits, Lysine, squalene, bio-active, phenolic

Molecular and insecticidal characterization of *Bacillus thuringiensis* Berliner (Bacillales: Bacillaceae) Cry toxins against the fall army worm, *Spodoptera frugiperda* J.E. Smith (Lepidoptera: Noctuidae)

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Abstract

The Fall Armyworm (FAW) was discovered in India after leaving a path of ruined plants in Africa and the Americas.Bt was re-isolated successfully from the dead larvae of FAW. A total of 10 putative *B.thuringiensis* isolates were acquired. All of the isolates were discovered to be Gram positive and crystalliferous. Majority of the isolates exhibited the bipyramidal crystal (crystals know to be effective against lepidopteron insects). A new *cry1I* gene from

the *B. thuringiensis* re-isolated from dead FAW larva were cloned and expressed in pRSET. Cloned FAW *cry1I* gene sequence showed a typical *Btcry* gene with significant homology to *cry1I* genes with toxic region differences. Predicted using Phyre2 homology modeling, the deduced 3-D structural model of the new FAW *cry1I* shows that the gene contains three domains that participate in the formation of a pore and determine the binding specificity of the receptor. We also assessed the insecticidal activity of *cry1I* gene for the effective FAW management. FAW larvae were evaluated in the first, second, third and fourth instars. The bioassays revealed that the larvae of the FAW were susceptible to indigenous Bt Cry toxins. Compared with the normal HD1 reference strain at 15.5 µg / mL, the purified Cry1I gene was lethal to FAW. The death percentage was observed at 100 percent. At the end of the toxicity test, all the treated larvae were dead, while most control larvae were found to be healthy and successfully complete the life cycle.

Assessment of N and P fertilizer requirement of fodder maize in spring season

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Abstract

In order to study N and P fertilizer requirement of fodder maize a field experiment was conducted during the *spring* season of 2019 at the Agronomy Research Farm of Chaudhary Charan Singh Haryana Agricultural University, Hisar .The soil of the experimental field is slightly alkaline in reaction, sandy loam in texture, low in organic carbon and nitrogen, medium in available phosphorus and potassium. The experiment was laid out in FRBD design with four nitrogen levels (0, 50, 75, 100 kg N ha^{-1}) and four phosphorus levels (0, 15, 30 and 45 kg P_2O_5 ha^{-1}) replicated thrice. Results revealed that growth parameters recorded in the study *viz*, plant height, leaf length, leaf breadth and no of leaves per plant of spring maize increased with the increase in nitrogen and phosphorus levels upto 100 kg N ha^{-1} and 45 kg P_2O_5 ha^{-1} respectively. With the application of nitrogen @ 50, 75 and 100 kg N ha^{-1} there was 27.86, 16.95 and 10.02 per cent increase in green fodder yield over the control (no nitrogen application), respectively. Application of 100 kg N ha^{-1} produced 33.91 and 10.91 per cent higher dry matter yield (DMY) as compared to 50 and 75 kg N ha^{-1}. Similarily increase in phosphorus levels upto 45 kg P_2O_5 ha^{-1} significantly increase the green fodder and dry matter yield of maize.

Keywords: Maize, Fodder, Nitrogen, Phosphorus, DMY, Spring

Integrated Nutrient Management in Maize – An Overview

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Abstract

Continuous application of chemical fertilizers to maize alone has been reported to deteriorate soil health. At the same time application of organic manures alone do not produce required

yields due to their low nutrient status. Sustainable yield levels could be achieved only by judicious use of chemical fertilizers in combination with organic manures. Sufficient and balanced application of organic and inorganic fertilizers is a major component of nutrient management in maize crop. Among the kharif crops, maize (*Zea mays* L.) occupies a pride place, because of its high production potential. In India, it constitutes an important staple food and the source of protein in areas inhabited by tribal and the rural poor people. In recent years, it has also been gaining popularity as industrial crop. To produce one ton of grain and dry matter maize crop withdraws 8.0 kg of, N, 2.5 kg of P_2O_5 and 18 kg of K_2O from the soil. Maize needs relatively lesser nitrogen when planted during winter season. On an average it is found that 100 to 125 kg N/ha becomes sufficient but the mode of application should be same as in *kharif* season.It is advisable to apply 25 kg zinc sulphate/ha along with basal application of fertilizers. The deficiency of Zn in plants at latter stages of growth, however, may be corrected by foliar application of $ZnS0_4$ dissolved in water (0.5 % $ZnS0_4$+ 2.5 kg urea solution).Maize nutrient requirements need to be met by chemical fertilizer integrated with organic manures. Application of fertilizer and farmyard manure is beneficial and significantly increased the dry matter yield of maize

Keywords: Maize, nutrient, fertilizer, Organic, Zinc

Evaluate the establishment techniques on growth and yield of finger millet(*Eleusine coracana*)

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Abstract

Field experiment was conducted at Agricultural College and Research Institute, Killikulam during *rabi* season (Nov – Mar) of 2018-19, to evaluate the different crop establishment techniques on growth and yield of finger millet. The experiment was laid out in Randomized Block Design, replicated with thrice using Co (Ra) 15 as the test variety. To accomplish the objectives, the experiment was planned with the following treatments *viz.,* The treatment structure comprises of Broadcasting (T_1), Line sowing of 30 x 10 cm (T_2), Random planting (T_3), Line planting of 30 x 10 cm (T_4), Square planting of 20 x 20 cm (T5), Square planting of 25 x 25 cm (T6), Square planting of 30 x 30 cm (T7) and Seedling throwing (T8). Observation on plant height, number of tillers m^{-2}, leaf area index, dry matter production, number of ear heads^{-1}, number of fingers earhead^{-1}, number of grains earhead^{-1}, grain and straw yield were recorded. Among the different methods of establishment, square planting of 25 x 25 cm (T6) significantly increased the plant height (105.4 cm), number of tillers m^{-2} (106), leaf area index (4.9), DMP (6820 kg ha^{-1}), number of ear heads^{-1}, (89), number of fingers earhead^{-1} (8.7), and number of grains earhead^{-1} (1716). Similarly the seed yield (2590 Kg ha^{-1}) and straw yield (4020 Kg ha^{-1}) were also registered higher under square planting of 25 x 25 cm (T6). The increase in grain yield recorded under square planting (25 x 25 cm) over random planting, line sowing and broadcasting were 19, 28 and 40 per cent, respectively. Square planting of 25 x 25 cm, proved to be the most profitable treatment in terms of higher growth and yield in finger millet cultivation.

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Abstract

Agriculture and rural development are sustainable when they are ecologically sound, economically viable, socially just, culturally appropriate humane and based on a holistic scientific approach. This means that sustainable agriculture and rural development action programmes, including farming, forestry, and fisheries must meet the nutritional requirements and other human needs of present and future generations, provide durable and decent employment, maintain and, where possible, enhance the productive and regenerative capacity of the natural resource base, reduce vulnerability and strengthen self-reliance. Sustainable livelihoods are those that are able to cope with and recover from shocks and stresses such as drought, civil war and policy failure through adaptive and coping strategies. Capability, equity and sustainability combine in the concept of sustainable livelihood. The concept Sustainable Rural Livelihood (SRL) is an attempt to go beyond the conventional definitions and approaches to poverty eradication. It is believed that agricultural growth did propel growth and structural transformation in many countries, demographic pressure, preponderance of small farms, declining share of household income from agriculture and commercialization have changed the role of agriculture in future economic growth. The studies show that the poverty ratio is higher among households in the low-rainfall and unirrigated areas than others. Across rural occupational categories, the incidence of poverty is the highest among agricultural labour households, followed by other labour households, self-employed in non-agricultural activities and self-employed in farming. Within each of these occupational groups, incidence of poverty is higher among owners of tiny landholdings as compared to landless households, which raises a fundamental question whether ownership of tiny holdings is a boon or bane. The transformation of the workforce in India away from low-productivity agricultural sector into manufacturing and other tertiary activities has been slow. More than 60% of the rural workforce continues to be employed in agriculture-based livelihoods, despite the share of agriculture output being around 17%. It is a widely accepted fact that agricultural households engage in a wide range of economic activities apart from cultivation. A recent nationally representative survey of farmers reflects this phenomenon: only 12% of the households whose primary source of income is cultivation are not engaged in any secondary activity.

Comparison among glomalin content present in rhizosphere of soybean varieties

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Abstract

In agroforestry systems, the root induced changes to the chemical environment of the rhizosphere are crucial to the nutrient acquisition of many plant species. Molecules contained in tree root exudates influence the development of Arbuscular mycorrhizal fungi (AMF), a fungal group that favors short-lived crops growth by improving plant nutrition and protecting plants from stresses. Breeding strategies must take into account functional traits like the ability of some crop varieties to increase their own AMF colonization when associated with trees. It is a tedious and difficult task to determine AMF biomass in field soils resulting in recognition of glomalin, a glycoprotein, as a biochemical marker to consider for the study of AMF. AMF hyphal growth has been linked to GRSP (glomalin related soil protein) production in forest soils and root mesh of crop cultivars. The present investigation involved isolation of root mesh of eight different soybean varieties grown under poplar based agroforestry system. The extraction of the total glomalin was carried out as described by Wright and Upadhyaya (1996 and 1998). Total glomalin is the maximum amount of glomalin that can be extracted by autoclaving at 121°C in one hour with 50 mM Sodium citrate buffer. The differences among the extractants tested by one-way analysis of variance (ANOVA) were found to be highly significant ($p<0.05$). The range of total glomalin concentration (mg/ml) was from 217.82 to 131.15, lowest being for P1042 and highest for PS1241. Based on the findings, promising genotypes can be selected for breeding under agroforestry systems in future to come.

Keywords: agroforestry; glycoprotein; glomalin; AMF; sodium citrate buffer; breeding

Efficiency of Dietary Supplementation of Flavonoid (Quercetin), Vegetable Oil and Its Combination on Growth Performance and Food Quality Chacarcters of Broiler Chickens

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Abstract

Dietary fat incroporation has common practices in modern poultry proucers to increasesenergylevel, improvetheconsistency and tastiness of feed, achieving early growth and improve performance of broilers. The present study was planned to evaluate the efficiency of dietary supplementation of flavonoid (quercetin), vegetable oil and its combination on growth performance of broiler chickens.One hundread ninghty two 7 days old Vencobb 400 strain broilers were assigned in to four dietary treatment groups comprised of four replicates (12 birds replicates^{-1}) for the duration of 35 days (7^{th} to 42^{nd} days). Chickens were fed with standard basal diet as per the recommndation in control group (T1) and other groups. While quercetin supplemented in (T2), high-energy diet in (T3) supplied with hydrogenated vegetable oil to raise the 10% high ME level than the recommnedation and high-energy diet supplied with hydrogenated vegetable oil to raise the 10% high ME level than the recommnedation along with quecetin supplementation in (T4) groups, respectively. The birds fed high- energy diet with or without quercetin in T3 and T4 groups were noted highest ($p<0.01$) final body weight and final body weight gain. The feed

conversion ratio had found better ($p<0.05$) in birds of T4 group. The T2 group had also noted improved ($p<0.05$) final body weight, final body weight gain and feed conversion ratio. The chemical composition of broiler meat had lower ($p<0.05$) moisture % whereas, pH and % cooking loss were comparatively high ($p<0.05$) in T3 group. The T2 groups shown better ($p<0.05$) sensory characters of food (meat) from broilers. The supplementation of flavaonoid (quercetin) or vegetable oil to raised the energy level has exerted better growth performance with improved feed conversion ratio in broiler chickens. The flavonoid supplementation had found positive influence on food quality chacracters produced from broiler chickens.

Keywords:Broiler chickens, Flavonoid, Food, Growth, Quercetin, Vegetable oil

Character association and path coefficient analysis of wheat genotypes under drought condition

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Abstract

Agricultural drought is the lack of sufficient moisture needed to complete the life-cycle for normal plant growth and development. Plant responses to the stress of drought are very diverse and include beneficial or deleterious effects. Drought affects plant morphology, growth, and metabolism in most plants that restricts grain yield. In present study forty wheat accessions in randomized block design with 3 replications were evaluated at field research area of Wheat and Barley Section, Department of Genetics & Plant Breeding, CCS HAU, Hisar under drought condition during Rabi 2018-19. The results revealed highly significant variations among the genotypes for all traits studied. Correlation coefficient analysis revealed that the association of grain yield per plant with harvest index followed by biological yield per plant were positive and highly significant. Path analysis revealed that harvest index and biological yield per plant showed the highest direct and positive effect on grain yield per plant. While, other traits contribute significantly indirectly to the grain yield per plant via biological yield per plant and harvest index. This indicates that harvest index and biological yield per plant having significant positive correlation and high direct effect on grain yield per plant has clarified the real relationship and direct selection of genotypes through such traits is the best way to enhance the yield potential.

Keywords- Character association, Path Coefficient Analysis, Direct effects and Indirect effects.

Persistence and Effect of Washing on Pyriproxyfen Residues in Chilli (*Capsicum annum* L.)

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Abstract

Pyriproxyfen (PYR) is a novel insecticide used as insect growth regulator in vegetables and fruits. A field and lab study was carried out to examine the persistence and effect of washing on PYR residues in chilli so as to evaluate potential negative effects of the insecticide on consumers. Chilli under field conditions were treated with PYR at 100 (T_1) and 200 g a.i. ha^{-1} (T_2). Under lab conditions chilli were treated with PYR solution containing dose (100 µg g^{-1} as T_1 and 200 µg g^{-1} as T_2) equivalent to field dose. Chilli samples were collected periodically; processed using liquid-solid extraction (LSE) and residues were estimated using gas chromatography-tandem mass spectrometry (GC-MS/MS). Dissipation followed first order kinetics with half-life of 4.7 and 6.5 days under field conditions at two doses. The half-life in lab was observed to be 7.4 and 8.1 days at two doses. The residues dissipated to more than 99% in 45 days after application under field and lab conditions. The dissipation data revealed that initially dissipation is slower under lab conditions (longer half-life) and also the effect of washing was found lesser than field conditions. The extent of removal of PYR using simple washing showed an average 54-56% reduction in the residues under field and 35-47% under lab conditions. The residues reached below detection limit on 45^{th} day in washed samples. An appreciable amount (0.114-0.194 µg mL^{-1}in field and 0.078-0.193 µg mL^{-1} under lab conditions) of the residues were also detected in wash water. Further it can be inferred from the results that there are no negative impacts due to PYR on consuming red chilli and its powder. On the other hand, keeping in view the safety of surface water bodies we should take appropriate cautions before discharging wash water.

Keywords**:**Pyriproxyfen, GC-MS/MS, Chilli, Persistence, Residues.

Trends and techniques for thiamethoxam residue estimation in different vegetables and fruits

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Abstract

At this present day, the use of pesticides has become an important part of farming practices for our farmer as well as for public health. Pesticides are being used globally in such an inflated rate that many of them are on the way of becoming a serious threat to the biosphere. Besides providing a very good coverage over various pest infestations, they bring additional hazard to non-targeted organisms, application surfaces and harm to the applicator. All-round use of pesticides had resulted in tainting of all the basic necessities of life, i.e. air, water and food. The incessant use of pesticides has caused the deleterious effects to ecosystem as well. In response to this, numerous methods have been developed by several regulatory agencies and private laboratories which are being applied perpetually for the qualitative and quantitative quantification and monitoring of multi pesticide residues in different vegetables and crops. The main intent of the review is to document access and analyze the results of the former data on levels of different pesticides in various fruits and vegetables in India and abroad. The findings of the previous studies clearly indicated that approximately more than 50 % of the samples were contaminated with organophosphate, pyrethroids and organochlorine pesticides. Many studies reported that among fresh fruits and vegetables tomato, apple, melon, mango, grapes, and plum crossed the FAO/WHO permissible limits for these contaminants residual levels.

Keywords:Pesticides, residues, environment, QuEChERS, half-lives, Gas chromatography.

Livestock production in present & future scenario

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Abstract

Currently, livestock is one of the fastest growing agricultural subsectors in developing countries. Its share of agricultural GDP is already 33 per cent and is quickly increasing. This growth is driven by the rapidly increasing demand for livestock products, this demand being driven by population growth, urbanization and increasing incomes in developing countries. Livestock systems have both positive and negative effects on the natural resource base, public health, social equity and economic growth. The livestock sector globally is highly dynamic. In developing countries, it is evolving in response to rapidly increasing demand for livestock products. In the future, production will increasingly be affected by competition for natural resources, particularly land and water, competition between food and feed and by the need to operate in a carbon-constrained economy. Developments in breeding, nutrition and animal health will continue to contribute to increasing potential production and further efficiency and genetic gains. Demand for livestock products in the future could be heavily moderated by socio-economic factors such as human health concerns and changing socio-cultural values. There is considerable uncertainty as to how these factors will play out in different regions of the world in the coming decades. This combination of growing demand in the developing world and stagnant demand in industrialized countries represents a major opportunity for livestock keepers in developing countries, where most demand is met by local production, and this is likely to continue well into the foreseeable future. At the same time, the expansion of agricultural production needs to take place in a way that allows the less well-off to benefit from increased demand and that moderates its impact on the environment.

Keywords: Livestock, Production, Growth, Demand, Future

Genetic diversity analysis in wheat (*Triticumaestivum* L.) based on phenological traits

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Abstract

The present investigation was carried out for genetic diversity analysis using 60 genotypes of bread wheat based on morphological traits. These genotypes were grown in RBD in three replications with plot size of three rows of six meter length during *Rabi* 2016-17 at Research Area of Wheat and Barley Section, Department of Genetics and Plant Breeding, CCS HAU, Hisar. To study the genetic diversity analysis, data were recorded for yield and its component traits *viz*., days to 50% heading, days to anthesis, plant height, number of effective tillers per meter, spike length, spikelets per spike, number of grains per spike, 1000 grain weight, grain

yield per plot, biological yield per plot and harvest index. The mean, range and mean sum of squares due to genotypes for all the traits studied were highly significant revealing sufficient amount of genetic variation among the genotypes for all the characters studied. Based on the divergence study, genotypes were grouped into 8 clusters. The intra-cluster distance ranged from 4.942 (II) to 7.191 (VIII), and inter-cluster distance ranged from 6.035 (between II and VI) to 9.507 (between III and VIII). These values were higher than any corresponding intra-cluster values. The cluster V was the largest cluster consisting of 12 genotypes followed by cluster VI (10 genotypes), II (8 genotypes), cluster IV (8genotypes), cluster VII (7 genotypes), cluster I (6 genotypes), cluster III (5 genotypes) andcluster VIII (4 genotypes).Cluster III showed maximum genetic divergence with cluster VIII. If the cluster possessing maximum genetic distance could be involved in hybridization programme, it is expected that more hetrotic F1's and most promising segregants in the segregating generations could be produced. Therefore, more emphasis should be given on cluster III and IV for selecting germplasm as parents for crossing with the germplasm of cluster, which may produce new recombinants with desired traits.

Keywords: wheat, genetic diversity, clustering pattern, morphological traits, genetic variation, segregants

Reaction of fenugreek varieties against *Peronospora trigonelllae,* causingdowney mildew

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Abstract

A set of twenty three fenugreek varieties was screened in natural conditions against the downey mildew disease. The pooled data of two years depicted in table 1 revealed that out of 23 fenugreek varieties screened 15 varieties were found resistant (R), 6 varieties were found moderately resistance (MR), 2 varieties were found susceptible (S) and no verity was found immune (I) and highly susceptible (HS) to the disease. Further the minimum disease index was recorded in two varieties namely Afg 6 (PDI 10.5) and Rmt 303 (PDI 11.5) while maximum disease index was reported in Rmt 351 (32.75) followed by Hisar mukta (PDI 41.5). Total number of 15 fenugreek varieties found resistant (R) where the disease index was found comparatively lower (10 to 20) were included Afg 6 (PDI 10.5), Pant ragini (PDI 16.0), Am1 (PDI 17.0), Afg 3 (PDI 19.0), Afg 4 (PDI 18.25), Rmt 303 (PDI 11.5), Gm1 (PDI 10.75), Rmt 143 (PDI 19.0), Azad methi (PDI 14.75), Am2 (PDI 17.0), Lam selection (PDI 16.75), Co2 (PDI 15.25), Rmt 361(PDI 15.75), Gm1 (PDI 17.75) and Hisar madhavi (PDI 14.5). Total number of 6 fenugreek varieties reported moderately resistant where the disease index was comparatively lower (20 to 30) were included Rajendra kranti (PDI 24.5), Afg 5 (PDI 20.5), Hisar suvorna (PDI 22.0), Rmt 351 (PDI 24.0), Hisar sonali (PDI 24.0) and Rmt 305 (PDI 23.0). Total number of 2 fenugreek varieties found susceptible to the downy mildew disease where the disease index was reported highest among the screened varieties. These were Rmt 351 (32.75) and Hisar mukta (PDI 41.5) and hence these two fenugreek varieties ware considered as susceptible ones as their disease index was comparatively higher (30 to 50).

Beneficial role of antioxidants against effect of nitrogen dioxide gas on differential leucocyte counts in Albino rats

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Abstract

Present study was designed to examined the toxic effect of nitrogen dioxide gas and a beneficial role of antioxidants vitamin(C+E) in combination on differential leucocyte count (DLC) viz.,Lymphocyte count,Monocyte count,Neutrophil count, Eosinophil and Basophil count have been observed in albino rats for one hour per day for 15 and 30 days.Fifteen adult healthy rats of equal size and weight were kept in standard laboratory condition and grouped in three sets (I, II,& III) containing five rats each.Control set (I) was unexposed ,Experimental set (II) was exposed to nitrogen dioxode gas (50ppm) alone ,while Experimental set (III) was exposed to nitrogen dioxode gas (50ppm) along-with supplementation of antioxidant vitamin [C(5mg/rat)+E(2.5mg/rat)] in combination for one hour per day for 15 and 30 days.A significant increase in neutrophil count and monocyte count ,while a significant decrease in lymphocyte count and a non-significant increase in basophil and eosinophil count have been observed after exposure to nitrogen dioxide gas in albino rats. The results of present study indicate that the toxicity of nitrogen dioxide gas exposure induced bronchial airway inflammation in albino rats,while after suplementation of antioxidant vitamin (C+E) in combination have mitigated the toxic effects of nitrogen dioxide gas on differential leucocyte counts due to the antioxidant defense mechanism in albino rat.

Keywords:-NO2 gas ,Vitamin(C+E),Differential Leucocyte count(DLC) ,Albino rat

Atalantia monophylla (L) leaf extract mediated; microwave assisted, green synthesis of AM-AgNP and its antibacterial activity

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Abstract

Atalantia monophylla is a tropical evergreen, aromatic medicinal shrub typically distributed in the regions of East and South-East Asia such as India, Myanmar, Thailand, Cambodia, Vietnam and Malaysia. The fruits oil was traditionally used to treat chronic rheumatism. The present study is focusing on the biocompatible nano-sized AM-AgNP, green synthesized from *A. monophylla* leaf extract with improved antibacterial activity. The characterization technique has used to confirm the synthesis of AM-AgNP was UV-VIS spectroscopy, PL, FTIR, DLS, Zeta potential and thermal analysis. The primary optimization of AM-AgNP has done by analyzing absorbance spectra peak with changing various parameters like $AgNO_3$ precursor concentration, *A. monophylla* leaf extract volume, microwave radiation exposer time and pH of the reaction medium. The surface plasmon resonance (SPR) of AM-AgNP was shifted from 480 nm to 396 nm when pH change from 4 to 12 while the increasing intensity of emission peak has obtained at 513 nm from PL spectra at 400 nm excitation

wavelength endorsing the better synthesis and maximum quantum yield respectively. The face centred cubic (FCC) crystal phase has an average crystal size of 8.3 nm, the particle size of 11.3 nm and polycrystalline nature were calculated by Scherer's formula using XRD data, HR-TEM micrograph and SAED pattern respectively. The stability and dispersity of nanoparticles were checked by investigating thermal analysis and zeta potential value respectively. The fabricated biocompatible AM-AgNP has shown effective antibacterial activity against drugs resistant gram-positive and gram-negative bacteria. The maximum zone of inhibition with a circle size of 21.3 mm has been recorded by testing synthesized AM-AgNP against *S. aureus* while the minimum zone of inhibition of 16.4 mm has shown against *E. coli* at the 200 µg/ml. From the present study it is confirmed that the given *A. monophylla* leaf extract synthesized nanoparticles can also be applied in further various biomedical fields and studies.

Key word: *Atalantia monophylla*, Microwave, Biocompatible, Bacteria, Polycrystalline

Development of value added products from finger millet

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Abstract

Finger millet (*Elusine coracana*) also known as Ragi, Nachani or Mandua in India is one of the important cereal (millet) occupies highest area under cultivation among the small millets. Finger millet is superior to rice and wheat with respect to protein, fiber, mineral and micronutrient contents. The intent of the present study was to assess the effect of roasting ($150+5^0$ C for 10 min) as a dry heat processing method on the nutritional and anti-nutritional components of finger millet. The roasting resulted in favorable changes in nutrients with effective reduction of anti-nutritional factors like polyphenols, tannins and phytic acid. Further, these roasted millet flour was utilized in preparation of cookies and vermicelli. Results of study revealed that the high fiber and protein rich cookies and vermicelli with acceptable sensory qualities can be prepared using refined wheat flour, semolina and the millet flour up to 30 percent incorporation. The resultant products had better physico-chemical and sensory properties and their cost of production was also comparatively cheaper as compared to market samples. Therefore, it can be proposed that these types of millet based food products will be best suitable for upcoming food market in which nutritional quality and techno-economical feasibility have prime importance.

Keywords: Finger millet, roasting, nutritional components, anti-nutritional components, cookies and vermicelli

Yield of *barley* as influenced by various combinations of nitrogen fertilizer, vermicompost and *biomix*

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Abstract

A field experiment entitled, **"**Integrated nutrient management in barley**"** was conducted during the *Rabi* season of 2017-2018 at the Agronomy Research Farm of Chaudhary Charan Singh Haryana Agricultural University, Hisar. The soil of the experimental field is sandy loam in texture, slightly alkaline in reaction, low in organic carbon and nitrogen, medium in available phosphorus and potassium. The experiment was laid out in Randomized Block Design replicated thrice with ten different treatments viz. T_1(Control) , T_2 (*Biomix*) , T_3 (Vermicompost @ 5 t ha^{-1}), T_4 (*Biomix* + Vermicompost @ 5 t ha^{-1}), T_5 (50 % RDN + *Vermicompost* @ 5 t ha^{-1}), T_6 (75 % RDN + *Vermicompost* @ 5 t ha^{-1}), T_7 (50% RDN + *Biomix* + Vermicompost @ 5 t ha^{-1}), T_8 (75 % RDN + *Biomix*+ Vermicompost @ 5 t ha^{-1}), T_9 (RDN) and T_{10} (RDN + *Biomix* + Vermicompost @ 5 t ha^{-1}). Overall results depicted that among nutrient management practices treatments T_{10} recorded significantly higher yield attributing characters [Number of grains per spike and spike length], grain, straw and biological yield (kg ha^{-1}), of barley. Performance in terms of yield of barley in treatment T_8 (75 % RDN + *Biomix*+ Vermicompost @ 5t ha^{-1}) was at par with treatment T_9 (RDN) and T_{10}(RDN + *Biomix* + Vermicompost @ 5t ha^{-1}). Various combinations of nitrogen fertilizer, *biomix* and vermicompost failed to produce any significant variation in test weight, harvest and attraction index of barley.

Key words: Barley, nitrogen, fertilizer, vermicompost, Yield and *biomix*

The quest for high yielding drought-tolerant cassava variety

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Abstract

This study was planned to assess the morpho-physiological response of cassava varieties under well-watered and water-deficit stress conditions along with the exploration of potential yield attributing traits that could facilitate in achieving higher productivity under water stress conditions. Scrutiny of the data revealed that all the traits under study viz; plant height, leaf area index, the number of leaves and leaf retention index reduced significantly *(P<0.05)* due to less water availability. Physiological parameters were also affected severely due to the central role of stomatal activity under water stress. Photosynthetic efficiency of plants subjected to water stress was about ½ fold of the plants grown under well-watered condition. Detailed investigation of various traits revealed that the variety which maintained higher photosynthetic activities along with the higher number of leaves, leaf area index, leaf retention index and harvest index produced a higher yield under water-deficient environment. Hence we are of the strong opinion that these traits are the drivers of higher productivity under water stress environments. Involvement of these traits in the breeding programme would lead to the breeding of a drought-tolerant cassava variety.

Keyword:Cassava, drought, drought tolerance, photosynthetic efficiency, tuber yield

Effect of IBA and NAA and their combination on the rooting of stem cuttings of African marigold (*Tagetes erecta* L.) cv. Pusa Narangi Gainda.

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Abstract

The present investigation entitled "Effect of IBA and NAA and their combination on rooting in stem cuttings of African Marigold (*Tagetes erecta* L.) cv. Pusa Narangi Gainda" was conducted in the Horticultural Research cum Instructional Farm at Department of Floriculture and Landscape Architecture, College of Agriculture, Indira Gandhi Krishi Vishwavidyalya, Raipur (C. G.), season 2017. The experiment consisted of three different concentrations of IBA (100, 200 and 300 ppm), NAA (100, 200 and 300ppm) and IBA+NAA (100+100, 200+200 and 300+300 ppm) along with control which were treated for root initiation in stem cutting of marigold under Chhattisgarh plain region. The experiment was laid out in a Completely Randomized Design with three replications and the cuttings were planted on protray and placed in mist chamber.The result revealed that growth regulators IBA and NAA had significantly effect on rooting and shooting performance of marigold. The maximum survival percentage (88.33 %) of rooted cuttings were recorded under 200 ppm IBA and 300 ppm IBA at 35 days after planting of cuttings. While the number of sprouts per cutting (7.55), average length of shoot (8.00 cm), number of leaves per cutting (163.44), fresh weight (1140.55 mg) and dry weight of shoot (159.00 mg) were recorded maximum in NAA 200 ppm at 35 days after planting of cuttings and the number of roots (93.44), fresh weight (404 mg) and dry weight of root (34.11 mg) were recorded maximum under 300 ppm IBA whereas, average length of roots (12.23 cm) were observed maximum under IBA 100 ppm.

Biosurfactants for soil management

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Abstract

Land degradation is resulting from various natural and anthropogenic activities that include the loss of organic matter, decline in soil fertility, erosion and the effects of toxic chemicals. It is a serious global environmental problem and it may be triggered by climate change. In other words, it can be as a consequence of poor management of precious natural resources like soil, water and vegetation. Various remediation technologies are being used for restoration of natural resources but most of them have additional impacts and are not

ecologically safe. Thus, there is a global interest in exploring the green technologies for remediation of such problematic soils but also in devising strategies for sustainable plant protection and improvement of crop yields. One such technology is use of Biosurfactants .These are commonly known as surface active agents of biological origin and are of great benefit because of their unique properties and ecofriendly nature. They are amphiphilic molecules which are mainly derived from plants and microorganisms. However, microbially produced biosurfactants are receiving more attention due to ease in culturing, lower production cost, and greater functional properties. The most common plant-based biosurfactants are saponins, lecithin, soy protein, and cyclodextrins. Microbial produced biosurfactants includes yeasts, bacteria and some filamentous fungi with different molecular structures and surface activities. First commercial biosurfactant was released under the name of "surfactin,"produced from *Bacillus subtilis,* (Arima *et al.*,1968). Since then, several workers have investigated the biosurfactants worldwide. Biosurfactants are suitable candidates to be used for soil improver as they can be used in improving the nitrogen mineralsation (Read *et al*. (2003) , composting process (Jin *et al.*2006), helps in removing soil pollutants like hydrocarbon, lead, manganese,copper etc which are released from industries (Lai *et al*.2009; Luna *et al.* 2016; Yang *et al.* 2016) .

Key words: Biosurfactant, Green technology, Soil pollution, Soil remediation.

Agriculture robots-A tool for reducing labour scarcity in agriculture

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Abstract

Overhistory,agriculturehasevolvedfrom amanualoccupationtoahighlyindustrialized business, utilizing a widevariety oftools and machines. Researchers are now looking towards the realization of autonomous agricultural vehicles that is agriculturalrobots oragribot. Theideaofapplying robotics technologyinagriculture isverynew.In agriculture the opportunitiesforrobotenhancedproductivityare immenseand also robotsareappearingonfarms invariousformsandinincreasingnumbers.Advancesin artificialintelligenceand softcomputingtechniques(artificial neural networks,fuzzy logic,genetic algorithms,*etc*.,) willpermitrobots andadvanced machines to better deal with chaosand uncertainty.Wecanexpecttherobots performingagricultural operationsautonomouslysuchas spraying and mechanical weedcontrol,fruit picking,watching thefarms dayandnightforaneffective report, allowingfarmerstoreducetheenvironmental impact, increase precision and efficiency and manage individual plants innovel ways. Some of the studies reveals that therobot seeding accuracy can be achieved about 87.49%depending on nature of soil (Divya*etal*.2013).as agricultural farms isnotthestraightlineandsmooth,ifanyobstacleisoccurredlikestone,electriclightpole,trees,etc in

such cases new path can be establish by remote control (Dattatraya *etal*.2014). Roboticweedcontrolsystem wascapableofdistinguishinggrass- likeweedsfrom cropplants,andapplyingachemicalsprayonlytotargetedweeds (Lamm*etal*.2002). Robotsare helpful in replacing t he skilledhumanworkforceduringthe peakseason (VanHenten *etal*.2003). However,manyoftherobotsarenotinthe stagesofdiffusionbut stillin thestagesof researchand development.

Key words: Robots, Artificial intelligence, Seeding, Weeding, Harvesting.

Combining ability analysis over locations in brinjal (*Solanum melongena* L.)

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Abstract

Brinjal *(Solanum melongena* L) also known as eggplant or aubergine or garden egg, is a major solanaceous fruit vegetable with chromosome number 2n=24. The Line x Tester analysis of combining ability is the most commonly used method to find out the general and specific combiners and study the nature of gene action governing the inheritance of different characters. Study of combining ability is important for selecting parents for hybridization. Combing ability analysis helps the breeder in identifying potential parents either to be used for heterosis breeding or for hybridization to evolve desirable pure line varieties through pedigree/bulk/back cross methods. Combining ability analysis is one of the efficient tools, which helps in selecting parents and crosses for the improvement of particular characters. Information regarding the general and specific combining ability and the types of gene effects influencing various traits enables the plant breeder to evaluate parental material and to decide a suitable breeding procedure for maximum character improvement. Combining ability and gene action were studied in line x tester mating design using seven lines namely, IC 090053, IC 285140, IC 421194, IC 545893, IC 90806, Pusa Shyamala and Heera and three testers *viz*., Bhagyamathi, Gulabi and Shyamala. General combining ability studies revealed that Pusa Shyamala, Heera, Bhagyamathi and Gulabi were the best combiners for yield and yield contributing characters. However, the estimates of specific combining ability showed the highest desirable *sca* effects in crosses *viz*., IC 285140 x Bhagyamathi, Pusa Shyamala x Gulabi, Heera x Bhagyamathi, Heera x Gulabi and Heera x Shyamala were identified as promising for fruit yield per plant and number of fruits per plant, relatively high fruit length, fruit girth and more fruit weight. Gene action analysis revealed preponderance of both additive and non-additive genes for yield and its contributing characters.

Keywords: Brinjal, Combining ability, Over seasons, Gene action

Reviving lentil production in tribal village through improved cultivation package

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Abstract

Madhya Pradesh is the largest producer of pulses in India. The population of schedule tribes engaged in agriculture is also very large in M.P. In Sagar district the tribal farmers are mostly engaged in the farming of soybean, wheat and *rabi* vegetables. Their financial needs are met through cultivation of *rabi* vegetable crops and wheat only. These farmers generally sows lentil crop by using indigenous (loose) seed which results in low remuneration due to low productivity of the crop. Due to the erratic weather conditions and incidences of wilt and root rot complex in the lentil crop, production of pulses was gradually becoming a non- viable option. They grow lentil crop for home consumption only. In an effort to promote production of lentil among these tribal farmers in the year 2019-20, under Tribal sub plan of MULLaRP; a tribal village Basiyagaon was selected for this study and farmers were provided with improved variety of lentil as demonstration for 30 ha area covering 75 tribal farmers. Through farmer's trainings and exhibitions the farmers were encouraged to adopt proper packages of cultivation of lentil crop. This lentil variety had good performance throughout the growing period and showed no incidence of wilt and root diseases, it is attracting interest of the farmers. It is giving approx. 6-8 quintal/acre productivity. On the basis of this demonstration it is expected that the demand for this variety will increase in the future and seed production of lentil will become a profitable business due to increasing demand of the same.

Key words- tribes, pulse, production, lentil, improved practices

Evaluation of Promising Chrysanthemum Lines for Commercial Traits

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Abstract

Chrysanthemum (*Chrysos*, golden; *anthos*, flower) is an important commercial crop grown in India for loose flower, cut flower, pot plants and garden decoration. The loose flowers are used for making garland, religious offerings and cut flowers for decoration. The potted chrysanthemums are mostly used for decorating garden, houses and for exhibition. Varieties for pot culture should have dwarf, compact growth with strong framework and profuse branching. A number of varieties are available in India for various purposes. Longer duration of flowering, cold tolerance, dark glossy leaves, bright colours, uniformity of bloom, synchronous opening of flowers, high sucker production and response to minimum number of pinches are desirable characters.In the present study, an experiment was laid out in the Research Farm of Directorate of Floricultural Research. 12 lines were evaluated for growth and flowering traits under Pune conditionconsecutively for three seasons. The perusal of data revealed that the line OPCh 16-5 -1213 exhibited highest plant height (83.41 cm) followed by OPCh 4-6 -1314 (79.45cm), OPCh 20-1 -1112 (72.88 cm) and OPCh 2-4- 1011 (72.62 cm). Whereas, it was least in OPCh 25-3 – 1112 (42.55 cm) and OPCh 12-7 -1112 (45.28 cm). Similarly the plant spread was maximum in OPCh 16-5 -1213 (79.54 cm) and least in OPCh

20-1 -1112 (40.45 cm). The branching behavior was found prolific in OPCh 9-4 – 1011 with maximum number of primary (17.5) and secondary (31.4) branches per plant. It reflected the spreading nature of the variety and is very much suitable for garden decoration. The lines namely OPCh 20-1- 1112 and OPCh 16-5 -1213 also have good number of branches per plant. Varieties having more branches produced more number of buds/ flowers. Regarding flowering parameters the lines namely OPCh 12-7 -1112, OPCh 7-5- 1011 and OPCh 4-6 -1314 are very early in terms of bud initiation (81.1, 82.9 and 83 days respectively from days of transplanting), days to colour break (88.6, 89.5 and 90 days respectively) and days to flowering (93.8, 94 and 95 days respectively). Whereas OPCh 12-2 -1213 and OPCh 12-6-1213 took maximum days for opening of flower (118.6 and 118.1 days respectively). It is also evident that the lines OPCh 16-5 – 1213 yielded maximum number of flowers per plant (174.2) followed by OPCh 26-7- 1314 (166.1) and OPCh 9-4- 1011 (164.9). However, least number of flower was recorded in line OPCh 30-1- 1112 (77.6) followed by OPCh 7-5- 1011 (87.2). The line OPCh12-7- 1112 produced large sized flowers (7.64 cm), whereas smallest were produced by OPCh 25-3- 1112 (4.81 cm). Other lines namely OPCh 20-1- 1112, OPCh 30-1- 1112, OPCh 12-2- 1213 and OPCh 16-5- 1213 also produced good sized flowers (diameter of 6.19 to 6.88 cm). The lines namely OPCh 12-2- 1213 (10.3 days), OPCh 16-5-1213 (9.3 days) and OPCh 30-1- 1112 (9.2 days) exhibited longer field life of flowers. Whereas it was least in OPCh 12-7- 1112 (7.5 days) and OPCh 12-6- 1213 (7.7 days). Based on the evaluation it was ascertained that the line OPCh 16-5-1213 is suitable for loose flower production; OPCh 9-4- 1011 and OPCh 2-4- 1011 for garden purpose/ loose flower (possesses mild fragrance) and OPCh 26-7- 1314 and OPCh 30-1- 1112 for garden/ pot purpose (based on compactness of plant and number of flowers).

Keywords: Chrysanthemum, loose flower, pot plant, line

Gain in knowledge post-exposure to vocational trainings of eco-friendly articles for environmental sustainability

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Abstract

For India, skill development is significant from both socio-economic and demographic point of view, stimulating a sustainable growth process and contributing in facilitating the change from an informal to formal economy. It is necessary to address the opportunities and challenges to meet new demands of changing economies and new technologies in the perspective of globalization. The study was conducted in four villages of Jhajjar and Hisar districts of Haryana state purposively. Ukhalchana Kot (Village 1) and Badhani (Village 2) villages were selected form Jhajjar and Mangali (Village 3) and Gawad (Villlage 4) villages were selected from Hisar for the present study. Impact of training was selected as dependent variable. Impact of training was assessed in terms of gain in knowledge, change in attitude. data collected was quantified and interpreted by using suitable statistical tools such as paired 't' test and weighted mean score. A significant gain in knowledge was observed among trainees post-exposure to trainings in terms of value added articles (10.30 t-value), cutting

and stitching of jute bags (7.25 t-value), preparation of eco-friendly articles (8.44 t-value), embellishment of value added articles (9.97 t-value) and precautions (6.86 t-value) to be followed while preparing eco-friendly and utility articles at 0.05 level of significance. Significant change in attitude of trainees was observed post-exposure to training among women belonging to four villages of district Hisar and Jhajjar.

Keywords: Vocational training, impact, knowledge, change in attitude, environment sustainablility, eco-friendly articles.

Information sources utilization for sustainable king chilli production –an analysis

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Abstract

Sustainable king chilli production demands keeping soil alive with natural organic matter, adoption of integrated insect pest management, reduced or no use of insecticides or pesticides along with maintaining biodiversity, ensuring the quality and adequate production so that it does not harm the environment and ecology and meet the demands of coming generation also. King chilli is one of the most successfully grown spice crops in Peren district of Nagaland. Therefore, Peren district was purposively selected for the present study. The basic objective of undertaking research was to analyze the information sources utilization pattern for sustainable king chilli production among the farmers and examine how the socio-economic variable influences the information retrieval and utilization for sustainable production of king chilli production. Sample included a total number of 120 king chilli farmers selected based on proportionate random sampling. The major findings of the study revealed that majority (79.17 %) of the respondents had medium level of overallutilization of information sources for sustainable king chilli production with utilization of informal information sources identified as the most preferred source for utilization of agriculture related information by the king chilli farmers. It was also found that variables *viz;* education, training exposure, social participation, attitude and knowledge had positive and significant association with the information sources utilization by the respondents.

Keywords: King chilli production, information sources, sustainability, Nagaland

Productivity and feasibility of Tropical Sugar beet cultivars intercropping with sugarcane under different row proportions in Peninsular India

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Abstract

The field experiment was carried out during 2011-12 at Agricultural Research Station (ARS), Madhurakhandi (Dist. Bagalkot), University of Agricultural Sciences, Dharwad to evaluate tropicalsugar beet cultivars (Cauvery, Shubhra, Magnolia and Calixta) with different row proportions (1:1, 1:2 and 1:3) in sugarcane. There were seventeen treatment combinations laid out in randomised complete block design with three replications. Results indicated that sole sugarcane and sugarcane (SC) + sugar beet (SB) in 1:1 RP recorded significantly higher cane (99.21 and 94.75 (average of all cultivars) t ha^{-1}, respectively) and sugar (10.73 and 10.26 (average of all cultivars) t ha^{-1}, respectively) yield when compared to other intercropped treatments (SC + SB in 1:2 and 1:3 RP). Sole sugar beet cultivars Cauvery and Shubhra recorded significantly higher tuber (82.47 and 76.95 t ha^{-1}, respectively) and sugar (9.38 and 8.65 t ha^{-1}, respectively) yield than intercropped treatments. In intercropping system sugar beet cultivars Cauvery and Shubhra in 1:3 and 1:2 row proportions recorded significantly higher tuber and sugar yield than 1:1 RP. Sugarcane (SC) + sugar beet (SB) (cv. Cauvery) in 1:2 and 1:3 RP recorded significantly higher gross returns (Rs. 315802 and 310607 ha^{-1}, respectively) and net returns (Rs. 218446 and 207339 ha^{-1} , respectively) when compared to other treatments, but B:C was significantly higher in 1:1 RP (3.26) .

Key words: sugarcane, sugar beet, intercropping, cultivar, row proportion

Evaluation of sugar beet varieties in intercropping with sugarcane in North Karnataka

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Abstract

Field trial was conducted during two consecutive *kharif* seasons of 2010-11 and 2011-12at Agricultural Research Station (ARS), Madhurakhandi (Dist. Bagalkot), University of

Agricultural Sciences, Dharwad to evaluate tropicalsugar beet cultivars (Cauvery, Shubhra, Magnolia and Calixta) with different row proportions (1:1, 1:2 and 1:3) in sugarcane. There were seventeen treatment combinations laid out in randomised complete block design with three replications. Pooled analysis results indicated that sole sugarcane and sugarcane (SC) + sugar beet (SB) in 1:1 RP recorded significantly higher cane (101.39 and 96.67 (average of all cultivars) t ha^{-1}, respectively) and sugar (11.07 and 10.56 (average of all cultivars) t ha^{-1}, respectively) yield when compared to other intercropped treatments (SC + SB in 1:2 and 1:3 RP). Sole sugar beet cultivars Cauvery and Shubhra recorded significantly higher tuber (85.58 and 79.84 t ha^{-1}, respectively) and sugar (9.76 and 9.00 t ha^{-1}, respectively) yield than intercropped treatments. In intercropping system sugar beet cultivars Cauvery and Shubhra in 1:3 and 1:2 row proportions recorded significantly higher tuber and sugar yield than 1:1 RP. Sugarcane (SC) + sugar beet (SB) (cv. Cauvery) in 1:2 and 1:3 RP recorded significantly higher gross returns (Rs. 300603 and 294345 ha^{-1}, respectively) and net returns (Rs. 208766 and 197398 ha^{-1} , respectively) when compared to other treatments, but B:C was significantly higher in 1:1 RP(3.29).

Keywords: sugarcane, sugar beet, intercropping , cultivar, row proportion

Performance of tropical sugar beet cultivars in intercropping with sugarcane at different row proportions

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Abstract

The field experiment was carried out during 2010-11 at Agricultural Research Station (ARS), Madhurakhandi (Dist. Bagalkot), University of Agricultural Sciences, Dharwad to evaluate tropicalsugar beet cultivars (Cauvery, Shubhra, Magnolia and Calixta) with different row proportions (1:1, 1:2 and 1:3) in sugarcane. There were seventeen treatment combinations laid out in randomised complete block design with three replications. Results indicated that sole sugarcane and sugarcane (SC) + sugar beet (SB) in 1:1 RP recorded significantly higher cane (103.56 and 98.58 (average of all cultivars) t ha^{-1}, respectively) and sugar (11.40 and 10.85 (average of all cultivars) t ha^{-1}, respectively) yield when compared to other intercropped treatments (SC + SB in 1:2 and 1:3 RP). Sole sugar beet cultivars Cauvery and Shubhra recorded significantly higher tuber (88.68 and 82.74 t ha^{-1}, respectively) and sugar (10.15 and 9.35 t ha^{-1}, respectively) yield than intercropped treatments. In intercropping system sugar beet cultivars Cauvery and Shubhra in 1:3 and 1:2 row proportions recorded significantly higher tuber and sugar yield than 1:1 RP. Sugarcane (SC) + sugar beet (SB) (cv.

Cauvery) in 1:2 and 1:3 RP recorded significantly higher gross returns (Rs. 285404 and 278083 ha^{-1}, respectively) and net returns (Rs. 199087 and 187457 ha^{-1} , respectively) when compared to other treatments, but B:C was significantly higher in 1:1 RP(3.33) .

Key words: sugarcane, sugar beet, intercropping , cultivar, row proportion

Economics and yield advantages of Sugarcane and sugarbeet Intercropping System in Northern Karnataka

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Abstract

Field trials were conducted during two consecutive *kharif* seasons of 2010-11 and 2011-12at University of Agricultural Sciences, Dharwad to evaluate tropicalsugar beet cultivars (Cauvery, Shubhra, Magnolia and Calixta) with different row proportions (1:1, 1:2 and 1:3) in sugarcane. There were seventeen treatment combinations laid out in randomised complete block design with three replications. On the basis of results obtained from pooled analysis of two years data, Intercropping of Sugarcane + sugar beet (irrespective of sugar beet cultivars) in 1:2 and 1:3 RP recorded significantly higher net returns (Rs.196845 to 208766 ha^{-1}& Rs.184429 to 197398 ha^{-1} in 1:2 and 1:3 RP, respectively) but B:C was significantly higher in 1:1 RP (3.25 to 3.29). Similarly with respect to intercropping yield advantages, sugarcane + sugar beet (irrespective of sugar beet cultivars) in 1:2 and 1:3 RP recorded significantly higher sugarcane equivalent yield (SEY) (122.43 to 128.03 t ha^{-1}& 119.24 to 125.32 t ha^{-1} in 1:2 and 1:3 RP, respectively), LER (1.66 & 1.65to 1.67 in 1:2 and 1:3 RP, respectively), ATER (1.08 & 1.05 to 1.07 in 1:2 and 1:3 RP, respectively) and SPI (184.89 to 206.93 & 183.89 to 204.21 in 1:2 and 1:3 RP, respectively),when compared to 1:1 RP [(SEY:116.02 to 118.45 t ha^{-1}), (LER: 1.40 to 1.41),(ATER:1.00 to 1.01) and (SPI:160.30 to 185.06)].

Key words: sugarcane, sugar beet, intercropping , cultivar, row proportion

Morphological study on the skeletal of chabro fowl (*gallus domesticus*)

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Abstract

The Chabro is a cross of Barred Plymoth Rock with Red Cornish. The domestic fowls are the most numerous birds in the world because of their importance as a source of food. Their skeletal can be used for teaching the avian anatomy to the students and comparative anatomy with other vertebrates. The bird skeleton was prepared after slitting the throat with sharp knife, the feathers and flesh were removed manually and with hot water. The bones were degreased and bleached with 10 % hydrogen peroxide by using fine tooth brush. After sun drying the Skelton was mounted on a wooden board. The skeletal was characterized by 14 cervical, 7 thoracic, 14 fused lumbo-sacral and 5 caudal vertebrae. The avian skeletal produced can be used to study avian morphology and make comparative analysis with other vertebrates.

Keywords: Chabro fowl, skeleton, morphology

Loop-mediated isothermal amplification (LAMP) for rapid and precise detection of the golden nematode of potato, *Globodera rostochiensis* directly from soil

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Abstract

The potato cyst nematodes (PCN), Globodera rostochiensis (Wollenweber) and G. pallida (Stone) are relatively specialized and economically important pest of potato crop. Recently, it has become a major biotic constraint in sustainable potato production with quarantine importance in Northern Himalayan hills in addition to Southern hills of India. Rapid and accurate detection of PCN in the soil at species level is important for development of resistant cultivar against the particular species for its management. The conventional technique available for identification of PCN at species level is time consuming and laborious. Already we have standardized LAMP technique for the detection of G. pallida directly from soil samples. Therefore, in the present attempt we developed a Gr-LAMP assay to detect *G. rostochiensis* directly from soil by developing the Gr-Exp (225bp) (Expansins) gene specific primer. The LAMP primer, efficiently detects the *G.* rostochiensis *directly* from soil sample *and t*here was no cross reaction with the DNA of other nematodes viz., G. pallida (Kufri), G. pallida (Ooty), Meloidogyne incognita, M. javanica, Heterodera avenae, H. carotae Cactodera spp. The LAMP assays were completed within 60 min at 60°C isothermal conditions. In analytical sensitivity tests, the Gr-LAMP assay was able to detect *G.* rostochinensis up to 1pg/µl of DNA visually with SYBR Gold nucleic acid stain whereas, it was 10 ng/µl for conventional PCR. The LAMP assay will facilitate detection of *G. rostochiensis and the know*ledge will aid management decisions.

Scope of Statistics in Biology and Medical Sciences

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Abstract

In modern times, statistics is viewed not as a mere device for collecting numerical data but as a means of developing sound techniques for their handling and analysis and drawing valid inferences from them. As such it is not confined to the affairs of the State but is intruding constantly into various diversified spheres of life- social as well as physical- such as biology, psychology, education, medical sciences etc. It is hardly possible to enumerate even a single department of human activity where statistics does not creep in. It has become indispensable in all phases of human endeavour. In medical science also, the statistical tools for the collection, presentation and analysis of observed facts relating to the causes and incidence of diseases and the results obtained from the use of various drugs or injection or medicine is tested by using the 'tests of significance' – (*t*-test).

Keywords: Statistics, Medical sciences, Pharmacy, Tests of significance

Residual Toxicity of Insecticides against Aphids, *Aphis craccivora*Infesting Cowpea under Laboratory Condition

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Abstract

Residual toxicity of the nine insecticides was evaluated against aphids, *Aphis craccivora*infesting cowpea under laboratory condition. The result revealed that acteamiprid 0.004 per cent, dinotefuran 0.006 per cent and dimethoate 0.03 per cent were comparatively more effective in controlling the adults of aphids than others insecticides under test, both in respect of mortality (44.29 to 61.89 per cent average toxicity) as well as their prolonged persistence (persisted up to 16 days after spray). Taking the RPT values into consideration, they can be arranged in descending order as follows: Acetamiprid > Dinotefuran > Dimethoate > Clothianidin > Chlorfenapyr > Flonicamid > Cyantraniliprole > Spiromesifen > Spinosad.

Keywords:Aphids, *Aphis craccivora*, Cowpea, Toxicity, Insecticides

Crop Phenotyping: A Popular Techniques for Plant Breeders

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Abstract

Phenotyping continues to be the cornerstone of plant breeding. In spite of advances in genetics and the application of molecular technologies in crop research. Nowadays, the word phenotyping can invoke visions of drones moving speedily across research plots collecting high-resolution data sets on a wide range of features. This has been made possible by recent advances in sensor technology and data processing. Nonetheless, more comprehensive often destructive phenotyping still has much to offer in breeding as well as research. This analysis considers the 'breeder friendliness' of phenotyping within three main domains: (i) the *'minimum data set'*, where being 'handy' or accessible and easy to collect and use is paramount, visual assessment often being preferred; (ii) the *high throughput phenotyping (HTP*), relatively new for most breeders, and requiring significantly greater investment with technical hurdles for implementation and a steeper learning curve than the minimum data set; (iii) *detailed characterization or 'precision' phenotyping*, typically customized for a set of traits associated with a target environment and requiring significant time and resources. While having been the subject of debate in the past, extra investment for phenotyping is becoming more accepted to capitalize on recent developments in crop genomics and prediction models, that can be built from the high-throughput and detailed precision phenotypes. This analysis considers different contexts for phenotyping, including breeding, exploration of genetic resources and other new breeding resources, and how the different categories of phenotyping listed above apply to each. Some of the same tools and thumb rules apply equally well to the genetic analysis of phenotyping complex traits and the discovery of genes.

Keywords:High throughput phenotyping, Phenotyping, sensor technology and Crop genomics

Cost and Benefit structure of Pesticide Application on apple crop in Kashmir

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Abstract

Kashmir is having a legacy of producing juicy fruits and is therefore very rich in producing globally acknowledged qualitative fruits of numerous species. Traditionally the fruits are produced through organic means and very few chemicals and pesticides used for its cultivation, but after green revolution the use of chemicals and pesticides has increased tremendously in every aspect of agriculture including horticulture and same was the tale of the apple cultivation as well. Over the years, the growers are spraying the pesticides on apple of and on and are using the dosage beyond the recommended level resulting into high chemical residues in the apple and which in turn resulted into the adverse effects on both the quality of apple, environment and human health. Therefore, the study aims to determine the amounts and types of pesticides used in apple orchards, and to analyze the economic loss

accrued by the growers on farm-level. The study utilises the date collected in 209-20 from 600 apple producers of the three regions of the Kashmir valley. The results revealed that average area under apple production was 1.49 ha with 12061.259 kg ha−1. The average cost of apple production was found out to the tune of Rs.79964 ha−1. The results revealed that excessive use of pesticides was observed in the apple production of sampled area, which resulted into an average economic loss of 20.48 per cent in just a g/ml/100 lt. of water.

Keywords: Pesticide use, economic loss, overutilization, chemical residues, gain threshold.

Forestry Aided by Statistical Methods

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Abstract

Forestry is a synthetic science drawing heavily from physical and biological sciences and entails both basic and applied research. Like in any other science the research method are in general based on the inductive - deductive approach and involves formulation of hypotheses from observed facts followed by deductions and verification repeated in a cyclical process. Statistical methods are important for objective verification of hypotheses and to deal with the uncertainty involved in making generalizations. The two major practical aspects of the whole process are the collection of data and interpretation of the collected data. The data may be generated through a sample survey on a naturally existing population or through a designed experiment on a hypothetical population. The collected data are condensed and useful information extracted through techniques of statistical inference. Apart this, a statistical method of substantial importance to forestry which has gained wider acceptance in recent times with the advent of computers is simulation. This is particularly useful in forestry because simulation techniques to an immense level can replace large scale field experiments which are exceptionally costly and time consuming. Statistical models are developed which capture most of the relevant features of the system under consideration after which experiments on system behavior can be conducted in computer rather than with real life systems.

Keywords:Statistical models, hypothetical population, simulation, Forestry.

Bio-hardening of micropropogated sugarcane (*Saccharumofficinarum* L.)

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Abstract

Micropropagation is the *in vitro* method to raise largenumber of genetically identical plantlets to the parents. However, during micropropagation, major drawback is the acclimatization or

hardening process. Tissue culture raised plantlets become more vulnerable to the different biotic as well as abiotic stress that pertains in the micro and macro environment of the plantlets. Maximum mortality of tissue culture plants observed at the hardening stage. Bio-hardening of the micropropagated plants is the process of using living microbes for increasing survival rate of plantlets. Plant Growth Promoting Rhizobacteria (PGPR) are the plant beneficial, rhizospheric inhabiting bacteria that confer plant tolerance towards different stresses and increase growth as well as survival of micropropogated plantlets during hardening process. For the isolation of different PGPR from rhizosphere ofsugarcane, different soil samples were collected from NAU farm considering diverse past cropping pattern. All the soil samples were characterized for physioco-chemical as well as microbiological parameters and data revealed that bulk density of different soil samples was recorded in the range of 1.2-1.5 g/cm3, particle density in the range of 2.62-2.65 g/cm3, electronic conductivity (EC) in the range of 1.01-1.23 (dS/m), and pH in the range of 6.85-7.62. Microbial population data was variable and found in the range of 2.2 X 109 to 12.3 X 109 cfu/g. Further, total 38 isolates were obtained from the collected soil samples with distinct colony morphology and were tested under *in vitro* conditions for their efficacy and Plant Growth Promoting (PGP) characteristics like ACC deaminase activity, phosphate and zinc solubilization, potash mobilization, nitrogen fixation, antagonistic potential etc. Two most potent PGPR isolates were screened and identified as *Myroids profundi* and *Proteus mirabilis* by biochemical and molecular identification methods. Both isolates were checked for their efficacy of biohardening of micropropogated sugarcane plantlets during primary and secondary hardening, in terms of individual and dual inoculation. Experimental data suggested that application of individual PGPR at the time of primary hardening produced significant effect on different plant growth promoting parameters such as root length, shoot length, no. of leaves/plant, shoot no., survival percent, soil microbial population, etc. However, single and combined application, at the time of primary and secondary hardening showed highest positive effect at 15 DAI of secondary hardening. It was evident from overall data that application of PGPR, two times increased root length 250-326%, shoot length 187-212%, no. of leaves 150-167%, shoot no. 155-173%, survival rate 124-140% and soil bacterial population 251-290% over control treatment. Application of microbial consortium two times, at primary and secondary hardening showed most promising results over single inoculation of PGPR, probably due to synergistic effect of both isolates to each other.

Sustainable rice production in Manipur: Analysis of constraints faced by farmers

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Abstract

Rice is the second most cultivated crop in India. It is grown in the eastern and western shoreline areas, drainage basin of Ganga river and Northeast India. In Manipur, rice is a dominant kharif crop by holding 90% of the Gross Cropped Area (GCA). It is important to understand the challenges faced by farmers in rice cultivation to ensure sustainable rice production. Prioritization of farmer's problems can make easier to target and fix the issues of sustainable production of rice by the farmers. Therefore the study was carried out in Imphal West and Bishnupur district of Manipur to evaluate the socio-economic attributes of rice growers and identify the major constraints faced in adoption of sustainable rice cultivation. Four community blocks namely Imphal West-I and Imphal West-II from Imphal West district

and Bishnupur and Moirang from Bishnupur district were selected purposively according to their relative importance in improved rice cultivation. A list of villages growing rice under the selected blocks was prepared and two villages from each C.D blocks were selected randomly. Thus a total of eight villages were selected for the study. Finally, among the rice cultivators, 20 farmers were selected from each village based on random sampling procedure making a sample size of 160 respondents. The primary data were collected using a personal interview schedule. The findings of the study revealed that high cost of required inputs, lack of agricultural credit facility, lack of knowledge about sustainable input management, lack of information about government schemes, lack of irrigation facility, non-availability of water storage tank, lack of awareness about rainwater harvesting technique, increase in temperature, increases the risk of diseases and pests due to climate change., irregular rainfall and rising temperature brought reduction in crop yield., sale of agricultural products through middleman and non availability of direct marketing facilities were the major problems faced by most of the farmers in sustainable rice cultivation. The study suggested that an effort to address sustainable rice cultivation should be promoted by popularising climate resilient agricultural technologies with improved input management thereby reducing the constraints and increasing sustainability in rice farming.

Keywords: Rice cultivators, socio-economic attributes, constraints, sustainability, Manipur

Threat of fall armyworm in India and its management- A Review

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Abstract

The Fall Armyworm (*Spodoptera frugiperda)* is a crop pest specie commonly known as FAW. It is an insect which is native to America. Firstly it was migrated to Africa in January 2016 and later it spreaded to several asian countries. In India, it was first reported in Karnatka in July, 2018 and afterwards found in other states like Andhra Pradesh, Telangana, Tamil Nadu, Maharashtra and Odisha. The National Bureau of Agricultural Insect Resources (NBAIR) issued a alert on 30th July, 2019 as based upon the prevalence of FAW in the maize fields in Chikkaballapur (Karnataka). Later on, it spreaded to 8-10 districts of Karnatka. The pest mainly attacks on maize, sugarcane crop. It has caused significant damage on maize and sugarcane crop in various states of India in 2019. FAW symptons, life cycle and the management is reviewed in the paper.

Keywords:Fall Armyworm, Sugarcane, Tamil Nadu, Maize etc.

Ecologically sustainable integrated weed management in dry and irrigated direct-seeded rice

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Abstract

Rice may be a principal source of food for quite half the planet population, and > 90% of rice worldwide is grown and consumed in Asia. A replacement in establishment method from manual transplanting to dry-seeded rice (DSR) has occurred in some countries as growers counter increased costs or decreased availability of labor or water. In direct seeded rice cultivation systems, rice and weed seedlings emerge simultaneously and there is no standing water to suppress weed emergence and growth at crop emergence. For this reason, weeds are considered one of the major biological constraints in DSR and cause a substantial rice yield loss owing to greater diversity in weed flora due to alternate wetting and drying. In country like India, weeds are mainly controlled manually in rice. However, manual weeding is becoming less cost effective due to labour crisis at critical times or increased labour costs. Herbicides are replacing manual weeding as they're easy to use but there are concerns about the only use of herbicides, like evolution of resistance in weeds, shifts in weed populations, cost of weed management to farmers and concerns about the environment, there is a need to integrate other weed management strategies with herbicide use because of the variability within the growth habit of weeds, any single method of weed control cannot provide effective and season-long control in DSR. Various weed management approaches may include tillage systems, the use of crop residue, the use of weed-competitive cultivars, appropriate water depth and duration, appropriate agronomic practices such as row spacing and seeding rates, manual or mechanical weeding, and appropriate herbicide timing, rotation, and combination need to be integrated to achieve effective sustainable and long-term weed control in DSR.

Keywords:Weed, DSR, herbicides, labour, Sustainable

Effect of Conservation on Growth, Yield and Quality of Banana (*Musa spp*.) Cv. Grand Naine.

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Abstract

Moisture conservation and utilization are extremely important at early stages in banana production to in increase the efficiency of irrigation water. At early stages of banana growth, when the plants are small. The inter-plant area is completely exposed, resulting in large-scale wastage of irrigation water; Mulches not only help in moisture conservation but reduce weed competition and increase the water and fertilizer use efficiency. Banana (Musa sp.) is an

important tropical crop that can tolerate short period of water deficit (Surendar *et al*., 2013). Thus, its productivity is greatly affected. Most of the investigations have shown that plant growth rate as well as biochemical and physiological processes were directly affected proportional by availability of water in the soil (Hu and Schmid halter, 2005). Surface irrigation method is most widely used all over the world (Mustafa *et al*., 2003). Irrigation is an important for all crops, because it influences on growth and development. Availability of adequate amount of moisture at critical stages of plant growth not only optimizes the metabolic process in plant cells, but also increase the effectiveness of the mineral nutrients applied to the crop. Consequently, any degree of water stress may produce deleterious effects on growth and yield of the crop (Saif *et al*., 2003).The main objectives of this study are to investigate the effect of different level of soil moisture and conservation (mulching) treatments and conventional (no mulching) on banana yield and its components, as well as some water-crop relations, and net return.

Keywords: Banana, irrigation regimes, mulching, vegetative growth, yield and fruit quality

Heavy Metals Concentration and Potential Health Risk Consequences on Fish from Subarnarekha River of Jharkhand, Odisha and West Bengal State, India

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Abstract

Subarnarekha River is a rain-fed peninsular river passing through industrial city of Jamshedpur, Ghatsila of Jharkhand, Paschim Medinipur of West Bengal and Kirtania of Odisha state in India. The heavy metal concentration of Cd, Cu, Pb, Ni, Mn, Zn and Cr were determined in three fish species collected from the Subarnarekha River during pre-monsoon season using inductively coupled plasma-mass spectrometry for five sampling station that are observed stressed with high concentration due to industrialization, urbanization and anthropogenic activities. Concentrations of different heavy metals in the fish overdid the recommended food standards for Cu, Pb, Ni, Cd, Mn and Zn in many samples. Here the estimated accumulation of heavy metals in fish were in order Cu > Zn > Ni > Mn> Cr > Pb and Cd respectively.Present study mainly focuses on the metal concentration in fish, with target hazard quotients (THQ). However, THQ for heavy metals in water and consumption of fish were above threshold value of 1 indicating potential health risk. Hazard indices (HI) indicated that high concentrations of metals in some species at some locations present an appreciable risk to the health of consumers of these species.

Keywords: Daily intake, Hazard index, Heavy metal, Subarnarekha River, Target hazard quotient.

Assessment of variability and genetic diversity in yellow sarson (*Brassica rapa* var. *yellow sarson*) germplasm for seed yield and attributing traits

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Abstract

Among oilseed Brassica group, *B. juncea* and *B. rapa* contribute significantly in rapeseed-mustard oilseed production in India. *B. rapa* is divided into three ecotypes viz., *B. rapa* var. *yellow sarson*, *B. rapa* var. *toria*, *B. rapa* var. *brown sarson.* Among these yellow sarson is more valued due to high oil content and attractive seed coat colour (Mishra, 2011). Yellow sarson seeds (whole or split or paste) are used as condiment in making of pickles, chatney, curry, hotdogs, salads, sandwiches and burgers. Its seeds content health promoting properties due to rich in protein, fiber, vitamin C, many of the B-complex vitamins, MUFA and PUFA.It is grown as catch crop due to short duration in North-eastern and eastern regions of India. In general, local cultivars are grown in these regions which are poor yielder. Therefore, 300 accessions of yellow sarson were evaluated in Augmented Block Design with 6 blocks during 2018-19 *rabi* season at research farm of ICAR-DRMR, Bharatpur. Each block consisted of 50 genotypes with four checks varieties (NRCYS-5-2, Pitambari, YSH-401, Benoy) to identify promising lines. Genotypes were grown in a row of 3 m length at a spacing of 45 cm. Plant to plant spacing was maintained at 20-25 cm by thinning out the plants at 15-25 DAS. Data were collected on five randomly selected plants for different qualitative (Plant surface, leaf colour, flower colour, leaf dentation) and 12 quantitative traits. Seed yield/plant varied from 4 to 36 g. Highest CV was notice for seed yield/plant (37.6%) and lowest for oil content (3.3%). UPGMA dendrogram was constructed based on the Euclidean distance coefficient which grouped 300 genotypes of yellow sarson in five major groups. Six lines with seed yield more than 30g/plant, 11 lines with thousand seed weight more than 5g, 05 lines with more than 350 siliquae/plant and six line with oil content more than 45% were identified. Three types of flower colour (yellow, light yellow, white) were observed. Harsha et al., (2016) assessed genetic diversity based on morphological traits and RAPD markers in 31 genotypes of yellow sarson collected from Uttar Pradesh and reported high genetic diversity among germplasm. Identified diverse promising lines can be utilized in yellow sarson breeding programme.

Keywords:*Brassica rapa* var. *yellow sarson*, Variability, Genetic diversity

Study on effect of genetic groups on growth performance of poultry

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Abstract

Poultry farming is one of the fastest growing segments of agriculture in India. It carries a pivotal position in current Indian economy and has evolved as an extremely business oriented enterprise. Local chicken varieties like Aseel and Kadaknath are picking up significance throughout the years because of their unique characteristics. Present investigation was carried out on a total of 1082 chicks on growth performances (hatch weight to weight at first egg) belonging to seven genetic groups' viz. Aseel, Kadaknath, desi, Black Australorp (BA), the crosses of desi with other recognized breeds as Rhode Island Red (RIR), BA and Aseel. The body weight of each and every chick was taken with the help of an electronic balance having least margin of error (accuracy) of 2 gms. Body weight was taken at the age of '0'

day, 2-week, 4-week, 6-week, 12-week and weight at first egg. Genetic groups had significant influence on weight at all the ages under study. Significantly higher hatch weight was noticed in exotic birds BA. Among indigenous birds, significantly higher hatch weight was observed in Aseel in comparison to *desi* and their crosses with exotics (BA and RIR). At 12^{th} week of age, significantly higher and lower body weight was observed in BA (559.16±6.659 g) and *desi* (397.41±9.615 g) birds, respectively. The weight in all the three crossbreds did not differ significantly among themselves. In general, weight at different ages from '0' day to weight at first egg was higher in BA followed by Aseel. On the contrary, lowest weight at different ages mentioned above was lower either in *desi* or in Kadaknath. The present study suggested rearing of purebred as backyard farming, BA birds are superior from dual purpose poultry birds, whereas Kadaknath and Aseel birds get higher price due to their specific good properties.

Keywords: Aseel, Genetic groups, Growth performance, Kadaknath, Poultry

Identification of causative agent of Wet Bubble Disease in *Agaricus bisporus*

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Abstract

Mushroom growing is one of the fastest growing and most technologically sophisticated horticultural industries in the world. Three species of edible mushroom, white button mushroom (*Agaricus bisporus*), paddy straw mushroom (*Volvariella* spp.) and oyster mushroom (*Pleurotus* sp.) are commercially grown in India. Button mushrooms are subject to a range of diseases and pests which have the capacity to cause serious crop losses. Sciarid fly, phorid fly, spring tails and mites are important arthropod pests of cultivated mushroom in India. Fifty four mite species have been found associated with mushrooms (Tripathi, 2005), out of which *Tarsonemus myceliophagus* Hussey, *Tyrophagus lantneri*Osb.,*Caloglyphus mycophagus* (Megnin) (Kumar *et al*., 2004), *Tyrophagus putrescentiae* Schrank,*Uroobovella* sp. (Rana, 2008) are considered economically important pests. In white button mushroom, the incidence of wet bubble disease caused by the fungus, *Mycogone perniciosa* is a serious problem (Gahukar, 2014) whose carriers are presumed to be pests but no detailed study is available. It produces symptoms like dense white growth on gills; swollen stems and caps from which reddish-brown liquid oozes, chlorine like smell and crinkled, walnut-like bodies on the surface of the casing. *T. putrescentiae*, a common mushroom pest was reported as an important vector of dispersing weed fungi throughout mushroom cultivation facilities (Okabe *et al*., 2001; Czajkowska, 2002). *T. putrescentiae* can spread viruses causing diseases in mushrooms (Hussey et al. 1969) and are also responsible for the dispersal of weed and pathogenic fungal spores, so the present study has been undertaken to assess the role of *Tyrophagus putrescentiae* in wet bubble disease

Key words: *Agaricus bisporus*, *Tyrophagus putrescentiae*, wet bubble disease, *Tarsonemus myceliophagus* Hussey, *Tyrophagus lantneri*Osb.,*Caloglyphus mycophagus*

Emerging Post Harvest Technology for enhancing the quality of horticultural produce

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Abstract

Post harvest technology is one of the emerging science which directly meets the increasing need and demand for horticultural produce, through effective technologies for preservation of perishable food products, particularly fresh fruits and vegetables. Improvements have been made in many aspects of postharvest technologies and handling of perishable foods, including harvesting indices, harvesting methods, pre-cooling methods and applications, storage techniques, packing and packaging, quarantine systems, transport systems especially by road and sea, modified and controlled atmospheres, *etc*. However, there is a persistent problem in most of the world especially in many developing countries, where significant quantities of perishable foods are lost every year. Globally, applications of postharvest technologies for instance; use of ethylene, 1-methylcyclopropene (1-MCP) and temperature management has proved to reduce postharvest losses of fruits and vegetables. Considering the effects of various substances and reactions, the components such as calcium, methyl jasmonate, nitric oxide, ozone and polyamines improves the post harvest quality. Use of nanotechnology in the packaging of fresh fruits and vegetables enhances the shelf life. Similarly, edible coatings and films are also used to enhance the nutritional quality. For example cryogenic grinding method and encapsulation method to improve the quality of spice produces and reduce the loss of essential oils. Now a day's innovative value addition practices like moringa leaf powder is converted as moringa nano tablets. Advanced extraction and distillation methods are also used to improve the quality of oil and secondary metabolites. Finally, finding of this review presents the scope of emerging eco-friendly technologies to maintain the postharvest quality of fresh produce in terms of safety and nutrition.

Keywords: Packaging, Quality, Safety and Nutrition

Covid-19 Crisis an Opportunity for Agriculture Marketing Reforms

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Abstract

The outbreak of Covid-19 and the subsequent lockdown globally and in India have sparked a huge economic crisis. As we know that 60 to 70 percent population of country are engaged in farming and allied activities. One of the key challenges in the Indian farm sector is the inability of the farmer to get a reasonable price for his produce. The present situation offers a solution to the farmers and government to resolve this problem. Currently, we also understand that there is a plan to pool *rabi* output across the all the states that can be effectively implemented *via;* electronic identification of food commodity movements across the states. The *e*-NAM mechanism can provide distant bidding facility for wholesale produce in APMC mandis without the need for physical presence of buyer or trader near the auction site. The electronic platform also provides e-payment facility through which traders can pay farmers after trade is executed from anywhere, be it home or office, without going to banks,

thus avoiding crowds. Given it is a digital platform,*e*-NAM provides a good avenue for social distancing in the current scenario while undertaking trade in agriculture produce seamlessly.

Keywords: Covid-19, Farmers, e- NAM, APMC, e- payments.

Microbial Hotspots and Hot Moments in Soil

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Abstract

Microbial hotspots as small soil volumes with much faster process rates and much more intensive interactions compared to the average soil conditions. Such hotspots are found in the rhizosphere, detritusphere, biopores (including drilosphere) and on aggregate surfaces, but hotspots are frequently of mixed origin. Hot moments are short-term events or sequences of events inducing accelerated process rates as compared to the average rates. Thus, hotspots and hot moments are defined by dynamic characteristics, *i.e*. by process rates. The fraction of active microorganisms in hotspots is 2-20 times higher than in the bulk soil, and their specific activities (*i.e*. respiration, microbial growth, mineralization potential, enzyme activities, RNA/DNA ratio) may also be much higher. The duration of hot moments in the rhizosphere is limited and is controlled by the length of the input of labile organics. It can last a few hours up to a few days. In the detritusphere, however, the duration of hot moments is regulated by the output, by decomposition rates of litter, and lasts for weeks and months. Hot moments induce succession in microbial communities and intense intraspecific and interspecific competition affecting C use efficiency, microbial growth and turnover. The faster turnover and lower C use efficiency in hotspots counterbalances the high C inputs, leading to the absence of strong increases in C stocks. Consequently, the intensification of fluxes is much stronger than the increase of pools. Maintenance of stoichiometric ratios by accelerated microbial growth in hotspots requires additional nutrients (*e.g*. N and P), causing their microbial mining from soil organic matter, *i.e*. priming effects. Consequently, priming effects are localized in microbial hotspots and are consequences of hot moments.

Keywords: Soil hot spot, Hot moments, Rhizosphere, Microorganisms, C use efficiency, Priming

Influence of weather factors on seasonal abundance of fruit fly, *bactrocera cucurbitae* (coquillett) of cucurbits

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Abstract

Surveillance was conducted to ascertain whether effect on seasonal fluctuation of fruit fly, *Bactrocera cucurbitae* through whole year. Noteworthy deviation in appearance of fly was witnessed during 2016-2018. Fly was absent during 48th to 52nd standard meteorological week (SMW) in 2017 & 49th, 52nd and 1st to 3rd SMW in 2018. There were peaks in population

during SMW of 33rd (2016), 33rd and 36th (2017) & 8th (2018). Low population existed mostly during 42nd to 12th SMW. Moderate to high incidence prevailed during other SMWs with few exceptions. Significant positive correlations of fly occurrence were detected with maximum temperature (r = 0.34 - 0.45), minimum temperature (r = 0.67 – 0.70) and rainfall (r = 0.49 – 0.55). The maximum temperature offered 11.2 to 47.2 per cent variations in fruit fly population. The respective percent variations were as 28.7 to 65.5 by minimum temperature and 4.6 to 29.9 by rainfall.

Keywords:Weather, abundance, fruit fly, *Bactrocera*, mateorological week

Aphelinid Fauna (Chalcidoidea: Hymenoptera) of Tamil Nadu, India

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Abstracts

Modern day agriculture is more agro-chemicals and machinery based. To manage agricultural pests, the usual way followed is to go for existing chemicals which cause many environmental concerns including degradation of biodiversity and poor soil health which directly affect sustainability and cause health hazards. One among the sustainable ways to manage agricultural pests in field is to conserve their natural enemies. Parasitic Hymenoptera group insects are among the most potential candidates of entomophagous insects employed for pest management (Narendran, 2001 and Greathead, 1986). Ecologically, Chalcids are found to be available in all zoogeographic regions and in all ecosystems (Gibson, 1993). However, they are further more diverse in tropics (Noyes, 2015). Biologically, most Chalcids are parasitoids of the immature stages and very rarely, of adults of nearly 13 orders of Insecta (Coleoptera, Diptera, Homoptera, Hemiptera, Hymenoptera, Lepidoptera, Neuroptera, Odonata, Orthoptera, Plecoptera, Strepsiptera, Siphonaptera and Thysanoptera), three orders of Arachnida (Araneae, Pseudoscorpionida and Acari) and one family of Nematoda (Anguinidae) (Gibson, 1993). Diversity of aphelinids from forest and the agricultural ecosystems of selected districts of Tamil Nadu were investigated during 2013-2015 using collection methods like yellow pan trap, sweep net and malaise trap described by Noyes, 1982. Aphelinid parasitoids were collected by above mentioning collection methods and preserved in 70 % ethyl alcohol. Identification of specimens was done following keys and taxonomic literature provided by Hayat, 1983;1998. An attempt was made to survey the possible hymenopteran parasitic fauna of selected districts of Tamil Nadu with more emphasis on Aphelinidae family from the forest and the agroecosystems. A total of 760 aphelinid parasitoids were collected from Tamil Nadu during 2013-2015, representing 15 different genera. Among them *Eretmocerus* was the dominant genus with a total of 244 parasitoids, followed by *Encarsia* (201), *Aphelinus* (164), *Marietta* (49), *Eriaphytis* (39), *Coccobius* (23), *Coccophagus* (10), *Promuscidea* (10), *Botryoideclava* (6), *Umairia* (5), *Centrodora* (3), *Coccophagoides* (2), *Ablerus* (2), *Proaphelinoides*(1) and *Paraphytis* (1). After diagnosis the specimens were preserved in 70 % alcohol in deep freezer and deposited in Entomology Department, Annamalai University, Chidambaram, Tamil Nadu.

Growth rate and trend analysis of rice crop in Uttar Pradesh

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Abstract

The growth and trends of area, production and productivity of rice crop in the state of Uttar Pradesh has been found in this study.The necessary time series data pertaining to the period from 1970-71 to 2009-10 on area, production and productivity of rice crop have been used to study the growth, trends and projection of rice crop in the state.Forecasting of rice production has also been done up to 2019-2020. The secondary data have been obtained from the Bulletins of Directorate of Agricultural Statistics and Crop-Insurance, Krishi Bhawan, Lucknow, Government of Uttar Pradesh.The results show that the growth rate area, production and productivity have increased during all the decades and during the entire period of the study.
Keywords:Area, Growth rates, Production, Productivity and Rice

Eco-Friendly Machinery for Dry Seeding of Rice with Organic Manure

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Abstract

Organic farming is a technique of agriculture which depends on green manure, compost and biological pest control. Tractor drawn FYM applicator cum planter, subject was designed to apply the FYM at required quantity with their band application. Solid-works design and drawing of the machine were prepared to fabricate the conceptual design of tractor drawn FYM applicator. The average moisture content, bulk density, dry matter content, angle of repose and angle of friction of manure pit were 28.97 % db, 421.21 kg/m^3, 71.03 %, 35° and 34°, respectively. These are the physical properties which were measured to develop the FYM applicator. The overall length × width × height of the machine was 2415 × 1500 × 1350 mm. FYM hopper was designed for 300 kg capacity of FYM. A frame for FYM hopper was fabricated according to giving the desired capacity of FYM hopper. MS sheet of 20 gauge thickness was welded on each face of frame for FYM hopper. Nine orifice openings for FYM delivery was provided at bottom surface of hopper. A counter shaft was fixed which takes drive from ground wheel and rotates the agitator in FYM hopper. An agitator type feeding mechanism for FYM and inclined metering unit for seeds was provided. To apply FYM in band form there was a shovel type furrow opener was used. Developed applicator was tested in the laboratory and field and found efficient, economical and energy efficient for rice crop.

Keywords: Agitator unit, FYM applicator, Farmyard manure, FYM hopper, metering unit.

Potential of *Raphanus sativus* as Biofumigant for the Management of Damping Off in Tomato

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Abstract

Overthelastdecadethephasing-outofmethylbromidehaspromptedthesearchfor newalternativestrategiesforthemanagementofsoilbornepestsanddiseases.Amongthe differentcontrolmethodsbeingusedtoreplacemethylbromideistheuseofotherfumigantsuchasmet amsodiumandchloropicrin.Theattentionforbiologicallybasedmethodshasbeenastrongconcer nforresearchersallovertheworldbecauseofsoilandenvironmentalconcern.Amongseveraleco-friendlyplantprotectionmeasures,biofumigationwithcruciferousplants standsoutasapromisingalternativeforthemanagementofavarietyofsoilbornepathogens.

Inthepresentinvestigation,anattemptwasmadetoevaluatetherootandshootsof differentvarietiesof*Raphanussativus*asbiofumigantaloneandincombinationwithPBAT-3 (*Trichoderma*and*Pseudomonas*)against*Pythiumaphanidermatum*andothersoilbornepathogens andtostudytheincidenceofpreandpostemergencedampingoffoftomatounder glasshouseandinthefieldconditions.Biocidalvolatilesreleasedfromdegradationofrootandshoot ofthreevarietiesof *R.sativus*viz.Japanesewhite,PusaChetki,andMAHY22significantlyreducedthemycelial growthof*Pythiumaphanidermatum*andothertestedpathogens.RootsofMAHY22wasfoundtob emosteffectiveasitresultedintomaximumpercentgrowthinhibitionof*Pythiumaphanidermatum*8 2.06percentfollowedbyJapanesewhiteshoot.Underglasshouse conditions,minimumincidenceofpreandpostemergencedampingoffintomatowasobservedint hecombinationofMAHY22root+PBAT-3(11.1%)andJapanesewhite+PBAT-3(5.2%)respectivelyincomparisontothecontrol.Whereas,infieldconditions,minimuminciden ceofpreandpostemergencedampingoffwasalsorecordedinMAHY22root+PBAT-3i.e.15.16percentand4.20percentrespectivelyascomparedtocontrol.Similarly,thecombinationof biofumigationandbiocontrolagentsresultedinhigherseedlingemergenceandvigourof tomatoseedlings.AmongdifferenttreatmentscombinationofMAHY22root+PBAT-3 resultedinmaximumpercentgerminationandseedlingvigourindexi.e.88.89percentand 3948.44underglasshouseand84.80percentand3259.08infieldrespectively.Thusfromtheresultsit couldbeconcludedthat*Raphanussativus*containshigheramountofbiocidalcompoundandhasagre aterpotentialasbiofumigantinsuppressingthegrowthof*Pythium aphanidermatum*inboth*invitro*and*invivo*conditions.

Keywords-*Raphanus sativus*, biofumigation, damping-off, *Pythium aphanidermatum*, tomato

Trends in price and arrivals of cumin in India

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Price of agricultural commodities play an important role in farm economy of India. They affect production decisions by the farmers and their incomes. Better harvest prices encourage the farmers to make more investment and to increase production and *vice versa*. Present study was undertaken to study seasonality and price variations in cumin in the country. The major markets from Rajasthan and Gujarat namely Jodhpur, Kekri, Merta City, Gondal, and Rajkot were identified on the basis of maximum arrivals. The information on daily price and arrivals was recorded from January 2008 to June 2019 (138 months). To measure seasonality in price and arrivals moving average method and to study trend linear regression method was used.In cumin, during 2008 to 2019 cumin price varies between 7221 to 19155 rupees per quintal. There was increasing trend in cumin prices from 2008 to 2019 except 2014. Lowest price was found in month of March when highest arrival was there in these markets. Whereas highest price was observed in January when lower arrival was seen. Study found inverse relationship between market arrivals and prices. Based on the finding of the study it can be concluded that seasonality in coriander and cumin is one of the major cause of variation in the prices in both the crops. Hence government should introduce market stabilization policies to reduce season price fluctuation by insuring ceiling and floor prices in the seed spice crops.

Diversity of click beetles belonging to tribe Dimini (Coleoptera, Elateridae) in India

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Abstract

The Elateridae (commonly known as click-beetles and larvae are known as wireworms) with 10,000 described species are among the richest families in Coleoptera. Wireworms are important pests of a wide variety of crops such as potato, cereals, carrot, sugar beet, sugarcane and soft fruits.Some of them are potential predators of notorious pests such as white grubs. Tribe Dimini Candeze, 1863 belongs to the subfamily Dendrometrinae. Members of Dimini share characters such as prognathous head, incomplete frontal carina, bidentate mandibles, pronotum with sublateral carina subparallel to lateral carina, partly reduced metacoxal plates, and at least tarsomere IV lobate. Dimini comprises about 273 species and 11 genera reported from world. The members of this tribe are distributed in Europe the Himalayas, China, Taiwan, and South East Asia, and include both flightless and flight-capablelineages. Dimini in India is represented by 7 genera *viz.*, *Brancuccia*, *Dima*, *Neocsikia*, *Paracsikia*, *Parapenia*,*Penia*, and *Pseudocsikia*. The total number of species so far reported is 64. Among the genera, the most specious one is *Penia* with 47 species and *Neocsikia* and *Pseudocsikia* are represented by single species. Maximum diversity of this species is reported mainly from high altitude north-eastern parts of the country. So the present listing of tribe Dimini provides a holistic view about diversity and distribution and it also helps in exploring diversity in unexplored areas.

Impact of shifting cultivation on rhizome rot of ginger (*Zinger officinale* Rosc.) and its management by native *Trichoderma* spp. in Manipur.

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Abstract

Natural incidence of Rhizome rots of ginger at five different districts of Manipur during July and September 2016 showed higher disease incidence in hill districts *viz*., Tamenglong, Churachandpur and Bishnupur where shifting cultivation has been practiced. Among these the highest was recorded in Tamenglong with disease incidence of 16.51% during July and 38.62 % during September 2016. Whereas in plains Imphal East district showed higher disease incidence of 10.79% in July and 29.22% during September as compared to Imphal west district which showed 08.89% during July and 25.39% during September 2016. Isolation of the biocontrol agent was done from the air-dried rhizosphere soil of healthy ginger leaves and rhizome using selective media. The studies resulted in recovery of those organisms which are known to act as biocontrol agents of plant pathogens. The isolated cultures of *Trichoderma* spp. were identified as six isolates of *Trichoderma asperellum*, six isolates of *T. harzianum*,one isolate each of *T. hamatum* and *T.longibrachiatum.* Maximum growth and sporulation of isolates of *Foz* was recorded at a temperature of 30^0C with pH 7. The antagonism test showed that 78% of the Trichoderma isolates strongly invaded *Foz in vitro* (rating =1 or 2). 47% had a rating of 1, 25% had a rating of 2, 15% had a rating of 3, 9% had a rating of 4 and 4% had a rating of 5. Comparison between the population densities of most potent Trichoderma isolate (*T. harzianum*-MH259837) and *Fusariumoxysporum* f.sp.*zingiberi*in ginger field at plains and under jhum cultivation was carried out. The initial population 6.8×10^5 c.f.u/g seed for *T.harzianum*-MH259837 and 2.4×10^6 c.f.u/g soil was recorded. The result showed that among the different substrate tested for mass multiplication of *T. harzianum*-MH259837 in plains at 30 DAS highest population densities was recorded in treatment with rice bran + *T. harzianum*-MH259837 (6.5×10^5 c.f.u/g soil). The success of a biocontrol agent depends much on the establishment of the product, the formulation and delivery system. The production of propagules can be carried out in liquid or solid fermentation. The maximum biomass production is influenced by aeration, agitation, pH, and temperature. It has been reported that the formulation used to introduce *Trichoderma* in soil influences rhizosphere competence. Agricultural wastes that have been reported to be good substrates as a result rice bran was found to be the most suitable substrate and highest spore count was observed for BCA.

Keywords:Ginger rhizome rot,*Trichoderma* spp., *Fusariumoxysporum* f.sp. *zingiberi*, jhum/shifting cultivation, mass multiplication.

Effect of Priming on growth and yield of French bean.(*Phaseolus vulgaris* L.)

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Abstract

An experiment entitled "Effect of Priming on growth and yield of French bean.(*Phaseolus vulgaris* L.)" was conducted during Rabi 2018-19 in the Vegetable Research field of Department of Vegetable Science, College of Agriculture, OUAT, Bhubaneswar. The trial was conducted in Randomized Block Design with three replications and ten treatments. The treatments were T_1 (Hydro priming), T_2 (GA_3 50 ppm),T_3 (KCl 2%),T_4 (Sodium Molybdate

500 ppm) ,T_5 (Vitavax 2g/kg) , T_6(*Pseudomona fluorescens* 10%), T_7(*Trichoderma viride* 10%), T_8 (GA_3 50 ppm+ *T. viride* 10%), T_9 (Sodium Molybdate 500 ppm +*Pseudomonas fluorescens* 10%),T_{10} (Control) Good quality seeds of French bean variety Harsha was taken and different priming treatments were done in the laboratory followed by growing the crop in the field as per recommended package of practices. Observations on twenty two characters were taken during the experiment. It was observed that the plant height at harvest was the highest (45.91 cm) in T_3 followed by 43.23 cm in T_8, the number of pods per plant was highest in T_3 (32.40) and T_2 (30.40) compared to control (20.2). length of pod was highest with T_8 (13.80 cm) followed by T_2 (13.70 cm), fresh weight of one pod was highest in T_3 (6.5g) followed by 6.2 g in T_7, number of seeds per pod was highest in T_3 (5.44) followed by T_8 & T_2 (5.2) and pod yield per plot was highest in T_3 (11.96 kg) followed by T_8 (10.98 kg). However the pod yield per hectare was highest in T_3 (13.28 t/ha) followed by 12.19 t/ha in T_8 and 11.86 t/ha in T_2 and the lowest pod yield of 8.10 t/ha was obtained in unprimed control. However days to 1st flowering & 50% flowering were found non significant. Priming with (GA_3 50 ppm + *T.viride*10%) was found the best in reducing leaf anthracnose and root rot by 62.9% and 75.9% respectively .Vitavax 2g/kg was the next best priming treatment which reduces anthracnose and root rot by 53.2% and 63.8% respectively. The seed quality parameters as studied in laboratory revealed the highest germination of 84.2%, seedling length of 43.00 cm ,Vigour index –I of 3620.6 and Vigour index –II of 72.41 in KCl 2%. From the present experiment it can be concluded that if (KCl 2%) is used for priming of French bean seeds it produces better yield attributing character & also record better yield of 13.28 t/ha followed by 12.19t/ha with (GA_3 50 ppm+ *T. viride* 10%.

Deficit irrigation strategies for improvement of WUE and saving of water in fruit crops

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Abstract

Water has become the most precious of natural resources in many areas since agriculture is the major consumer of water, improvement in water use efficiency are increasingly sought. There are many pressures on irrigators to improve the water use efficiency of their crops. These include increases in the cost of water and reduced water availability. To a large extent, these issues are generic to most irrigated horticultural crops, since supply of water through irrigation is an essential component of all intensive horticultural practice, including citrus, mango, grapes, papaya, litchi etc production. We then sought with addition of deficit irrigation strategies, Deficit irrigation (DI) is a watering strategy proposed many years ago to improve water productivity and reduce the irrigation application. The Partial root zone drying technique alternates irrigation such that one side of the tree root zone is allowed to dry whilst the other side is irrigated. Regulated deficit irrigation consists of applying water in quantities below those necessary to satisfy crop evapotranspiration during certain periods of the crop cycle. Lima *et al.*, (2015) worked on papaya and obtained that papaya can tolerate some water deficit without significant reduction in yield. DI resulted in considerable saving in water which improved water use efficiency in litchi (Mali *et al*., 2014). Grapefruits are a rich source of vitamin C, flavonoids, carotenoids and other nutraceutical compounds which is increase by water stress in T2 and T3 phase of fruit growth (Navarro *et al*., 2015). In Mango increase fruit weight, fruit retention capacity and yield by irrigation management (Spreer *et*

al., 2009). Hence we conclude that Combination of DI with other practices like mulching, protected cultivation and pruning improve WUE and facilitated the saving of water.

Key words: Deficit irrigation (DI), Partial root zone drying (PRD), Regulated deficit irrigation (RDI), water use efficiency (WUE).

Productivity of different cropping systems in rainfed pecan nut based agroforestry in Indian Himalaya

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Abstract

A field experiment was conducted (2010-2016) to determine the feasibility and profitability of pecan nut based agroforestry over control (without pecan nut) in rainfed ecosystem of the Indian Himalaya. Four cropping systems, *viz*. finger millet (*Eluesine coracana*)–lentil (*Lens esculentum*), finger millet (*Eluesine coracana*)–wheat (*Triticum aestivum*), soybean (*Glysine max*)–lentil (*Lens esculentum*) and soybean (*Glysine max*)–wheat (*Triticum aestivum*) were evaluated under pecan nut and control (without pecan nut) in rainfed ecosystem. The results revealed that significantly higher (15%) grain yield was recorded in control (3.67 t ha^{-1}) compared to under pecan nut (3.19 t ha^{-1}). Among cropping systems significantly higher 73.9, 47.1 and 16.4% grain yield was recorded from soybean–wheat system than finger millet–lentil, soybean–lentil and finger millet–wheat systems, respectively. Similarly, wheat equivalent grain yield was also significantly higher in control (4.89 t ha^{-1}) as compared to under pecan nut (4.25 t ha^{-1}). System productivity of the crops was significantly higher (16.3%) in control (26.36 kg ha^{-1} day^{-1}) compared to under pecan nut (22.67 kg ha^{-1} day^{-1}). However, soybean–wheat (30.67 kg ha^{-1} day^{-1}) system was significantly more productive than finger millet–wheat (26.02 kg $ha^{-1}day^{-1}$), soybean–lentil (22.52 kg ha^{-1} day^{-1}) and least productivity was recorded in finger millet–lentil (18.87 kg ha^{-1} day^{-1}). Gross returns was more than two and three fold with pecan nut (1,52,192 and 3,31,076 ₹ ha^{-1}) as compared to control (70,883 and 1,02,154 ₹ ha^{-1}) in years 2010 and 2016, respectively. Soybean–wheat (1,31,965 and 2,75,459 ₹ ha^{-1}) system provided maximum gross returns and least was under finger millet–lentil (1,02,221 ₹ ha^{-1}) and finger millet–wheat (2,28,692 ₹ ha^{-1}) cropping system in year 2010 and 2016, respectively. Hence, it is concluded that pecan nut based agroforestry is more profitable in terms of economics, diversified output and ecological balance.

Keywords: Agroforestry, Cropping system, Himalaya, Pecan nut, Productivity

In vitro evaluation of fungicides and biocontrol Agents for management of root rot of *Cedrus Deodara* (Roxb.) G. Don caused by binucleate *Rhizoctonia* AG-E

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Abstract

Cedrus deodara is the state tree of Himachal Pradesh, the most important conifer in the Himalayan moist temperate forests. Root rot is a serious diseaseof *Cedrus Deodara* caused by binucleate *Rhizoctonia* AG-E that causes critical economical losses in Himachal Pradesh. We conducted two experiments, one to test the *in vitro* efficacy of rhizospheric fungal and bacterial antagonists against the binucleate *Rhizoctonia* AG-E pathogen through dual culture technique and second to test the *in vitro* efficacy of Fungicides against the binucleate *Rhizoctonia* AG-E pathogen through poisoned food technique. In first experiment, Antagonistic activities of the native fungal and bacterial microorganisms were determined against Root rot pathogen (Binucleate *Rhizoctonia* AG-E), the most effective antagonists could be evaluated under pot conditions for the management of the disease. We evaluated four fungal antagonists and two bacterial antagonists, out of four species of fungal antagonists *Trichoderma viride* was found to be most effective and showed significant superiority amongst all the antagonists tested that resulted in 75.02 per cent inhibition of the mycelia growth of pathogen followed by *T. harzianum* with 70.41 per cent inhibition. Out of two bacterial antagonists, *Bacillus subtilis* was found better than *Pseudomonas fluorescens* which inhibited the mycelial growth up to 66.11 per cent as compared to *P. fluorescens* with 40.75 per cent mycelial inhibition under *in vitro* conditions. In second experiment, we evaluated ten chemicals against the binucleate *Rhizoctonia* AG- E causing root rot of *cedrus deodara* (Roxb.) G. Don. Amongst ten fungicides , tebuconazole + trifloxystrobin was found most effective and showed significant superiority among all the chemicals tested that resulted in 95.18 per cent inhibition of the pathogen followed by carbendazim 50 WP (92.88%) and hexaconazole 5 EC (85.47%) under *in vitro* conditions.

Keywords:Antagonists, *Cedrus deodara*, Fungicides, *Rhizoctonia*, *in vitro, Inhibition.*

Development of low calorie functional beverage from *Aloe vera*, apricot and herbal extracts using stevioside

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Abstract

Aloe vera (*Aloe barbadensis* Miller**)**, is being used as a valuable ingredient for developing food and pharmaceutical products mainly because of its biological activities and functional properties. However, its utilization in beverages is limited due to its poor appearance and bitter after taste. Further, excess calorie intake has been reported partially responsible for increased incidence of lifestyle related diseases like coronary heart disease, obesity, diabetes etc. Whereas, non-nutritive sweeteners like stevia/stevioside can offer consumers a way to enjoy the sweet taste with no calories. Therefore, efforts have been made to develop a calorie therapeutic beverage by blending *Aloe vera* with apricot pulp and herbal extracts in different proportions and replacing sugar sweetness with the equi-sweetness of stevioside (steviol glycoside). Results revealed that the beverage prepared by using 25 per cent fruit part of *Aloe vera*-apricot blend (70:30) having 40ºB TSS with herbal ingredients consisting of black salt,

ginger extract, common salt, black pepper, cumin and large cardamom was adjudged best by the panellists in terms of better taste, flavour and overall acceptability score. Further, sensory analysis of reduced calorie herbal beverage indicated highest acceptability for the treatment prepared by replacing sucrose sweetness with 75% stevioside sweetness level without adversely affecting the overall sensory quality of the prepared beverage. The developed low calorie herbal beverage contained good amount of ascorbic acid (19.22 mg/100g), phenolics (70.11 mg/100g) and found to have strong antimicrobial activity against *Staphylococcus aureus* compared to control samples. The aloin content in the developed beverage was estimated to be 0.70 ppm. Whereas, the energy value was recorded to be 54.24 Kcal/100g compared to 146 Kcal/100g in the control sample, thereby reduced the calorie value to about 64 per cent.Hence, the developed product can help in exploring the possibilities of utilization of *Aloe vera* as one of the substrate for the beverage industry with reduced calorie value and enhanced phytochemicals.

Keywords:*Aloe vera*, apricot, functional beverages, non-nutritive sweeteners, stevioside and low calorie beverages

Seasonal Incidence of Foliage Insect-Pests Infesting Rabi Oats (*Avena sativa* L.)in North Kashmir

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Abstract

Experiment was carried out in the field at the Faculty of Agriculture, Wadura, Kashmir, India during 2015-16 under free choice conditions to Seasonal incidence of different foliage insect-pests infesting Rabi Oats (*Avena sativa* L.**)** in North Kashmir. The results of investigation on Per cent damage of caterpillars of armyworm (*M. separata*) appeared from 10th meteorological week (7.57%) and reached its peak (29.97%) in the 22nd meteorological week whereas, caterpillars of gram pod borer (*H. armigera*) appeared from 12th meteorological week (2.75%) and reached its peak (22.67%) in the 18th meteorological week. Similarly, damage of cereal leaf beetle (*O. melanopa* L) appeared from 8th meteorological week (5.94%) and reached its peak (34.58%) in the 23rd meteorological week while, damage of surface grasshoppers appeared from 10th meteorological week (1.26%) and reached its peak (3.21%) in the 22nd meteorological week. Later on, the pest population declined gradually towards the maturity of crop. Correlation between abiotic factors and per cent damage through caterpillars of *M. separata*, *Helicoverpa armigera*, and *O. melanopa* and grasshopper exhibited highly significant positive correlation with maximum, minimum temperature and sunshine (hrs.), while as highly significant negative correlation with relative humidity of morning as well as non-significant negative correlation with relative humidity of evening. However, this pest exhibited non-significant positive correlation with rainfall.

Keywords: *Helicoverpa armigera*, percentage damage, oats, weather parameters and correlation.

Determination of Various Insecticidal Residues in Tomato

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Abstract

Various rapid methods were developed in reverse phase high performance chromatograph (RP-HPLC) for instantaneous detection of various insecticides, which are commonly used by the farmers of Manipur in tomato for controlling various insect pests. Extraction and clean-up process was done by modified QuEChERS wheresodium chloride, activated anhydrous, magnesium sulphate ($MgSO_4$), anhydrous sodium sulfate, primary secondary amine (PSA) sorbent and graphitized charcoal black were used. The peak determination of insecticides was achieved by C_{18} column with UV-VIS detector. The conditions developed in HPLC for different insecticides for different methods are as follows: (i) The peaks of imidacloprid, carbofuran, chlorantraniliprole, fipronil, malathion, chloropyriphos and cypermethrin in chromatograms was observed at retention times of 2.67, 3.27, 3.50, 4.00, 4.20, 8.60 and 9.97 mins respectively at 225 nm wavelength, (ii) the method for determination of monocrotophos and deltamethrin was separated by an isocratic flow of 1.70 ml/minat 0.79 and 3.00 mins respectively (iii) the peaks of phosphamidon and dichlorovos was separated at 210 nm wavelength and the peaks were found at 1.13 and 1.40 mins for phosphamidon and dichlorovos respectively and (iv) the simultaneous detection of residues of thiamethoxam, flubendiamide and α-endosulphan and β- endosulphan were found at distinct peaks of retention times at 1.90, 2.35, 3.35 and 3.80 mins respectively at 230 nm. Constant recoveries of the above methods were found 80 % for all the insecticides when tomato samples were spiked at different levels of 0.05, 0.10, 0.25, 0.50 and 1.00 mg kg^{-1} levels.

Characterization of pummelo germplasm in new alluvial zone of West Bengal

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Abstract

Pummelo (*Citrus grandis* Osbeck.), thegiant among the citrus, is one of the major monoembryonic species and is well known as the ancestor of grapefruit. The presentinvestigation was carried out with twelvegenotypes of pummelo with three replications in each during 2016-17considering nineteen characters like leaf characters, flowering and fruit morphological, physical and chemical characters from 'citrus descriptor' (cited by IPGRI, Rome, Italy).Among different morphological characters of leaf, fruit, pulp and seed the pattern of variation was more in characters like leaf lamina margin, leaf apex, fruit shape, fruit base, fruit skin colour, pulp colour and seed shape. The above-mentioned

morphological characters are generally highly heritable characters and identity of individual types which may lead to chance of getting desirable types. Early flowering and maximum yield obtained in Type-1.The wide variation of fruit yield showeddue to number of fruits per plant and other yield attributing characters.Less number of seeds in a fruit was obtained in Type-9. Significant variation in ascorbic acid (34.98 – 62.61 mg/100 ml juice) was obtained among different pummelo germplasm.From the present investigation, it can be concluded that there is a wide range of variation among different pummelo germplasm.Few types can be exploited for commercial cultivation in new alluvial zone of West Bengal like-Type-1,Type-2, Type-3,Type-5, Type-9 and Type-10 and Type-11

Keywords: Pummelo, Citrus descriptor, variation, yield, TSS/acid ratio, characters

A comparative evaluation of somaclonal and gamma rays induced variation in strawberries under field conditions.

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Abstract

The present study was conducted to evaluate the induced somaclonal variation and gamma irritated mutants in the strawberry plantlets. For the induction of gamma rays mutants *in vitro* axillary buds of strawberry cv. Chandler were treated with different doses of gamma rays (10 Gy, 30 Gy, 50 Gy and 60 Gy) and for the induction of somaclones leaf explants of strawberry were used. The somaclones performed better with regard to vegetative and reproductive characters in terms of number of leaves, number of flowers, number of fruits, fruit size and weight per plant while axillary buds irradiated with lower dose of gamma rays (10 Gy and 30 Gy) was more vigorous in terms of number of leaves, number of flowers and petiole length and plant height respectively as compared to field grown plants whereas, axillary buds irradiated with higher dose of gamma rays (50 Gy and 60 Gy) showed abnormal fruit development, reduced growth with short height, small leaf area and fruit size as compared to field grown plants. A total of 6 variants were obtained on screening the somaclones and irradiated plantlets on the basis of phenotypic characters, fruiting characters and SSR markers. The frequency of variants was higher in soamclones (3.22%) than in irradiated plants (2.75%) obtained from axillary buds.

Genetic variability in peach (*Prunus persica* L.) genotypes for fruit quality and yield attributes grown under temperate environment

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Abstract

The present investigation was carried out at experimental field of ICAR-CITH, Srinagar to assess the genetic variation in 40 peach genotypes for important horticultural traits. All the

selected genotypes differed significantly for fruit, color, physico-chemical and yield attributes. Ten economic traits were scored and subjected to multivariate analysis. Results revealed a considerable phenotypic variability among peach genotypes for the traits studied. The cluster analysis classified genotypes into two major groups according to their potential characteristics. The first group was found superior attributes in terms of highest fruit length, weight, width and diameter and second group in high fruit weight, high TSS, titratable acidity and high yield per plant. Principal component analysis (PCA) revealed that The first PC, which is the most important component, explained 39.8% of total variation and was positively related to leaf length and leaf length/width ratio, leaf thickness, oil content (fresh and dry weight basis), stone weight, yield per plant. Among genotypes most diverse genotypes were Nimla, Summerglo, Mayfire, Red Globe, Fantasia, Crest Heaven, CITH-P-5, Syria and Punjab Nectarine which could be utilized as superior diverse genotypes and donor parents to commence crossing in peaches and breeding programs which may result in increase in the desired traits such as fruit color, fruit size, TSS and yield per plant.

Keywords: Peach, genetic variability, fruit quality, yields, temperate

Evaluation of pheromone traps for the management of pod borer, *Helicoverpa armigera* (Hubner) in redgram [*Cajanus cajan* (L.)Millsp.]ecosystem

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Abstract

The present study was carried out to study the trap design optimization on trap catches of the pod borer, *Helicoverpa armigera* in redgram ecosystem during *Kharif* 2017 at experimental farm of NPRC, Vamban and farmer's field at Vadakaddu in Tamil Nadu. The study on trap design comparison indicated that at both locations the green funnel traps caught significantly more moths than others. Next in rank was yellow funnel trap with triple stand followed by red funnel traps and yellow funnel traps with double stand. Among the other trap types compared, Delta traps with holes were next in rank and caught significantly more moths than those without holes. The other water basin trap followed by delta trap was in descending order of moth catches, recording poorer catches than others. These results have confirmed the superiority of funnel traps in general over other trap types for *H. armigera* moth trapping.

Evaluation of rapid spot tests such as Latex Agglutination Test and Dot ELISA based on Recombinant LigB protein for detection of anti-Leptospira antibodies in dogs

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Abstract

Canine leptospirosis, which is often referred to as Stuttgart's disease, is a serious public health concern since dogs act as an epidemiological link between wild or feral reservoirs and humans. This *spirochetal disease* has been a bane to canines worldwide since it is responsible for hemorrhagic diathesis, uveitis, pulmonary hemorrhage as well as acute hepatitis and renal failure. In the present study, 423 canine sera collected from different Indian states such as Kerala (n=101), Karnataka (n=94), Manipur (n=88), Uttar Pradesh (n=63), Odisha (n=42) and Maharashtra (n=35) were screened using Microscopic Agglutination Test (MAT). Out of 423 sera screened, agglutinins against various leptospiral serovars were present in 121 canine sera samples (seropositivity 28.6%). Most predominant serovars reported in this study was Icterohaemmorhagiae 102 (24.11%), Grippotyphosa 71 (16.78%), Pyrogenes 35 (8.27%), Javanica 27 (6.38%), Canicola 12 (2.83%), Pomona 11(2.60%), Australis 08 (1.89%), Dejasiman 07(1.65%), Autumnalis 06 (1.42%), Cyanopteri 06 (1.42%), Tarassovi 02 (0.47%). The inherent pitfalls of MAT have forced researchers to search for alternative field oriented tests. Hence, in this present study, a truncated recombinant antigen of 46 KDa which represented the N terminal conserved region of LigA and LigB (rconLigA/B) was chosen as the diagnostic antigen to develop field oriented spot tests such as Latex Agglutination Test (LAT) and Dot-ELISA to detect canine leptospirosis. All the canine sera (n = 423) subjected to MAT were further screened using recombinant rconLigA/B based LAT and Dot ELISA. The sensitivity of rconLigA/B based LAT and Dot-ELISA for 121 MAT positive sera were 83.47% and 77.68% respectively while the specificity of rconLigA/B based LAT and Dot-ELISA for 302 MAT negative sera was 99.01% and 99.33 % respectively. Further, Kappa value of 0.86 and 0.82 for rconLigA/B based LAT and Dot-ELISA respectively indicates high agreement with MAT. The results obtained with these two spot tests indicates direct field applicability of these tests in resource poor settings prevalent in tertiary levels of animal health care system.

Response of scheduling of irrigation with mulch under different planting methods on cane and water productivity in sugarcane

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Abstract

The aims of correct irrigation scheduling are to produce the optimum yield and to apply water efficiently. An experiment was conducted during 2016-17, 2017-18 and 2018-19 at research farm of Genda Singh Sugarcane Breeding and Research Institute, Seorahi, Uttar Pradesh under AICRP on sugarcane.The experiment consist of four combination of planting methods and mulching practices i.e. (P_1) conventional flat planting 75 cm row spacing with organic mulch @6 t/ha, (P_2) conventional flat planting 75 cm row spacing without mulch, (P_3) paired row trench planting 120:30 cm row spacing with organic mulch @ 6 t/ha and (P_4) paired row trench planting 120:30 cm row spacing without mulch and three irrigation schedule (IW/CPE) with irrigation water depth 7.5 cm i.e. I_1- 0.60, I_2- 0.80 and I_3- 1.00 were tested in strip plot design with three replications. Recommended dose of N:P:K ratio was 180:80:60 kg per hectare and applied before onset of monsoon. The experimental field was medium in

organic carbon, medium in available phosphorus and low in potash with pH 8.15. Sugarcane variety CoSe 11453 was planted in spring season. The experimental findings on the basis of pooled data of three years showed that paired row trench planting 120:30 cm row spacing with organic mulch @ 6 t/ha recorded significantly higher germination per cent (56.18), shoot population (166.20 thousand ha^{-1}), NMC (124.46 thousand ha^{-1}) and cane yield (106.59 t/hectare) over remaining treatments of planting methods except paired row trench planting 120:30 cm row spacing without mulch treatment. Lowest cane yield (72.85 t ha^{-1}) was obtained in conventional flat planting 75 cm row spacing without mulch. Irrigation scheduling IW/CPE 1.0 ratio recorded significantly higher germination (53.10 per cent), shoot population (164.89 thousand ha^{-1}), NMC (116.76 thousand ha^{-1}) and cane yield (101.85 t ha^{-1}) over remaining irrigation scheduling. Sucrose per cent was not affected significantly due to different treatments of irrigation schedules and planting methods. Water productivity was recorded maximum in paired row 120:30 cm spacing trench planting with organic mulch @6t/ha (7.04 q/ha-cm) and 6.47 q/ha-cm in IW/CPE ratio 1.0 irrigation schedule.
Keywords:Mulch, Irrigation, Scheduling, CPE ratio, Planting, Water

Grain yield, growth and biochemical parameters of wheat (*Triticum aestivum* L.) varieties under timely and late sown conditions to assess thermotolerance

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A field experiment was carried out in Factorial Randomized Block Design (FRBD) with three replications to assess the thermotolerance in wheat varieties when grown under timely and late sown conditions and to study the biochemical parameters of grains as also their relationship with grain yield. Nine different wheat varieties *viz.*, GW 433, GW 431, HI 1571, GW 432, RAJ 3765, HD 2864, HI 1563, HD 3091 and PBW 670 sown in timely and late sown conditions (i.e., 22 November and 6 December 2012) were included in the study. Late sown varieties were exposed to 32.40C and 33.9-35.30C temperature during flowering and grain filling period as against 29.40C and 30.3-33.30C temperature faced by timely sown wheat. Grain yield was reduced under late sown condition as compared to timely sown wheat. Considering the yield reduction, variety HI 1571 exhibited the least reduction (1.73%), followed by GW 433(7.90%) and GW 431 (13.8%) under late sown condition, whereas variety PBW 670 recorded maximum grain yield reduction (29.41%). Varieties GW 433 and PBW 670 exhibited increased chlorophyll content under late sown condition. HD 2864 had showed better performance with respect to lysine content. Under late sown condition, variety GW 433 recorded higher CGR while GW 431 had maximum LAI. Considering correlation coefficient, grain yield showed very strong significant positive association with crop growth rate. It also exhibited positive and significant correlation with chlorophyll content.

Key words: Growth parameters, lysine, crop growth rate, leaf area index, thermo-tolerance, wheat

Effect of seasons on the microbiological quality of raw milk produsd and sold in the central region of Madhya Pradesh.

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Abstract

Milk is often described as a complete food because it contains various nutrients, but it also serves as a suitable medium for microbial growth . Fresh milk (immediately after milking) has <100 bacteria per ml. The Coliform limits accepted internationally are less than 100 cell/ml. A total of 100 samples obtained from different producers were analyzed for microbiological properties during the period between April 2018 to March2019. About 52.3 % of the samples from milk available from vendor and shops for consumption satisfy this limit. In winter and summer the percentages of milk samples which satisfy this limit were 70.4 and 51.3%, respectively. Vendor milk is more contaminated; with Coliform bacteria compared to milk from the shops; only 47.8% were in the acceptable limits during winter and 43.07% summer. The difference between winter and summer counts, and the differences between individual, bulk, vendor and shops were statistically significant, at p(0.05). In this study 60.1% of all the raw milk samples in the state were of counts between 0 to <100 cell/ml, but in winter the percentage (76.9%) was higher than summer (53.6%). Statistically there was a significant difference between the two seasons in the state, but the differences between these three areas were statistically insignificant. The majority of the coliform isolates for the raw milk consumed in Escherichia coli 32%, Enterobacter species 29.2`%, Klebsiella species 19.4%, Serratia species 11.1% and Citrobacter 1.0%, in addition to some Enterobacteriaceae.

Key words: Coliform bacteria, Count, isolation.

Environmental Pollution an Emerging Issue Caused by Agricultural activity

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Abstract

Crop and livestock production have an intense effect on the wider environment. They are the main source of water pollution by nitrates, phosphates and pesticides. They are also the major anthropogenic source of the greenhouse gases methane and nitrous oxide, and contribute on a massive scale to other types of pollution. The extent and methods of agriculture, forestry and fishing are the leading causes of loss of the world's biodiversity. Agricultural activity refers by-products of farming practices that result in contamination or degradation of the environment and surrounding ecosystems, and/or cause injury to humans and their economic interests. If more sustainable production methods are used, the negative impacts of agriculture on the environment can be minimized. No single cause can be attributed to the widespread environmental pollution we face today. If agricultural production patterns don't change, the environmental pollution will gradually accumulate. Contamination of agricultural products can not be reflected through the price system. Nowadays, farmers are using new techniques to increase the crop productivity and quality, but despite all this, this industry is not following rules and regulations that have been implemented in other industries. Therefore, there should be a primary focus to strengthen the regulatory programs to prevent the agricultural pollution and its drastic effects on the environment. Proper policies should be

made on local to global level to minimize its effects on our surroundings and to improve yield, quality, the agricultural practices, and the wellbeing of humans and biodiversity.

Keyword: Environmental Pollution, Emerging Issue, Nowadays, Agricultural activity

Comparative Transmission Electron Microscopic Studies on erythrocytes of *Clarias gariepinus* (Magur Fish) and Rohu (*labeo rohita*)

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Abstract

The studies were conducted on six magur and six rohu fish of Jharkhand region. The erythrocytes of magur fish under transmission electron microscope were mostly spindle to elongated in shape. However, erythrocytes of rohu were elongated, triangular, ovale and irregular in shape. Few small rounded vacuoles were seen in rohu however, it was not visible in magur. Few electron dense bodies were seen in cytoplasm of rohu however, it was not visible in magur. Cytoplasmic organelles was not visible in both magur as well as rohu fish. The nucleus was mostly heterochromatic in both the fishes. The nucleus was rounded and centrally located in rohu fish whereas it was oval slightlyeccentric in magur. The nuclear membrane was well visible in magur fish however; it was not clearly visible in rohu fish.

Aeroponic minituber production through TPS

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Abstract

Recent developments in automation of minitubers production have further enhanced adaptability of these techniques in potato seed production. In addition to quality assurance through meristem culture, aeroponic technique of minitubers production ensures high multiplication rate at initial stages of quality seed potato production. TPS as a source of plant material for minituber production through aeroponics was tried for the first time. 150 lines were evaluated and 100 minitubers/plant productions were recorded. The TPS of a cross were planted in portrays containing soil coco-peat media (1:1). After one month, each germinated seedlings were transferred for hardening in a glass filled with soil: FYM (2:1) media for vigorous growth thereof. After 15-20 days the plants were ready for transplanting in the aeroponic boxes. The roots were properly washed and treated with fungicides (Bavistin (1%) +mancozeb (2%) mixture) to avoid any further media contamination. There was 100% survivability of the plants. The first harvesting was done at 28-30 days of transplanting. This technique could serve the purpose of accelerated breeding to advance the generations in potato breeding.

Keywords: TPS, Minitubers, Aeroponic, Nutrients, Planting Source

Impact of Abiotic Factors on Eriophyid Mite, *Aceria jasmini* C. damage in Jasmine, *Jasminum auriculatum* Vahl.

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Abstract

Jasminum auriculatum is an ornamental medicinal flower crop cultivated commercially in India and Thailand and also found in Nepal, Sri Lanka, Bhutan and Andaman Islands. It is generally infested by budworm, blossom midge, thrips, leaf web worm, mite species. In which eriophyid mite, *Aceria jasmini* cause considerable economic damage to *J. auriculatum*. A study was carried out in ADAC & RI (TNAU), Trichy to record the damage sequence of eriophyid mite from August 2019 to March 2020. Results indicated that damage was recorded throughout the study period with maximum occurrence in February 1st fortnight (57.83%) and minimum in January 2nd fortnight (13.55%). The eriophyid mite has 7 – 30µm length stylet. Mite punctures leaf epidermal cells and sucks sap meanwhile inject callose that results in cell walls thickening and hairy outgrowths (erineum). Based on these erineum symptom developments the damage percentages were recorded. The incidence was positively correlated with maximum (r = 0.272), minimum (r = 0.279) temperatures, rainfall (r = 0.308) and negative with morning (r = -0.214) and evening (r = -0.113) relative humidity. Regression equation obtained with weather parameters was $Y = 88.78 + 0.76\ X_1 + 0.11\ X_2 – 0.87\ X_3 – 0.08\ X_4 – 5.25\ X_5 – 0.85\ X_6 + 5.31\ X_7 + 0.11\ X_8$. As per statistical analysis, increase in 1mm rainfall would tend to increase damage by 0.11%. In the study period, October 2nd fortnight received maximum of 160mm rainfall while the damage was 56.94, which subsequently reduces in the following fortnights as 40, 33.33 and 32.93 %. Integrated pest management strategies has to be planned during peak incidence of the insect pest. Further observation on seasonal occurrence has to be studied to better understand the incidence of eriophyid mite.

Keywords: *Aceria jasmini*, *Jasminum auriculatum*, Seasonal occurrence, Weather parameters.

A new emerging insect pest under a changing climate scenario: Threats to our global infestation of Locust (*Schistocerca gregaria*) and their sustainable management

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Abstract

The desert locusts (*Schistocerca gregaria*) is a short-horned grasshopper and among the most destructive agricultural insect-pests because of the ability of swarms to fly rapidly across great distances. Innocuous when solitary, locusts undergo a behavioural change in a changing climate scenario and their population builds up rapidly. They enter the 'gregarious phase' by forming huge swarms that can travel up to 150 km per day, eating up every bit of greenery on their way. These insects feed on a large variety of crops.The bigger problem will come once the present swarms breed. An adult female locust lays 80-90 eggs thrice in her three-month life cycle. If left uncontrolled, a swarm can grow exponentially to 40-80 million locusts per square kilometre, when locust numbers have crossed the economic threshold level (ETL) which is 10,000 adults/ha.and 5-6 hoppers/bush that may require control. This coincides with the monsoon season is very high and frequency of desert locusts is doubled from May to November as compared to December to April and required temperature for growth and development range from 20–38°C. Locusts are invertebrate animals with highly migratory habits, marked polymorphism and voracious feeding behaviour. They are able to take rapid advantage of the climate and geography can survive in temperature range from 0 ˚C to 60 ˚C. Food and Agricultural Organization (FAO) alarm that more offensive that the insects were from new emerging areas and their losses hug number of crops tends to be led as famine and starvation in our global. Preventive management strategy is increasingly implemented as being the most rational effective, economically feasible and environmental sound methods of management. Therefore, finding of present research paper use of wide amount and number of chemical pesticides to control locust invasions is a central concern and alternatives a growing necessity. But it's no more effective and eco-friendlier so now time need to be applying Integrated pest management plague prevention strategy *i.e.*, monitoring the breeding period, cultural, physical, chemical pesticides and biologically as Green Muscle and NOVACRID are based on naturally occurring entomopathogenic fungus take up to two weeks to kill about 90% locust in early stage of infestation. Above the mention conclude that the integrated pest management plague prevention strategy is most essential for the management of locust.

Keywords: Locust, outbreak, preventive, INM strategy

Marine Microalgae as biofertilizer: Impact on agricultural crop production

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Abstract

Marine macroalgae or seaweed are rich in diverse compounds like lipids, proteins, carbohydrates, phytohormones, amino acids, osmoprotectants, antimicrobial compounds and minerals. Their potential for agricultural applications is used since antiquity, but recent demands of organic farming and organic food stimulated much the application of organic treatments like seaweed extracts in agriculture. The benefits of seaweeds application in agricultural field are numerous and diverse such as stimulation of seed germination, enhancement of health and growth of plants namely shoot and root elongation, improved

water and nutrient uptake, frost and saline resistance, biocontrol and resistance toward phytopathogenic organisms, remediation of pollutants of contaminated soil and fertilization. The use of marine algae is promising and provides suitable solutions to overcome pollution problems caused by the extensive use of chemical fertilizers and industrialization. Seaweeds are known to contain several organic contents which are helpful in retaining moisture and nutrients in the upper layers of soil. The beneficial impacts of seaweed-based fertilizer on soil and crop growth are to increase water-holding capacity, stimulation of microorganisms' activity and to improve soil texture. Seaweed fertilizers are helping soil to create an environment suitable for root growth by increasing microbial diversity and improving biological activities like respiration and nitrogen mobilization and mineralization of mineral nutrients. It is well established that marine algae are very rich in different secondary metabolite compounds, which make them resistant to different climatic and environmental stress conditions and which could also improve the fertility of agricultural soils and foster plant growth. Due to the diversity of these compounds, seaweeds or seaweed-derived products are also being utilized successfully in many different applications in industry, medicine, food and agriculture.

Keywords: Seaweed, Macroalgae, Biostimulants, Osmoprotecttion, Soil, Agriculture.

Effect of dietary supplementation of graded levels of sea buckthorn leaf meal on the body weight gain, feed conversion ratio, blood biochemical attributes and immunocompetence traits of coloured chicken during extreme summer

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Abstract

An experiment was conducted to study the effect of dietary supplementation of graded levels of sea buckthorn leaf meal on the body weight gain, feed conversion ratio, blood biochemical attributes and immunocompetence traits of coloured chicken during extreme summer. One hundred and twenty day old straight run coloured chicken were distributed into four dietary treatments: T1-basal diet, T2-T1+0.5% Sea buckthorn leaf meal (SBTLM), T3- T1+1% SBTLM, T4- T1+1.5% SBTLM, having three replicates each. The experiment was conducted during May-June and the average temperature during the experiment was 42^{o}C during 8 weeks experimental period. T2 group birds had apparently higher body weight gain and better FCR during 0-4 weeks, 4-8 weeks and 0-8 weeks of growth phase. There was no significant difference in the biochemical attributes among the treatment groups at 8 weeks of age. However, humoral immune response to 1% SRBC (log2 titre) and cell mediated immune response to PHA-P was significantly better ($P<0.05$) in T2 compared to other treatment groups at 8 weeks of age. Thus, it may be concluded that dietary supplementation of 0.5% SBTLM resulted in numerically higher body weight gain, better FCR and significantly better immune response in coloured chicken during extreme winter.

Keywords: Body weight gain, Chicken, FCR, Feed, Immunity, Sea buckthorn

GCA and SCA for Plant and Pod Parameters of Okra [*Abelmoschusesculentus* (L.) Moench]

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Abstract

Combining ability analysis was carried out for pod yield and its components in okra in a 12 x 12 diallel cross (excluding reciprocals) in a randomized block design, with 3 replications. Both general a combining ability (GCA) and specific combining ability (SCA) variances were highly significant for all the characters indicating the importance of both additive and non-additive gene actions. However, the relative magnitude of general and specific combining ability, variance revealed that the magnitude of general combining ability was less than specific combining ability variance indicating thereby that the non-additive component was of major importance in the expression of all the characters. The highest gca effect for pod yield per plant and pod yield per hectare were recorded in IC-45802, Parbhani Kranti and VRO-3. The highest significant positive sca effect was observed in the cross combinations *viz.*,IC-45802×SB-8, IC-45802×Pusa A-4 and IC-282272×Sel-4 for pod yield per plant and pod yield per hectare. Exploitation of hybrid vigour from these crosses through heterosis breeding method is advocated.

Keywords: Okra, Diallel cross, Combining ability, GCA, SCA and heterosis

Assessment of Potato Cyst Nematode (*Globodera* spp.) and other phytoparasitic nematodes related to potato fields in hilly regions of Uttarakhand

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Abstract

One of the most important objective of the present agriculture practices is to reduce extreme poverty and hunger. Phytoparasitic nematodes cause damage annually alone and in complex form with soil borne pathogen compared to insect pests. They cause estimated yield loss of 12.3 % ($157 billion dollars) worldwide. Out of which $40.3 million is reported from India. Nematodes are known to reduce both potato tuber quality and yield by inducing physiological modifications in plants and pave the way to the secondary infections by opportunistic plant pathogens leading to complex diseases. Under favourable soil and moisture condition plant parasitic nematodes typically complete their life cycles (from egg to egg laying adult) within

thirty to sixty days. Potato cyst nematodes (*Globodera* spp.) are serious pathogens that causes estimated yield losses up to 30% and reduce tuber quality. PCN are nematodes of the highest biosecurity and quarantine concern, their movement being regulated by over 100 countries. In India, PCN was first reported from Nilgiri hills in Tamil Nadu in 1961, followed by Himachal Pradesh and Jammu & Kashmir and are regulated by domestic quarantine. The present study was conducted to evaluate the diversity of phytoparasitic nematodes present in the potato fields of hilly regions of Uttarakhand, specifically focusing on Potato Cyst Nematodes (Quarantined Pest since 2018 in Uttarakhand). The district covered in the roving survey were, Pithoragarh, Bageshwar Almora, Champawat, Nainital, Rudraprayag, and Chamoli, The soil samples were collected just after the harvest of potato crop in order to assess the plant parasitic nematodes and samples were sieved and nematodes were identified and quantified on the basis of morphology of juveniles, females and males. This study reveals the presence of three major potato nematodes viz. PCN, *Cactodera* spp., *Punctodera* spp. for the first time in Uttarakhand spotting the major hot spot areas, infested areas and pest free areas alongwith *Aphelenchus, Tylenchorhynchus, Helicotylenchus, Tylenchus, Ditylenchus, Meloidogyne, Pratylenchus, Tylenchulus, Trichodorus, and Criconemoides* in the potato fields throughout Uttarakhand.

Keywords: Potato Cyst Nematode, Uttarakhand, Potato, Nematodes, *Globodera*

Carbon source, *meta*-topolin, inoculum density and auxin influence micropropagation in mango ginger (C*urcuma mangga*)

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Abstract

Curcuma mangga is a multipurpose species valued in pharmaceutical, fragrance and food industries. To multiply the species in large number, high efficiency multiplication protocol was developed. Factors such as carbon source and its concentration, kind and concentration of cytokinin, inoculum density and auxin concentration for concurrent ex vitro rooting cum hardening were studied. Culture medium supplemented with glucose (3%) and *meta* topolin (1 mg/L) as cytokinin was found to promote highest culture multiplication. Inoculum density of two-buds per culture bottle was recommended during subculture as it promoted superior shoot proliferation. Instead of in vitro rooting followed by hardening, concurrent ex vitro rooting cum hardening method was standardized and it was possible to induce rooting without auxin treatment. The present protocol could be useful for large scale production of quality planting material.

Keywords: Concurrent ex vitro rooting cum hardening; inoculum size; glucose; India; tropical

Cultivation method and weed management practices in rice *(Oryza sativa L.)*

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Abstract

Rice is a principal source of food for more than half of the world population. The only way to meet the future food requirements is to increase the productivity per unit area by utilizing improved production technology such as System of Rice Intensification (SRI) and Direct Seeded Rice (DSR). Weed management is the foremost component in rice, 15 to 90% of crop losses in India occurs depending upon the various establishment methods. An experiment was carried out in the agricultural farm, Palli Siksha Bhavana , Visva-Bharati, Sriniketan, West Bengal, under sub-humid, semi arid region of West Bengal during kharif session of 2014 and 2015 for studying the effect of different cultivation method and weed management practices on growth and productivity of rice under lateritic belt of West Bengal.The experiment was laid out in split plot design with three main plot treatment and five sub plot treatments with three replications. Sowing methods used for the experiment were M1: DSR, M2: SRI and M3: Conventional method of rice cultivation and sub plots treatments were application of S1-Azimsulfuron @35 g a.i per ha at 20 DAS/DAT, S2-Bensulfuron Methyle+Pretilachlor@70g +700 g a.i. per ha at 2 DAS/DAT ,S3: two hand weeding at 30 DAT & 45 DAT, S4:Cono-weeder at 30 DAT and variety of rice used for transplanting was Naveen. Result revealed that the growth characters and yield attributes of rice in all the growth stages in both the years were recorded highest in SRI method followed by DSR method and conventional method and among the weed control methods the highest values were seen in case of application azimsulfuron @35 g a.i. per ha, followed by bensulfuron methyl + pretilachlor @70g +700 g a.i. per ha and then conoweeder followed by hand weeding. The treatment combination SRI with use of azimsulfuron @35 g a.i. per ha recorded significantly highest values of growth characters and yield attributes in respect with other treatment combination.

Keywords: DSR, SRI, Cono-weeder, azimsulfuron, bensulfuron methyl, Pretilachlor.

Physiological response of Iranian wheat landraces under irrigated, restricted irrigated and rain-fed conditions

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Abstract

Drought is major abiotic environmental stress affecting about 32% of 99 million hectares under wheat cultivation in developing countries and at least 60 million hectares under wheat cultivation in developed countries. The major physiological attributes such as chlorophyll content and canopy temperature are severely affects under drought stress. The aim of present

study was to investigate the effect of water stress on 27 Iranian landraces along with commercial relevant checks under irrigated, restricted irrigated and rain-fed conditions. These lines were selected on the basis of minimum reduction of vigor index under water stress induced by Polyethylene glycol (6000) as compared to control lines under lab conditions Physiological traits such as chlorophyll content was recorded at regular interval from anthesis stage to maturity stage from tagged plants by using chlorophyll content meter (SPAD Model CM -200).Canopy temperature was recorded first at anthesis stage and then 10 days after anthesis using infrared thermometer (ModelLT-300) in cloudless and bright days with minimum wind movement between 12:00 noon to2:00 PM.Chlorophyll content at anthesis and chlorophyll content at post anthesis was significant among lines under irrigated and restricted irrigated conditions. These three lines IWA8600435, IWA 8600846 and IWA8607572 selected on the basis of chlorophyll content at anthesis and at post anthesis under irrigated, restricted irrigated and rain-fed conditions. Canopy temperature at anthesis and10days after anthesis among Iranian lines was highly significant under irrigated restricted irrigated and rain- fed conditions. IWA 8600064, IWA 860091, IWA 8606661 and IWA 8606739 had lower canopy temperature under stress conditions. The identified landraces can be included in future programmes for the wheat improvement in drought prone areas.

Keywords: Anthesis, Canopy temperature, Chlorophyll content, Iranian landraces, Post-anthesis and Water stress

Influence of various Irrigation and Micronutrients levels on maize (*Zea mays.L.*) Under Malaprabha command area in northern Karnataka

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Abstract

Field experiment was conducted during AICRP on water management Research institute on soil deficient in available micronutrient study the Influence of various Irrigation and Micronutrients levels on maize under Malaprabha command area in northern Karnataka. The results revealed that, crop receiving irrigation at 0.8 IW/CPE recorded significantly higher maize grain yields (70.80 q/ha) with higher gross returns (Rs.88,924) and net returns (Rs. 65,804) with B: C ratio of 3.84 as compared to other treatment. However, pooled analysis, the yields were on par with different irrigation levels. Among different level of boron applied to soil or through foliar application from 2 to 6 kg granubor /ha increased the yield over no boron application. But, significant results obtained at 6 kg/ha granubor application and foliar application of 0.5 % of $Feso_4$ and 0.5 % of Znso4with borax @ 0.1 % at 30 and 45 DAS. The interaction effects between irrigation and boron levels showed that, irrigating the crop at 0.8 IW/CPE along with foliar application of 0.5 % $Feso_4$ and 0.5 % $Znso_4$ with borax @ 0.1 % at 30 and 45 DAS recorded higher yield and higher gross returns and Net returns , B:C ratio and WUE over the treatments. But, it was on par with all the treatments receive the boron either through soil or foliar.

Keywords: Irrigation, micronutrients, yield of maize, economics

Delivery of oxaliplatin encapsulated in oleic acid solid lipid nanoparticle for lung cancer treatment

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Abstract

In spite of a large number of antineoplastic agents produced by the pharmaceutical industries, cancer is still considered the main reason for death worldwide. Oxaliplatin (OXA) is widely used in the treatment of cancer but they are very toxic to the organs due to their lack of selectivity. Solid lipid nanoparticles (SLNs) are usually spherical particles with an average diameter of 10 -1000 nm and possess a solid lipid core by the means of surfactant/cosurfactant. SLNs have revolutionized the pharmaceutical industry due to their potential to improve the bioavailability of the drugs. In this study, the antitumor activity of OXA encapsulated in an oleic acid-based SLN was *in vitro* evaluated in A549 non-small cell lung cancer cells. The inhibition of cell growth was examined by the crystal violet assay for 24h. The z-average diameter and zeta potential of the nanodroplets of the SLN formulas were measured by the zetasizer. The z-average diameter of SLN and OXA-SLN were (67.81 ±1.28) nm and (195.2 ±94.58) nm, respectively with zeta potential of (-9.09±0.68) mV and (-8.09±1.18) mV, respectively. It has been found that combining OXA with a SLN formula has enhanced the cytotoxicity of OXA as the IC50 of OXA (50±5.88) µM was reduced to (12.50±5.24) µM in OXA-SLN. The current study proved that formulating OXA in SLN has improved the therapeutic potential of OXA as anticancer drug.

Influence of Foliar Application of Pulse Magic on Seed Yield and Economics of Pigeonpea

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Abstract

Pigeonpea is extensively grown in northeastern dry zone of Karnataka and it occupies a unique position in every cropping system of this zone. Crop Productivity of pigeonpea being low in the north-eastern dry zone of Karnataka and this is due to several reasons. One of the main important and major reason is flower drop and poor seed setting. To reduce this problem and to enhance productivity of pigeonpea Krishi Vigyan Kendra (KVK), Kalaburagi, has introduced a product known as Pulse Magic (consists of nutrients and Plant growth regulators) as foliar spray. Foliar spray was carried out during 50% flowering stage and 15 days after 1st Spray. The result indicated due to foliar spray of Pulse Magic were higher number of pods per plant (212.91), pod weight per plant (78.08g), pod length (5.63cm) and test weight (12.48g), compared to control (120.82, 48.70g, 3.9cmand 9.45g, respectively). Due to increase in yield attributes higher seed yield was obtained (1442 kg/ha), as compared to control (1182 kg/ha). Consequent upon higher yield, higher net returns (Rs.53903/ha) were obtained in Pulse Magic sprayed plot compared to control (Rs.35647/ha).

Keywords: Pigeonpea, Economics, Yield attributes and yield

Correlation studies in Genotypes of China aster [*Callistephus chinensis* (L.) Ness] for yield under Shade net Conditions in Rayalaseema Region of Andhra Pradesh

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Abstract

Seven genotypes of China aster [*Callistephus chinensis* (L.) Ness] were evaluated for genotypic correlation coefficient between flower yield and 28 quantitative traits, to understand the association between these characters and their relative contribution to flower yield. The present investigation was carried out during the year 2017-18 at College of Horticulture, Dr. Y.S.R Horticultural University, Anantharajupeta, Y.S.R. Kadapa Dist. of Andhra Pradesh. The experiment was laid out in randomized block design with four replications under 50 per cent shade net condition. The aim was to bring about rational improvement in China aster. Significant positive correlation for the flower yield ha^{-1} with number of leaves plant^{-1} (0.897), number of branches plant^{-1} (0.893), plant spread (0.910), LAI (0.830), protein content in flowers (0.804), number of flowers plant^{-1} (0.944), weight of flowers plant^{-1} (0.999) and yield ha^{-1} (0.972) and negative correlation with days to first flower opening after flower initiation (-0.821). These traits may serve as effective selection parameters for breeding in China aster for improvement of the yield.

Keywords: China aster, genotypes, correlation, yield

Medicinal Plants and endophytic fungi: interplay for curbing cancer

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Abstract

Cancer is an extremely detrimental disease causing high mortality all over the world every year. At present surgical removal of tumors and systemic chemotherapy is available for treatment of cancer but these techniques also have adverse effects to human health. To

overcome these adverse effects, it is highly desirable to give emphasis on naturally produced bio-products for cancer treatments that are cost effective with high therapeutic value. Many studies show that the phytochemicals are very effect in inhibiting the cancer before and during the carcinogenesis. There is a wide range of phytochemicals like flavonoids, resveratrol, gingerol etc. are identified to control the progression of cancer in human body. Capsaicin (alkaloid compound in chilli), catechin, epicatechin, epigallocatechin and epigallocatechin-3-gallate (phytochemicals in greentea), lutein (carotenoid found in yellow fruits), garcinol (phenolic compound present in kokum tree) and many other naturally obtainable compounds are also very useful to develop the drugs to curb the cancer. There are numerous plant associated fungi (Endophytic fungi) available in nature which has the anti-cancers compounds and offers even stronger hopes for the discovery of anticancer drug. These endophytic fungi are, during their life cycle substantially embedded within the plant and share endosymbiotic relationship with plant. These fungi provide various bioactive molecules like terpenoids, flavonoids, alkaloids, phenolic compounds, quinines, and steroids etc. which have anti-cancerous property. These products are very less explored as compared to others for the purpose of drug discovery. Thus, the present perspective highlights the relevance of phytochemicals and chemistries in endophytic fungi in research to develop anti-cancerous regimes via use of naturally synthesized compounds.

Keywords: Phytochemicals, miRNA, Tumor inhibition, anti-cancer, endophytes, secondary metabolites

Development and Quality Evaluation of Shelf Stable Ready to Eat Pickle from Goat Intestine

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Abstract

Goats are slaughtered mainly for meat, the by - products that are emanated from slaughtered goat are also of good value. Intestine is one of the important edible offal and weighs about 1.2 to 1.5 kg per animal. Texture of intestine is rubbery due to characteristic muscular construction, poor functional properties and shelf life. It is necessary to evolve appropriate technologies to convert the tough and perishable goat intestine into convenience and more acceptable novel products. In this perspective, a study was conducted for the preparation of vinegar based shelf stable intestine pickle and assessed their storage stability at room temperature at an interval of 15 days up to 90 days. The mean pH, product yield (%), moisture (%), protein (%), fat (%), ash (%), titrable acidity (% acetic acid), free fatty acid (% oleic acid) and TBA value (mg malonaldehyde / kg meat)of the freshly prepared pickle were 4.94 ± 0.16, 88.58 ± 0.12, 54.66 ± 0.10, 20.74 ± 0.12, 15.24 ± 0.17, 1.94 ± 0.14, 1.68 ± 0.12, 0.62 ± 0.14 and 0.54 ± 0.12, respectively. pH, moisture and titrable acidity values were non significantly increased whereas free fatty acid and TBA values were significantly ($p < 0.05$) increased during the storage at room temperature up to 90 days. Total plate, coliform and yeast and mould counts of the goat intestine pickle remained satisfactory up to 90 days of storage at room temperature and the microbial counts were within the standard stipulated for

cooked meat products. Sensory attributes of the goat intestine pickle such as appearance and colour, flavour, tenderness, saltiness, sourness and overall palatability on 9 - point hedonic scale did not alter and the product remained highly acceptable throughout storage. Therefore, it can be concluded that pickle prepared from goat intestine had better physico-chemical and microbial qualities up to 90 days of storage at room temperature. Finding of this study have shown that goat intestine can be successfully used for preparation of shelf stable pickle of acceptable quality with substantial value addition to the materials.

Development of Ready to Fry Seasoning Meat Pellets (Meat Vadam) incorporated with Different Levels of Chicken Meat Emulsion

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Abstract

Left over rice vathals or vadams is a sun - dried product which can be stored for over a year. Vadam is traditionally made using left over rice. Most of the vadam available in the market are mainly based of cereals which are high in calorie and low in protein contents. Incorporation of animal proteins in such snack type food products can improve the nutritional quality especially with respect to amino acid composition, flavor, odor and taste. In this perspective, meat based ready to fry seasoning pellets (meat vadam) with 25, 50 and 75 % chicken meat emulsion were developed and their quality were evaluated. The corresponding levels of rice flour were 50%, 50% and 75% in the respective formulations. Control ready to fry seasoning pellets contained 100% rice flour and no chicken meat emulsion. Linear and significantly ($P<0.05$) increased values were observed from control to chicken meat emulsion incorporated ready to fry seasoning meat pellets for pH, product yield, bulk density, moisture, protein and fat contents. Significantly ($P<0.05$) reverse trends were observed for hydratability, water absorption index and water solubility index. Results of sensory evaluation on 9 - point hedonic scale showed appearance and colour, flavour, texture, crispness, after taste, meat flavour intensity and overall palatability were higher for 50% chicken meat emulsion incorporated ready to fry seasoning meat pellets followed by 25% and 75% chicken meat emulsion incorporated ready to fry seasoning meat pellets. Thus, it can be concluded that, 50% chicken meat emulsion can be successfully used preparation of meat based ready to fry seasoning pellets.

Use of suppliments in covid-19

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Abstract

Covid -19 has been declared a pandemic by WHO on March 11th, 2020. Morbidity and mortality in covid 19 are caused by different immunological effects. Respiratory blockage is the main cause of the mortality in maximum cases. The infection has shown variation in

different incubated organs including neck, lungs, heart and kidney as a major effective areas. Till today there are neither any vaccines nor medicines are available to treat this disease. Studies suggested that higher immune system can fight strongly with the covid infection and also can prevent it at prior stage. Supplements and ayurvedic treatments are included in our day to day practice since last so many decades to boost the immunity. Here I am trying to brief the effect of supplement and herbs in prevention of any infection. The study is a small review on already available data of herbs and suppliments.

Keywords: Covid-19, Suppliment, Ayurveda, WHO.

Development and physico-chemical evaluation of protein rich cookies using underutilized *Curcuma aungustifolia* starch

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Abstract

Curcuma angustifolia is one of the Indian tribal minor tuber crop found growing wild in northeast and western coastal plains and hills containing highly nutritious and easily digestible starch which is especially recommended for children.The study was conducted with the objective of utilizing the under exploited tribal tuber crop *Curcuma angustifolia* starch by processing it into protein-energy rich functional cookies which is highly suitable for tribal communities. The basic ingredients under this study were *Curcuma angustifolia* starch, pearl millet flour and refined wheat flour where as the functional ingredients were used as protein sources as whey protein concentrate (WPC), bengal gram flour (BF) and soy flour (SF).The level of *Curcuma angustifolia* starch was standardized based on experimental trials and incorporated up to 25% in formulation of functional cookies. It is used as source of energy in cookies. The level of protein rich functional ingredients were used as 5%, 10% and 15%. Raw materials were analyzed for chemical properties. Also the produced cookies were evaluated for physical, chemical, minerals content and sensory characteristics. The results indicated that spread ratio and expansion ratio of functional cookies decreases as the level of functional ingredients increases. Textural characteristics like breaking hardness of functional cookies were increased as the level of functional ingredients increases. Results indicated that protein-energy rich functional cookies for tribal people with highest overall sensory acceptable score can be prepared using a whey protein concentrate (15%). Protein rich functional cookies containing 15% whey protein concentrate along with other ingredients was found most sensory acceptable by the panelists and it provides protein 8.24%, fibre 3.33%, carbohydrate 57.3% and energy 481.37Kcal.

Keywords: Protein rich, cookies, *Curcuma angustifolia*, Physical properties, Nutrirional composition

Morphological and biochemical studies in *Garcinia dhanikhariensis*: A potential natural colorant from the Bay Islands, India

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Abstract

Garcinia dhanikhariensis is an endemic tropical species distributed in the South Andaman Islands of Andaman and Nicobar Islands. No studies have been made so far to realize the horticultural potential of this underutilized fruit species. In order to study the species in detail, surveys were conducted in different parts of South Andaman islands and four collections (GDH/SA/LP, GDH/SA/KT, GDH/SA/DK and GDH/SA/SW) were identified. It was noticed that, pulp of this species is being consumed by the island dwellers with familiarity to this species, while rind and seeds are discarded. We found that red rind of fruit is edible and is a novel source of anthocyanins. Hence, the species could be promoted as a novel source of natural colourant. Various fruit morphological parameters and biochemical analysis were carried out in the collections, which revealed wide variations amongst the collections for fruit morphological and biochemical parameters. Fruit weight varied between 7.75 to 44.1 g in the collections studied. Further, total anthocyanin content in the rind was determined, which revealed that the collection GDH/SA/DK had highest content than other collections studied. Considering superior fruit size (44.1 g), higher pulp content (48.04%), thicker rind (3.38 mm) and higher anthocyanin content, collection GDH/SA/DK was found to be a promising collection for further utilization.

Keywords: Andaman Islands; Anthocyanins; Endemic; Rind; Underutilized fruit

Identification of superior germplasm of underutilized blood fruit (*Haematocarpus validus*)

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Abstract

Blood fruit is a fast disappearing underutilized species bearing fruit bunches directly on stem of the liana. It is distributed in the Andaman and Nicobar Islands and Northeastern regions in India. Recently, we have identified blood fruit as a natural source of anthocyanins, of which Pelargonidin and Cyanidin as dominant compounds. However, the species is dwindling as the natural stands are under threat from natural and manmade calamities. Considering the nutritional value of the species and ability to fetch livelihood to the dwellers of these regions, blood fruit is being promoted as a backyard crop in the islands. In order to study the natural variability present in this species, three collections from North and Middle Andaman islands were studied for morphological and biochemical parameters. Results revealed significant differences for various morphological parameters studied. Fruit weight varied between 12.68 g to 17.42 g, while total anthocyanin content in collections showed distinct variations (183.63 to 328.38 mg/ 100 g, Cyanidin equivalent). Collection HV/MA/SND with highest total anthocyanins content (328.38 mg/ 100 g, Cyanidin equivalent) and bigger fruit size (17.42 g) was found to be promising germplasm that could be mass multiplied for establishing new plantations in the islands.

Keywords:Andaman Islands; Anthocyanins; *Khoon phal*; Tropical; Underutilized Species.

Sequence analysis of DNA beta molecule associated with Mungbean yellow mosaic India virus-[IN:Ana:CpMBKA25:04]

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Abstract

Geminiviruses consists of single stranded DNA as their genome which is encapsidated in the twinned icosahedral particle . In the present study, association of the DNA beta with MYMIV-[IN:Ana:CpMBKA25:04] possessing 1367 base pairs of nucleotide has been found. The sequence identity matrix analysis showed 96% similarity with Potato apical leaf curl virus followed by Tomato leaf curl betasatellite virus [Accession No. AY230138] 95.3% with less relatedness to beta satellite Bhendi yellow vein betasatellite [Accession No. AJ308425] (45.7%) when compared with seventeen isolates of DNA beta infecting different crops. Beta satellite sequences of the common region showed the putative stem-loop structure TAATATT/AC. Repeat sequence also was found as GCTACGC. An A rich region was found from 910 to 1120 nucleotides. The amino acid sequence showed presence of extra aminoacid residues V, C, N in the ßC1 protein at the carboxyl end. In the identity matrix analysis ßC1 showed 95.9% with beta satellite associated with Tomato leaf curl Karnataka virus and Potato apical leaf curl virus. The phylogenetic analysis showed the beta satellite associated with MYMIV-[IN:Ana:CpMBKA25:04] found to be a distinct isolate belonging to Papaya leaf curl virus.

Key words: Beta satellite, geminiviruses, sequence similarity

Integrated Weed Management in Blackgram (*Vigna mungo* L.)

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Abstract

An On Farm Testing (OFT) was conducted at the farmer's field of adopted village Daloda Rail of District Mandsaur (Madhya Pradesh) in kharif season of 2014, 2015 and 2016 to assess the effect of integrated weed management treatments on yield of blackgram (*Vigna mungo* L.) and its weeds. Application of Imazethapyr @ 75 g ai/ha at 18 DAS and hand weeding at 40 DAS treatment gave 36.91 percent higher grain yield as compare to farmer's practice (8.81 q/ha) on pooled basis. Further, application of Imazethapyr @ 75 g ai/ha at 18 DAS and hand weeding at 40 DAS treatment gave significantly higher plant height, pods/plant, net return and B:C ratio as compared to all other treatments tested and significantly reduced the weed count and weed dry matter recorded at 45 DAS as compared to all other treatments tested.

Study on the performance of ten Genotypes of crossandra for vegetative, yield and quality parameters under coastal region of Andhra Pradesh

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Abstract

The present investigation was carried out during the year 2017-18 at College of Horticulture, Dr. Y.S.R Horticultural University, Venkataramannagudem, West Godavari district of Andhra Pradesh. The experiment consisted of 10 crossandra genotypes, laid out in randomized block design with three replications under open conditions. The observations were recorded on various vegetative, flowering, yield and quality parameters in which the genotype Arka Shravya exhibited superiority in parameters like plant height (56.97 cm), fresh weight of the plant (80.83 g), number of spikes per plot (3121.92) and number of florets per spike (53.67), whereas, Arka kanaka showed the more number of primary branches (3.62), secondary branches (3.61) and longest shelf life (3.33 days) while, Kadiyam Local 2 found to be earliest in number of days for first flower opening in spike (71.00 days) as compared to check and other genotypes. The genotypes Arka Ambara and Nilakottai local recorded more weight of 100 florets (9.89 g) and more number of days for final flower opening in spike (110.00 days) respectively whereas genotype ACS-2 recorded more number of flowers per 10 g weight (328.00) as compared to check and other genotypes.

Keywords:Crossandra, genotypes, evaluation, vegetative and quality.

Reassessment of Fertilizer Dose According to Maturity Duration of Rice (*O. sativa* L.) in Koshi Region of Bihar

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Abstract

A field experiment was conducted at BPSAC, Purnea during two consecutive *kharif* season of 2015 and 2016 to reassess the response of different duration of rice varieties at different levels of fertilizer doses. The experiment comprised fifteen treatment combinations including three varieties of rice V1: Rajendra Bhgwati (Early maturity), V2: PA6444 (Medium Maturity) and V3: Rajendra Mahsuri (long maturity) and five fertility levels viz. viz. T_1-N_{80} P_{40} K_{20}, T_2- $N_{100}P_{45}K_{30}$, T_3 –N_{120} P_{50} K_{40}, T_4- $N_{140}P_{55}K_{50}$ andT_5-N_{160} P_{60} $K_{60}$with split plot design in three replication. The results revealed that among the different varieties, Medium duration hybrid rice PA 6444 recorded highest number of tillers m^{-2}. All yield attributes viz. number of effective tillers m^{-2}, number of filled grains per panicle, grains weight per panicle, 1000-grain weight and grain yield, straw yield and harvest index significantly differed in different varieties and were recorded highest in PA 6444 which were however, statistically at par with RajendraMahsuri except grain yield and effective tillers m^{-2}. Rice variety PA6444 recorded maximum number of effective tillers m^{-2} over others. However, Among the fertility levels, it significantly increased up to $N_{140}P_{55}K_{50}$ kg ha^{-1} thereafter non-significant differences were noticed.

According to the maturity duration , medium duration rice hybrids PA6444 and long duration Rajendra Mahsuri HYV recorded almost similar grain yield but it was significantly superior over Rajendra Bhgwati. Interaction effect of varieties and fertility levels revealed that Medium duration hybrid, PA6444 responded significantly up to fertility levels of N_{160} P_{60} K_{60} kg ha^{-1} in term of grain and straw yield whereas, Rajendra Mahsuri and Rajendra. Bhagwati responded only up to $N_{140}P_{55}K_{50}$ kg ha^{-1}. On an average increment in grain yield were noticed upto 19.6, 31.4 and 41.5 % more due to increase in fertilizer doses upto $N_{140}P_{55}K_{50}$ from $N_{80}P_{40}K_{20}$ kg ha^{-1},' respectively. Late maturing variety Rajendra Mahsuri recorded highest grain yield upto fertility level with N_{160} P_{60} K_{60} kg ha^{-1} however it was significantly at par with $N_{140}P_{55}K_{50}$ kg ha^{-1}. This may be due to the reason that hybrids with medium in crop duration habit have greater nutrient utilization capacity (Parsahivamurthy *et al.*,2012).. The effect of rice varieties and fertility levels could not bring any significant effect on the pH, EC and organic carbon of the soil. Highest N, P and K uptake was observed in N_{160} P_{60} K_{60} kg ha^{-1}followed by $N_{140}P_{55}K_{50}$kg ha^{-1}however these are at par the each other and differ significantly over others . The maximum nutrient uptake of 86.25, 17.85 and 70.66 kg NPK ha^{-1}, respectively were recorded with N_{160} P_{60} K_{60} kg ha^{-1}.

Zoonoses and One Health Concept

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Abstract

Zoonoses is "disease or infection caused by all types of agents (bacteria, parasites, fungi, viruses and unconventional agents) transmissible from vertebrate animals to humans &*vice-versa*". Zoonotic diseases are important because they may create public health problems, prevent efficient production of food of animal origin and obstacles to international trade in animal and animal products. About 61% of human pathogens are zoonotic in origin and of which 13% species regarded as emerging or re-emerging diseases.About 75% of emerging infectious diseases are zoonotic in nature and originate mainly from wildlife. Five new human diseases appear every year and 3 of which are animal origin. Nearly 80% of agents with potential bioterrorist use are zoonotic pathogens. Nearly 70% of the world's rural poor depend on livestock and working animals for their livelihoods, animals can not be left out of the solutions. "One health concept" was first introduced in beginning of 21st century with theme that human health and animal health are interdependent and bound to the health of the ecosystems in which they exist. It is a collaborative, multi-sectoral and trans-disciplinary approach which includes working at local, regional, national and global levels with the goal of achieving optimal health outcomes recognizing the interconnection between people, animals, plants and their shared environment. One health approach obviously includes the human health professionals, but it also includes veterinarians, wildlife specialists, anthropologists, economists, environmentalists, behavioural scientists and sociologists. Maximizing of the well-being of people through maximising the well-being of animals as well as ecosystems is the key point behind one health approach. It is well said that solving today's threats and tomorrow's problems cannot be accomplished with yesterday's approaches, so foreseeable envisionary ideas should come up with particular regard to apply the concept of "One health" into action.

Keywords: Zoonoses, One Health Concept

Ethno-Veterinary Practices: A Way Forward for Indigenous Traditional Knowledge

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Abstract

It was very well said by Hippocrates that "Nature itself is the best physician". Indigenous knowledge is defines as "cumulative and complex bodies of knowledge, know-how, practices and representations that are maintained and developed by local communities, who have long histories of interaction with natural environment". Ethno-veterinary medicine (EVM) is a scientific term used for traditional animal health care that encompasses the knowledge, skills, methods, practices and beliefs about animal health care found among community members. Ethno-veterinary practices were in vogue since time immemorial. In ancient India, vedic literature, particularly Atharvaveda is a repository of traditional medicine including prescriptions for treatment of animal diseases. Role of EVM in livestock development is presently realized beyond dispute, especially in developing countries. It is also viewed as a potential tool to overcome the side-effects of modern drugs and promote organic farming in both developing and developed nations. EVM often provides cheaper options than comparable allopathic drugs and the products are locally available and more easily accessible. Besides indigenous medicine, ethnic communities use forest products not only for household consumption but also for commercial purposes to generate community income, conservation of biological resources is integrated with regional and national economies.Interest in EVM practices has grown recently because these practices are much less prone to drug resistance and have fewer damaging side effects on environment than conventional medicine. A largenumber of plants, plant extracts and constituents have been identified as having anti-microbial, antiviral or antifungal activities and are often considered as immune enhancing.EVM also supports emerging agri-business opportunities such as organic animal husbandry and herbal farming. It is expected that current global herbal market valued at US$120 billion would rise to nearly US$7 trillion by 2050. India ranks world's second largest exporter of herbs (8.13% share) after China (28%).

Keywords:Ethno-veterinary medicine, EVM, Indigenous, Traditional Knowledge

Zinc use efficiency and their uptake in food crops

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Abstract

Zinc is needed by plants in small amounts, but yet crucial to plant development. In plants, zinc is constituent of many enzymes and proteins. It plays an important role in a wide range of processes, such as growth hormone production and internodes elongation. Data are limited on Zn uptake and use efficiency during crop growth cycles. Zn uptake and use efficiency in upland rice, dry bean, corn, and soybean during growth cycles. Zinc concentration in rice and corn decreased in a quadratic fashion with increasing plant age. However, in dry bean and soybean, Zn concentration had a quadratic increase. Zinc uptake followed an exponential quadratic response in four crops, and it was higher in corn and upland rice than in dry bean and soybean. Zinc use efficiency in shoot dry- weight production had significant quadratic responses in upland rice and soybean with increasing plant age. In corn, Zn use efficiency for shoot dry- weight production was linear as a function of plant age. Zinc use efficiency for grain production was maximum for corn and minimum for soybean. Hence, cereals had higher Zn use efficiency than legumes. Zinc concentration in grain of dry bean and soybean was higher than in upland rice and corn, which is a desirable quality factor for human consumption so as to avoid Zn deficiency.

Liming effect of straw biochar in an acidic soil

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Abstract

Rice and wheat straws were slowly pyrolyzed at 400^0C in a muffle furnace in oxygen deficient condition to prepare biochars with an aim to study their effect on some important chemical properties of acidic soil such as pH, exchangeable acidity and cation exchange capacity (CEC) in a laboratory incubation study. The incubation was conducted incubating an acidic soil (Typic Fluvaquent, pH 5.07) with assorted doses of biochars (0, 10, 20 and 60 g kg^{-1}) for 120 days. A dose of lime at half or the lime requirement was also added separately for comparison. Results indicated that incubation period (F, 84.81; Pr>F, <.0001), and application rate (F, 281.05; Pr>F, <.0001) had significant liming effect ($p < 0.05$) on the pH of soil. Application of biochar derived from wheat residues showed relatively greater increase of soil pH. Both the biochars also significantly decreased exchangeable acidity and increased the CEC of the soil.

Keywords:Rice biochar,Wheat biochar, Soil pH, Exchangeable acidity, Phosphorus uptake, Wheat

Character studies for seed yield and quality characters in soybean (*Glycine max* (L.) Merril)

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Abstract

The significant character association recorded among the entries at a phenotypic level. Days to 50% flowering has a positive association with days to maturity, 100 seed weight and unfilled pods. Plant population has a positive correlation with pod bearing length and seed yield. Plant height has a positive correlation with pod bearing length, Seeds per pod, whereas highly negative correlation with 100 seed weight**.** Branches per plant have positive association with seed yield. Pod bearing nodes has highly significant positive associations with filled pods, pod length and non significant positive association with seed yield. Filled pods have significant association with unfilled pods, and highly significant association with pod length. Pod bearing length has a highly significant positive correlation with qualitative feature volume weight. Biological yield has a significant positive association with seed yield, Path analysis revealed that seed yield is directly affected by days to 50% flowering, 100 seed weight, through a low magnitude of direct effect, while plant height, pod bearing length, and harvest index contributes through a moderate magnitude of direct effect on seed yield. Filled pods and biological yield contribute to seed yield by the highest magnitude of direct effect. The negligible value of residual factor value (0.0000) justified that characters considered in the study were justified for seed yield.Findings indicate that direct selection of significant characters will enhance the breeding efficiency for seed yield in soybean.

Keywords:Correlation, path coefficient, soybean, yield.

Role of prevailing temperature on infectivity of Entomopathogenic nematodes against Rice Moth *Corcyra cephalonica*

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Abstract

Entomopathogenic nematodes are arthropod parasitic nematodes with potential for use as bio-control agents. Although the use of EPNs against several insect pests is common, their efficacy depends on soil characteristics, agricultural management, and competition with native EPNs (Glazer, 2002). In addition, temporal fluctuations of EPN populations indicate the importance of temperature changes due to seasonal changes. An attempt has therefore, been made to find out the effect temperature on infectivity of *S. carpocapsae* againstrice moth *Corcyra cephalonica.* Five last instar larvae of *Corcyra cephalonica*was placed in each petriplate and different inoculums level of IJs 100, 200, 300, 400 and 500 of *S. carpocapsae* were released in each petriplate and each treatment were replicated four times. Treatment without IJs EPNs was considered as control. Each treatment was kept at different level of temperature 15^{o} C, 25^{o} C and 35^{o} C under BOD conditions. The observations were taken on the mortality of insect larvae after every 24 hrs up to 96 hrs from the times of inoculation of IJs. The dead larvae were examined for presence of nematodes Results on revealed that maximum (100) percent mortality was observed at 35^{o}C and with 500 IJs after 48 hours of inoculation while at 25^{o} C temperature (100) percent insect mortality was recorded after 72

hrs with 500 IJs. Likewise at 35^{o}C with inoculums level of 400 IJs, 80 percent insect mortality was achieved after 48 hrs and 100 percent mortality was observed after 72 hrs. Minimum 10 per cent mortality was recorded at 15^{o} C with 100 IJs after 24 hours of inoculation. The results indicate that absolute mortality of *C. cephalonica*larvae was achieved within 48 hrs at 35^{o}C, with inoculums level of 500 IJs per petriplate.

Keywords:Entomopathogenic nematodes, *Steinernema carpocapsae*,infectivity, abiotic factors, *Corcyra cephalonica* , temperature.

In-silico antigenic heterogeneity analysis for capsid protein VP1 of serotype Asia1 Foot and Mouth disease virus

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Abstract

Foot and Mouth Disease (FMD) is a highly contagious viral disease of the cloven-footed animals. The causative agent of the disease is FMD virus, present as seven different serotypes (O/A/C/Asia1/SAT1-2-3) globally. The serotype Asia1 is limited to the Asian continent region and offers an advantage to devise specific disease eradication strategy. In India, serotype Asia1 virus strains were attributed to Lineage B, C and D group. In this study,the in-silico analysis was done for the capsid protein VP1 genome region of representative field isolates (n= 45) and vaccine virus strain (IND63/1972). The VP1 sequences were aligned and homology modeling was performed using *Modeller* 9.24. The antigenic sites were mapped on 3D protein structure of consensus VP1 sequence. The variants at the obs3erved sites were analyzed by calculating the protein variability index and relative mutation combination. The escape mutants were identified and are derived frommutationsina few antigenic sites. The five antigenic peptides (n=05) were identified as the least variable epitopes. Thus, the results showed that limited numbers of serotype Asia1 antigenic variants were found to be circulating in the country. The results emphasizes the possibility of formulating a customized synthetic vaccine for controllingserotype Asia1 FMD in the country.

Keywords: homologymodeling, antigenic sites, Foot and Mouth disease

In vitro evaluation of fungal antagonists against purple leaf blotch of onion (*Alternaria porri)*

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Abstract

Onion (*Allium cepa*) is an important crop grown throughout the world. Onion has manifold uses as spice, vegetable, salad dressing *etc*, hence it is known as "queen of kitchen". It is also used as condiments for flavouring a number of food and medicines. The crop is attacked by many pathogens. Among them Purple leaf blotch *(Alternaria porri*) is most devastating disease of onion in India and a challenge for producer is to find the effective means of control for this disease. As Fungal bio agents are also playing an important role in controlling the incidence of purple leaf blotch disease. An experiment was carried out in the Department of Plant Pathology, College of Horticulture, Anantharajupetato isolate the causative agents of purple leaf blotch to study the effect of different fungal antagonists to control the disease in *in vitro*. The efficacy of 5 fungal antagonists *viz, Trichoderma harzianum, Tichoderma viride,* TCT4, TCT10and *Penicillium chrysogenum* ongrowth of *A. porri* was studied *in vitro* by dual culture technique.The results revealed that the fungal antagonists significantly reduced the growth of the pathogen either by antibiosis (exhibiting inhibition zones) or competition (over growing). It was noticed that maximum reduction in colony growth of *A. porri* was observed in *T. harzianum* (54.84%) and significantly superior over all other bioagents tested and followed by *T. viride* (44.72%) and the next best was TCT4 (42.19%). Least inhibition was noticed in P*enicillium chrysogenum* (27.42%).

Keywords: Onion, Fungal antagonists, *Alternaria porri, Trichoderma harzianum, Trichoderma viride.*

Biochar: A Strategy to Mitigate Climate Change and Other Environmental Allies

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Abstract

Humanity is living in an ever-increasing threat of climate change. With an estimated 2°C rise in average global temperature by the end of the 21st century, most of the species are facing a risk of extinction. The global temperature has been rising since industrialization due to increasing greenhouse gas emissions. Among which the major contributor is Carbon dioxide. Development of new techniques to sequester the increasing atmospheric CO2 is need of the day and one such approach is the implication of Biochar, an amorphous form of carbon, produced pyrolytically from the organic material in the absence of oxygen. Agri-waste, either field residue i.e. stems, leaves, stalks, or processing residue i.e. husk, bagasse, is the suitable substrate for Biochar production, which will not only help in carbon sequestration but also help in managing the agricultural waste. Unlike other sequestration techniques, the condensed poly-aromatic structure of biochar makes it resistant to microbial decomposition. As per reports, it can remain in the soil for anywhere between hundreds of years to a millennium and thus acting as a permanent store for carbon. Apart from that, numerous parameters of the soil are affected by biochar such as reduction of bulk density, enhancement of water-holding capacity & nutrient retention, and stabilization of soil organic matter, thus proving beneficial to both soil flora and fauna. Biochar enhances phosphate solubilizing capability of microbes and also acts as an absorbent for pollutants such as heavy metals, toxic fluorides, etc. Hence, Biochar is an efficient strategy to alleviate anthropogenic environmental damages.

Keywords:Agri-waste, Biochar, Carbon Sequestration, Climate change

Impact of Front Line Demonstration on the Yield and Economics of Chickpea in Shajapur District of Madhya Pradesh

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Abstract

The present study was conducted continuously during three years from *Rabi* 2016-17, 2017-18 and 2018-19 to assess the impact of front line demonstration on the yield and economics of chickpea in Shajapur District of Madhya Pradesh. The improved technologies consisting use of improved variety, sowing method, seed treatment with rhizobiumand PSB culture, balanced fertilizer application and integrated pest management. FLD recorded higher yield as compared to farmer's practice. The average results of three pooled data revealed that the front line demonstration on chickpea an average yield was recorded 18.24 q/ha under demonstrated plots as compare to farmers practice 15.31 q/ha. The improved technology gave higher gross return, net return with higher benefit cost ratio as farmer's practices.

Keywords- Chickpea, Yield, Technology gap, Extension gap

Effect of raised bed planting on the growth characters and yield of Soybean (*glycine max*)

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Abstract

Field demonstrations were conducted inShajapur district of Madhya Pradesh during kharif 2017 -18 assess the effect of raised bed planting on growth characters and yield of soybean crop. The raised bed plantingwas found better in term of plant population, plant height ,number of root nodules per plant, seed yield weight per plant, seed index, seed yield comparison with ridge & furrow sowing for soybean crop. The highest productivity of 18.6 q/ha observed in the raised bed planter whereas it was found lowest under ridge & furrow sowing sowing (13.58 q/ha). Highest net return (Rs 33783 per ha) were recorded under raised bed planting system whereas, the lowest net return (Rs 19252) per ha was recorded under comparison ridge & furrow sowing.

Attitude of chilli farmers towards front line demonstrations

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Abstract

The study was conducted in three talukas of bellari district in Karnataka state to measure the attitude of demonstration and other farmers towards Front Line Demonstrations (FLDs). Fifty FLD/demonstration farmers and fifty other farmers were interviewed using a pre-tested schedule. The data were collected through personal interview with the help of pre-tested schedule. The collected data were processed, tabulated, classified and analysed in terms of mean percent scores, ranks, etc. in the light of objectives of the study. The results revealed that majority of farmers (94.1%) between the age of 23 and 42 years old. Regarding the educational level, the study showed that 27% were illiterates, whereas 38% had completed secondary high school, and 42% were university graduates. We observed that that majority of the chilli growers had medium level of knowledge, adoption and attitude towards chilli cultivation technology. The 59.00% chilli growers belongs to medium level of adoption of chilli cultivation technology, whereas 23.00% chilli growers had high level of adoption and 18.00% of them had low level of adoption.

Keywords: Attitude, Front Line Demonstration, knowledge, adoption.

Evaluation of Front Line Demonstration on Chick Pea (*cicer arietinum*) in Bellari District of Karnataka

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Abstract

Front line demonstrations on chick pea were conducted in Hirehadagali, Uttangi, Ittagi villages of Bellari district by Agricultural Extension Education Centre, Huvinahadagali in Rabi seasons of 2017 and 2018. The package of improved practices were included like adoption of improved variety JG-11 and BGD-103, Proper seed rate, Integrated nutrient management (10kg Nitrogen + 25 kg Phosphorus + 20 Kg Potash + rhizobium @ 5g/kg seed + PSB @ 5g/kg of seed), integrated pest management (for Bird perches, sorghum seeds @ 100-125 /ha + seed treatment with *Trichoderma virdae* @ 5g/kg seed + spraying of profenophos 50 EC @ 2ml/lit of water), Proper irrigation (Ist irrigation at the time of branching and IInd irrigation during the pod formation) and weed management. The results were revealed that percentage increase in the yield in demonstrations over farmer practices was 13.87 % and 14.67 % in the year 2017 and 2018 respectively. The benefit: cost ratios of chick pea cultivation under improved practices were 1:1.2 and 1: 1.52 as compared to 1.48 and 1.45 under farmer practices for the two consecutive years.

Studies on comparative efficacy of botanicals and biochars for management of root and stem rot of cucumber caused by *Fusarium oxysporum* f.sp. *radiciscucumerinum*

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Abstract

The present study was undertaken in cucumber root and stem rot disease caused by *Fusarium oxysporum* f.sp. *radicis cucumerinum* leading to rotting of stem, roots. The studies were

aimed; Occurrence and pathogenecity of *Fusarium oxysporum* f.sp. *radiciscucumerinum* in field and polyhouse condition and develop management strategy through botanicals and biochars. The disease samples of cucumberwere collected from severely affected field of RCA Horticulture farm and RCA Polyhouse during *Kharif* 2017-18 when crop was one month old.Eight Botanicals as water and ether extract such as *Ipomea carnea, Calotropis gigantean, Allium cepa, Datura stromonium, Catharanthus roseus, Azadirachta indica, Curcuma longa* and *Piper nigrum*were evaluated *in vitro* against mycelia growth of *F. oxy*sporum f.sp. *radicis cucumerinum* at three concentrations *viz*., 10, 20 and 30 per cent by poison food technique. Among the above botanicals water and ether extracts of *A. indica* found to have maximum per cent growth inhibition of the pathogen, 77.77% and 82.22 % with water and ether extracts, respectively.The biochar treatments were used to evaluate their influence on the growth parameters like germination shoot and root length. The biochar combination Eucalyptus wood (EW) + Citrus wood (CW) + Green house waste (GHW) showed maximum germination 100%, shoot length 7.73 cm and root length 12.10 cm.In order to device the efficient management strategy of the disease root and stem rot of cucumber under pot conditions seven treatments of biochar such as Eucalyptuswood (EW), Citrus wood (CW), Green house waste (GHW), Eucalyptus wood (EW) + Citrus wood (CW),Eucalyptus wood (EW) + Green house waste (GHW), Citrus wood (CW) + Green house waste (GHW) and Eucalyptus wood (EW) + Citrus wood (CW) + Green house waste (GHW) were evaluated against of *F. oxy*sporum f.sp. *radicis cucumerinum* at four concentrations *viz*., 1, 2, 3 and 4 per cent by per cent mortality. Among the above mentioned treatments the lowest mortality rate 4.17% was recorded with Eucalyptus wood (EW) + Citrus wood (CW) + Green house waste (GHW) at 3% concentration.The results obtained suggested that botanicals and biochars are good inhibitors of the disease *in vitro* and *in vivo*,respectively and thus can be recommended for the management of root and stem rot of cucumber in the field. The use of biochars would help the farmers get better yield and profit by reducing the cost of the fungicide and also the biochars improve the soil quality by maintaining the pH and EC of the soil.

Keywords:*Fusarium oxysporum* f.sp. *radiciscucumerinum; Biochars; Botanicals;*Growth parameters; Root and stem rot; Plant Mortility.

Improving household fish availability and income through homestead aquaculture

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Abstract

Aquaculture is proving to be more and more important in meeting the food and nutrition security as well as the much needed micronutrients availability for women and children. Homestead ponds are a very common phenomenon in the eastern and north eastern states of India. But aquaculture is mostly limited to composite carp culture wherein the contribution to household nutrition is usually overlooked. Inorder to improve the productivity and hence the production and household fish consumption, species diversification in homestead aquaculture with indigenous small fishes is needed. They are rich source of high quality protein and micronutrients. The small indigenous fishes being autobreeders will automatically replenish in the ponds. They can be harvested in a biweekly basis after 2 months of its stocking so that

continuous availability of micronutrient rich fish is ensured for the rural family. Keeping this in view 24 homestead ponds of areas ranging from 0.17-0.22 Ha in Puri District, Odisha was selected to undertake action research on polyculture of Indian Major Carps with small indigenous fishes. The objective of the study was to analyze its impact on the household income and fish availability. The ponds were stocked with Indian Major Carps @10000/ha and small indigenous fishes like *Amblyphanrynogon mola* and *Puntius spp* @25000/ha. Inorder to facilitate easy harvesting of small indigenous fishes by women, gill net (mesh size 12mm), a passive fishing gear was introduced. As a result of this intervention a biweekly harvest of 200-750gms of small indigenous fishes was done by women which was entirely used for their household consumption. After grow out period of 10 months, the farmers could harvest 298kg of Indian Major Carps from 0.17 Ha water area with an average weight of 742gm/fish. The application of scientific management practices clearly had a positive effect on the fish yield as prior to the intervention; the yield was 130kg/0/17Ha. They could realise a profit of Rs 20560/- during the season. The research proved that polyculture of Indian Major Carps with small indigenous fishes by following the scientific management practices will result in better yield, improved fish availability to the house and better management of the household resources.

Keywords: Gill net, Homestead ponds, Nutrition, Polyculture, Small indigenous freshwater fishes

Trait assocation and path cofficient analysis for yield and yield attributing traits in sesame (*Sesamum indicum*L.)

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Abstract

The present investigation was conducted with twenty-one genotypes following RBD with three replications during *kharif*, 2017. Data on morpho-physiological and yield traits were recorded on six randomly selected plants. The analysis of variance revealed significant differences among the genotypes for each character, indicating the presence of considerable variability among the genotypes for the characters studied.Correlation studies indicated that harvest index, productive capsules per plant, number of seeds per capsule, number of branches per plant, productive branches per plant, biological yield, 1000 seed weight and plant height showed significant positive association with seed yield per plant as well as among themselves at phenotypic and genotypic level. Hence, selection for any one of these characters would bring in simultaneous improvement of other character and ultimately seed yield. The traits *viz.*, plant height, number of branches per plant, days to maturity, number of seeds per capsule, biological yield and harvest index had positive direct effect on seed yield. Path analysis revealed that high positive direct effect was exhibited by number of branches per plant, biological yield and harvest index with positive and significant correlation for seed yield; hence, selection based on these characters would be more effective for yield improvement in sesame.

Keywords: Sesame, Variance, Correlation, Direct effect, Path analysis, Seed yield.

Organix farming – a value addition cultivation prctice of medicinal plants

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Abstract

Recently there has been an increase in interest and use of herbal medicine for the treatment of various ailments, through, the use of herbal drugs in health care is as old as the mankind itself. Traditional medicine has also been steadily gaining interest and acceptance even amongst the practitioners of modern medicine. With this, the market potential of herbs and herbal products has being increased significantly. The present global trade in herbal products is estimated to be around 60 billion US $ and is predicted to reach the figure of 5 trillion US $ by 2050. At present our country's turnover is drugs used in traditional systems of medicine is around 2400 crore rupees. In view of the increased market potential, many pharmaceuticals companies are diversifying in the manufacture of herbal drugs. However, the attempt to commercially exploit our herbal wealth should be done in a scientific and sustainable manner otherwise; we may end and up losing this great wealth for short term economical gains. With the resurgence of interest in herbal products all over the world, the global market for herbal product expanded with a concurrent demand for good quality herbal raw material as well as herbal products. As a result of this trend, the standardization and quality control of *Ayurvedic* drugs have gained/become the attention and importance and also have become the need of the hour. Analysis or quality control is basically the check functions carried out of different stages so that the batch – to –batch variation can be controlled and product of uniform quality can be produced. For minimizing batch – to –batch variation it is essential to carry out (i) Quality control of raw materials (medicinal plants), (ii) Process validation (iii) quality control of finished products and quality control of packaging materials. For getting food quality medicinal plants, it is necessary that emphasis must be given on the medicinal plants' production only with organic farming due to medicinal plants quality (i.e. No residue of pesticides/fertilizer) which is more important than the quantity and is only possible in the organic farming. The organic farming production system is to provide us safe and nutritious and quality products and simultaneously to restore our natural resources of land, water, bio-diversity of flora and fauna. New export market for organic and processed product has been coming up in the last decades, where none existed earlier. Organic commodities were imported by developed countries on international demand. Therefore, organic farming in medicinal plants production has bright prospect in India both for internal and external market.

Keywords: Organic farming, medicinal plants, herbal products.

Isolation of Keratinase Producing Microorganisms from Poultry Waste

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Abstract

Keratinases are proteolytic enzymes that catalyse the cleavage of keratin. Microbial keratinases have become biotechnologically important since they target the hydrolysis of highly rigid, strongly cross-linked. Structural polypeptide "Keratin" which is recalcitrant to the commonly known proteolytic enzymes. These enzymes (Keratinases) are largely produced in the presence of keratinous substances in the form of hair, feathers, wool, horn etc. Bacterial strains are known which are capable of producing keratinase. This enzyme makes it possible for the bacteria to obtain carbon, sulfur and energy for their growth and maintenance from the degradation of keratin. This present work has been undertaken for the Screening and isolation of Keratinase producing strains of Bacteria were carried out from soil samples, collected from poultry farm of CCS HAU and used to screen for Keratinase production by using feather powder agar plate assay. In the present study, an attempt was made to isolate efficient Keratinase producing bacteria from diverse poultry waste. Different isolates were screened for possessing the ability to produce Keratinase. About 8 bacterial isolates were found to be promising to produce Keratinase. All the promising bacterial isolates were further tested for proteolytic activity.

Keywords: keratinase, keratin.

Efficacy of Nano-formulation against *Phomosis* blight of Eggplant under Net house condition

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Abstract

Phomopsis vexans is one of the most important pathogen of eggplant which cause leaf blight and fruit rot of eggplant, that lead to heavy yield loss in field condition. Hence, in present study, an efficient research work carried out related to management of agricultural important pathogen of eggplant. Under greenhouse condition three chemical namely silver Nanoparticle(AgNPs), Silvox(H_2O_2+$AgNO_3$) and Chitosan were evaluated in different concentration against fungal pathogen *Phomopsis vexans* causing leaf blight of eggplant under net house condition, out of these chemical AgNPs @ 50ppm appeared to be most effective in controlling the disease as curative spray.

Keyword: Phomopsis vexans, Silver Nanoparticle (AgNPs), Chitosan, Eggplant

Effect of Bio-Digested Liquid Manures on Soil Fertility, Productivity and Quality of Onion (*Allium cepa* L.)

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Abstract

Present investigation was conducted during 2010-11 and 2011-12 at Gandhi Krishi Vigyana Kendra, University of Agricultural Sciences, Bengaluru to study the effect of Bio-Digested Liquid Manures on Soil Fertility, Productivity and Quality of Onion (*Allium cepa* L.). Application of enriched biodigested liquid organic manure (EBDLM) at 25 kg N equivalent ha^{-1} + 3 sprays of panchagavya (PG) at 3 % produced significantly higher bulb yield (37.78 t ha^{-1}) and was found on par with that of EBDLM @ 125 kg N equi.ha^{-1} + VW spray @ 3 % (36.01 t ha^{-1}) and EBDLM @ 125 kg N equi.ha^{-1} (34.96 t ha^{-1}). The treatment receiving recommended FYM 30 t + 125:50:75 kg $N:P_2O_5:K_2O$ ha^{-1} recorded the lowest bulb yield (25.59 t ha^{-1}) as compared to other treatments. The onion quality parameters like TSS, reducing, non-reducing and total sugar, protein, ascorbic and pyruvic acid content of onion bulb (16.93, 3.66, 8.66 , 12.32 1.36 %, 25.27 mg 100^{-1} g & 12.82 µ moles g^{-1}, respectively) were significantly superior with EBDLM @ 125 kg N equi.ha^{-1} + PG spray @ 3 % . Further with respect to soil fertility significantly higher available nitrogen, phosphorus, potassium and sulphur (355.1, 78.3, 190.8 & 36.3 kg ha^{-1}, respectively) was noticed with T_6as compared to other treatments and it was on par with T_5 (342.6, 75.3, 197.1 & 32.7 kg ha^{-1}, respectively) and T_4 (324.9, 72.1, 185.2 & 32.2 kg ha^{-1}, respectively).

Keywords: Onion, Biodigested liquid manure, Panchagavya, Vermiwash, uptake, protein yield, oil yield

Investigating the impact of *terminalia arjuna* powder on the hypercholesterolemia in young adult.

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Abstract

In India, Cardio Vascular Disease is the leading cause of death. Among the modifiable risk factors, hyperlipidemia is one of the important factor. Therefore, lowering cholesterol level is a key factor in controlling this disease. The aim of this study is the management of hypercholesterolemia in young adults. The study was carried on to assess the impact of Terminalia Arjuna powder in young adults suffering from hypercholesterolemia. In this study the random sample of 35 experimental group and 35 control group was taken and then the data was collected and their Low-Density Lipoprotein [LDL] cholesterol level was recorded. Experimental group was intervened with 5g of terminalia arjuna powder for 2 months, pre–consumption level is compared with the post consumption level. The LDL cholesterol level of experimental group found to be lower than the control group. The unpaired t-test was used for analysis in this study. The pre consumption analysis of experimental group was 186.23±34.75 and the level fell to 149.26±34.36 after post consumption. Hence, Terminalia arjuna powder was found to be highly effective in lowering the hyper cholesterol level, as the experimental group who consumed terminalia arjuna powder got their cholesterol level lowered significantly. So, the study suggested future exploration of terminalia arjuna powder in the treatment of hypercholesterolemia as the potent medicinal beneficial effect on young adults as well as old age people.

Keyword: Terminalia Arjuna powder, Low Density Lipoprotein, HDL, cholesterol, Hypercholesterolemia, Cardio Vascular Disease

Plant Bioregulators:- frontier aspects in abiotic stress management

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Abstract

The continuous increase in human population together with loss of agricultural land (due to urbanization, industrialization and desertification) decrease in soil/soil-water quality and changing climatic condition, posing serious threat to agriculture and food security. Increasing agricultural productivity and sustainability will have to be prioritized to enhance food production. The major challenge toward this emanates from multiple stress factors and unpredictable climatic conditions. More than 80 per cent of the damage and losses of Indian agriculture is caused by drought and flood (Compendium of Environment statistics, 2016-17, Ministry of Statistics & Program Implementation, Government of India). Drought-induced loss in crop yield probably exceeds losses from all other causes, since both the severity and duration of the stress are critical. Drought occupies the top positions among the abiotic stress causing loss to Indian agriculture followed by heat and edaphic stresses (Singh and Singh, 2017). So, various strategies have been adopted to mitigate the drought stress among which plant bio regulator is an emerging arena of research and also a cost effective tool.

Plant bio-regulators (PBRs), are biochemical compounds stimulates plant growth and productivity when applied, even in small quantities at appropriate plant growth stages. These are being extensively used in agriculture to enhance the productivity. Their central role in plant growth and development is through nutrient allocation and source-sink transitions while most of the PBRs stimulate redox signaling under abiotic stress conditions (Ratnakumar *et al.*, 2016).

Plant bio regulator (PBR) is classified into hormone based and chemical based. Thiourea, silicon based compound, salicylic acid, KNO_3, polyamines, hydrogen peroxide, brassinosteroids, GA are widely being used in agriculture. PBRs such as inorganic, organic chemicals will have strong impact on plant adaptation to abiotic stress either independently or synergistically with one another (Srivastava *et al.*, 2016). Ample of research investigations have been carried out to estimate efficacy of the PBRs under drought, saline and high temperature conditions in crops.

So, there is need of cost effective PBR based formulation and technology that can address the alleviation of drought.

Floral biology of exotic and indigenous almond (*Prunus amygdalus* Batsch.) genotypes under temperate conditions of Kashmir valley

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Abstract

Flowering behaviour and pollen studies of nine almond genotypes were investigated at DARS, SKUAST-Kashmir. Observations were recorded on flowering parameters and *in-vitro* pollen studies in all genotypes. KD-05 was earliest in pink bud, advanced pink bud and initial bloom whereas full bloom, initial petal fall, complete petal fall and dehiscence of pollen grains was recorded in Mukhdoom in the first year. During second year, KD-05 was earliest in all the stages of flowering. Bloom duration ranged from four days (Pranyaj, Mukhdoom, KD-06, Shalimar) to nine days (Primorskij and Merced). Stigma receptivity was 100 per cent on the day of anthesis, one day after and one day before of the anthesis among all the genotypes. Maximum pollen germination of 96.0 % and 90.0 % was observed for Primorskij and Pranyaj in both years, respectively. Considerable overlapping of bloom among cultivars was observed with Mukhdoom, Shalimar, KD-03, KD-05 and KD-06 as early bloomers and Pranyaj, Merced, Primorskij and Waris were late bloomers.

Effect of pectin coatings and packagings on antioxidant enzyme activities and shelf life of radish stored under ambient conditions

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Abstract

The potential use of pectin coatings and different packaging materials for shelf life extension of radish was investigated. Radish of variety Punjab Safed Mooli 2 was harvested, washed, coated with pectin (0.5 and 1%), surface dried and was stored in different packaging materials viz. open trays, jute bags and perforated bags under ambient conditions till the edible state. The samples were analyzed for weight loss, firmness and activity of antioxidant enzymes after two days intervals. The loss in moisture content increased while the texture quality decreased gradually over the storage period. The activities of CAT, DHAR and MDHAR increased continuously but the activities of SOD, GR and POX first increased to highest and then decreased. Coating and packaging of radish exhibited a slower decline in weight and texture. Activities of antioxidant enzymes were higher in coated and packed samples as compared to the control samples during whole storage period. The samples stored in trays and perforated bags witnessed rooting after 10 days of storage. The coating with 0.5% pectin and storage in jute bags was more effective in maintaining the quality and can be used for shelf life extension of radish during ambient storage.

Keywords :Radish, pectin coatings, packaging, antioxidative enzymes.

Isolation and characterization of protein isolates from apricot press cake

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Abstract

The apricot kernel deoiled press cake with good functional properties was used for extraction of protein isolate. Protein isolation conditions were optimized using response surface methodology (RSM) and 20^{o}C temperature with pH 10 was optimized on the basis of RSM

desirability with 36.52 per cent yield, 14.25 per cent soluble protein and 90.15 per cent crude protein from apricot kernel press cake. The extracted protein isolate was light creamish in colour (L* 22.01, a* 6.45 and b* 17.85) contained 0.21 per cent crude fibre, 0.15 per cent crude fat with 362.51 Kcal/100g energy value. The apricot kernel protein isolate found to contain all essential amino acids. Further, the water absorption capacity (WAC) of 2.45ml/g, oil absorption capacity (OAC) of 2.52ml/g, emulsifying activity/capacity of 52.00 per cent, foaming capacity of 20.00 per cent with protein solubility of 88.00 per cent, which shows the better functional properties of the isolate. Thus, based on present studies the extraction of protein isolate from deoiled apricot press cake seems to be a profitable venture and provides many health benefits to the consumers.

Keywords:Deoiled press cake, protein isolate, protein solubility, essential amino acid.

Survey and Prevalence of major diseases of Boro rice (*Oryza Sativa* L.) in rice growing areas of Koshi region of Bihar

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Abstract

Research Investigations were made to determine the status of major diseases in Boro rice/ summer Paddy in different locations of Koshi region of Bihar. Disease survey was carried out on 20 rice fields in different district of Koshi region of Bihar to evaluate the percentage of disease incidence. The survey work was conducted in Boro rice growing areas of Purnea, Araria, Kishanganj and Katihar districts. The observation were recorded on the basis of survey and experiment conducted at Bhola Paswan Shastri Agricultural farm was found that % disease incidence of Sheath blight was highest *i.e.* from 22-to-34 % as compared to Brown leaf spot (6.84 to 10.86%) and Blast disease of Boro rice (3.23 to 7.49%). Among the disease incidence of all these three major disease, maximum incidence of Sheath blight disease was recorded from four districts (Purnea, Araria, Kishanganj and Katihar) of Bihar. The maximum incidence of Sheath blight disease found in Purnea district at BPSAC, Farm (34%) followed by Kursela village (31%) of Katihar district and Farbisganj (28%) of Arariya district.

Keywords:**Survey, Prevalence, Diseases, Boro rice, Koshi region of Bihar.**

Comparative host susceptibility analysis of different banana cultivars to plant parasitic nematodes at Attappady tribal hill area, India

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Abstract

To achieve first rank in world for production and cultivation area of banana, the state Kerala contributes a major portion for India. In Kerala, the major share got from Palakkad district with lion's contribution of Attappady hill area. Attappady is a region of immense biological importance which comes under the Nilgiri Biosphere Reserve area of India. The specific environmental features of this area became a controlling factor for life cycle of pathogen. Among the pathogens of banana plant parasitic nematodes have a crucial role. So evaluation of nematode diversity became very much value addition to the agriculture sector of the state. In the aspect of controlling them it should be started from knowing the diversity and distribution in the banana fields. Except a national range study for nematode fauna in Indian banana fields, a detailed survey at Attappady, an agriculturally and environmentally important area, has not reported yet. So this study has great importance in conservative science. The different banana varieties present in the study area selected for comparing the nematode host susceptibility were *Musa*×*paradisiaca* L. (AAB) 'Nendran', *Musa acuminata* Colla (AAA) 'Robusta', *Musa acuminata* Colla (AA) 'Kadali' and *Musa*×*paradisiaca* L. 'poovan' (Mysore AAB). The nematode diversity analysis was done with samples taken for rhizosphere soil and roots of banana from the study area during post monsoon season of 2017. The samples were taken for Cobb's decanting and sieving method followed by Baermann funnel technique. Comparing with the reported study the present study newly reported the presence of genera such as *Aphelenchus* spp.,*Dorylaimoides* spp., *Hoplolaimus* spp., *Rotylenchulus* spp., *Tylenchorynchus* spp. and *Tylenchus* spp. along with already reported genera *Helicotylenchus* spp., *Meloidogyne* spp., *Pratylenchus* spp. and *Radopholus* spp. at Palakkad district. The analysis revealed that the variety 'Nendran' was the most susceptible one to plant parasitic nematodes and 'Poovan (Mysore) was the least susceptible one.

Keywords:Attappady; Banana varieties; Comparison; Diversity; Nematode

Business and marketing in agricultural sector for enhancing rural livelihood in India

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Abstract

Market led diversification and enterprise development broadens the income opportunities and improves the livelihoods for rural poor. There is a need to emphasise on the rural areas so that they can become more competitively engaged with markets. According to 2011 census 70 percent of its rural households still depend primarily on agriculture for their livelihood, with 82 percent of farmers being small and marginal. Census 2011 also says, 45 millionIndians move outside their district of birth for work opportunities—be it employment

or business. Agribusiness provides source of employment opportunities and therefore helps to absorb the growing rural labour force. Through increasing rural livelihood economic activities may help slow down the temporary migration of labours. The study also aims at identifying the innovative marketing practices. Some of the opportunities for sustenance of rural livelihood are Apiculture, Sericulture, organic fertilizer production, mushroom, poultry farming, fish farming, hydroponics, snail farming, livestock feed Production, Frozen chicken production, biopesticide production, fruit juice-jam-jelly production, spice processing, soyabean processing, dairy and dairy products etc.

It can be seen that India has a vast scope for agribusiness and also a large number of opportunities for doing agribusiness. Some of the strategies to encourage agribusiness are development of rural infrastructure, skill development trainings, market linkage, finance linkage and also the workforce participation of rural women is only 30% which needs to be enhanced. Besides these, various agriculture and rural development projects and policies need to be framed out and implemented successfully.

Keywords: Agribusiness, livelihood, migration, rural infrastructure, policies.

Biological control of *Xanthomonas malvacearum* ,a commonPhyto Pathogenic bacteria by solvent extracts of *Anacardium occidentale* Linn., *Sapindus laurifolius* Vahl. and*Datura metel* Linn

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Abstract

All over the world, diseases of plants are exploding with the potential to wipe out the crops. A check to this explosion is done by the pesticides. Incessant and extensive use of synthetic pesticides are posing serious problems to the life supporting systems due to their residual toxicity and many microorganisms have acquired resistance to synthetic pesticides . Plants are reservoir of natural chemotherapeutic agents and can provide valuable drugs for effective management of plant diseases. *Xanthomonas axonopodis pv malvacearum* is an important Phytopathogenic bacteria, a Gram negative rods, aerobic, motile known to cause angular leaf spot of cotton, The host is infected at all growth stages causing seedling blight, leaf spot, black arm (on stem) and ball rot . In the present study the antibacterial activity of *Anacardium occidentale*Linn., *Sapindus laurifolius* Vahl. and*Datura metel* Linn solvent extract of Leaves was tested against *Xanthomonas axonopodis pv malvacearum* . Four different solvent extracts viz. petroleum ether, chloroform, ethyl acetate and methanolofthe screened plantswere subjected to antibacterial activity by agar cup diffusion method. All the solvent extracts showed antibacterial activity with the inhibition zone ranging from 9.0-21.25mm. Methanol extractof the screened plants showed significant inhibition zone (19.0-21.25mm) followed by ethyl acetate extract (15.0-17.0mm) against the test bacteria. The Minimum inhibitory concentration (MIC) of methanol extract of*D.metel* and *A. occidentale*was 0.3 and 0.56 mg/ml respectively. Phytochemical analysis of methanol extract showed the presence of terpenoids, flavanoids, tannins and steroids.

Keywords: Antibacterial activity, Phyto pathogens, Inhibition zone, Minimum Inhibitory concentration

Effect of Organic Fertilizers on the Growth and Yield of Garlic (*Allium sativum*) in Prayagraj Agro Climate Region

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Abstract

The present field trials were carried out consecutively during *Rabi* 2018-19 crop seasons in Randomized Block Design (RBD) with three replications. The effect of various agronomic practices such as application of farm yard manure (FYM), poultry manure (PM), spent mushroom waste, vermicompost and neem cake. The growth and yield parameters were observed. Among all the treatment application of FYM have better influence on growth and yield of garlic under this agro climatic conditions but more bigger size bulbs were observed with the application of poultry manure treated plot.

Keyword:FYM, Garlic, PM, RBD.

Study the extrusion of second polar body at different thermal regime for the purpose of triploidy induction in Golden Mahseer (*Tor putitora*)

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Abstract

The King of rivers, Golden Mahseer (*Tor putitora*) of cyprinid family, is one of the most promising and demanding fish species in coldwater. For achieving a better growth and resistance against diseases, production of sterile fish by ploidy manipulations like induction of triploid is a feasible technology now a day. Induction of triploid in Golden Mahseer (*Tor putitora*) has not been reported yet from India in recent days. Triploid can be achieved by suppression of second polar body by applying sub-lethal treatments to newly fertilized eggs with the help of thermal shock (heat shock or cold shock), pressure shock and chemical exposure. During oogenesis a small cleavage formed concomitantly is known as polar body. Hence, timing of extrusion of second polar body has limited but a differential life span and that is crucial for triploidy induction. Hence it is a pre-requisite for the successful operation of triploidy induction for better results. An attempt has been made to calculate the accurate timing of extrusion of second polar body from the newly fertilized eggs of Golden Mahseer. Three brooders were utilized in ratio of 2:1 Male: Female for obtaining the fertilized eggs. The arrival timing of second polar body was observed between 14^{th} to 15^{th} minute after fertilization at 19^{0} C and 13^{th} to 15^{th} minute at 20^{0}C and 21^{0}C of water temperature, which

persists for 5-6 minutes in normal condition. The above, findings may be consistently in favor of triploid production of mahseer for it's better aquaculture practice by producing sterile fish.

Keywords**:** Triploid induction,Golden Mahseer (*Tor putitora*), ploidy manipulation, polar body extrusion, sport fish, coldwater.

Transgenic Field and Vegetable crops - Present status and Future prospects

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Abstract

Transgenic crops are crops that have been genetically engineered, a breeding approach that uses recombinant DNA techniques to create plants with new characteristics. Productivity gained in the last 21 years through biotech crops also proves that conventional crop technology alone cannot allow us to feed the immense increase in population. The first genetically modified plant was produced in 1982, using an antibiotic - resistant tobacco plant. The first genetically modified crop approved for sale in the U.S. in 1994, was the Flavr-Savr tomato having longer shelf life. At present 181.5 million hectares of transgenic crops are cultivated on worldwide. Only five crops being marketed commercially i.e. soyabean, maize, cotton, canola and others (include vegetable crops).Using *Cry* genes many *Bt* – transgenic crops (brinjal, tomato, cabbage, cauliflower, canola, corn, cotton, eggplant, maize, potato, tobacco, rice, soybean etc.) have been developed and commercialized at national and international levels through modern biotechnological approaches. Various traits are transferred for these cultivars like delayed fruit ripening in tomato, fruit and shoot borer resistance in brinjal, viral resistance in summer squash etc. Various advantages associated with the transgenic crops areimproved nutritional quality, increased crop yield, insect resistance, disease resistance, herbicide resistance, salt tolerance, biopharmaceuticals, ability to grow plants in harsh environments. In order to remove the hunger, malnutrition and to satisfy the demands of economically ascendant population in the coming century, world food production needs to be doubled by 2030 – 2050.

Keywords : Transgenics , Vegetable crops, Various traits, Present status, Future need.

Emerging Problems Lesion Nematode, *Pratylenchus* Spp Infecting Turmeric

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Abstract

Lesion nematode, *Pratylenchus* spp., is one of the newly emerging problems in turmeric. It is widely prevalent in intensive turmeric growing states of Andhra Pradesh, Telangana and Tamil Nadu in India. A survey was conducted during 2017 to 2019 in the turmeric growing regions and total samples 94 were collected. The sampling points were chosen based on symptoms viz., yellowing, drying of tip and marginal leaves, stunted plants with weak plant posture and patchy appearance in field. Below ground symptoms included plants that could be easily pulled out due to very less anchorage, brown colored lesions on the roots, rotten roots, shrunken rhizomes with spongy inner content, light to dark brown, reddish brown and black colored infected turmeric fingers. *Pratylenchus* spp. were isolated from infected rhizomes by Cobb's sieving and decanting, and modified Baermann's method. The nematode suspension was collected after 24 h and the nematode count was determined to obtain population density, distribution (%) and share of each nematode. The data revealed that relative distribution of the plant parasitic nematodes ranged from 2.1 to 47.8% (absolute frequency) and 1.6 to 36.6% (relative frequency), in entire samples of surveyed regions, but in case of *Pratylenchus* spp. it was 36.1% (absolute frequency) and 27.6% (relative frequency) next only to *Meloidogyne* spp (47.8% and 36.6%, respectively). Association of other soil borne pathogens (*Pythium* spp. and *Fusarium* spp.) with *Pratylenchus* was also studied. Considering the wide prevalence of *Pratylenchus* spp. in turmeric growing regions of India, there is an urgent need is to manage this nematode through ecofriendly methods.

Keywords: Turmeric, Curcuma longa L, Pratylenchus spp., lesion nematode, relative distribution and survey

CLASSIFICATION OF MUTAGENIC POPULATION OF TUBEROSE (*Polianthes tuberosa* L.) BASED ON QUALITY TRAITS

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Abstract

Tuberose (Polianthes tuberosa L.) is a plant with low genetic diversity and self incompatible nature. Therefore, the use of plant breeding techniques such as mutation in order to create novel ornamental cultivars are usually considered. The present experiment was performed at College of Horticulture, Anantharajupeta, India. In this study, in order to create diversity in tuberose cv. 'Hyderabad Single', gamma-ray irradiation treatment with LD50 dose (20 Gy) was used on mature bulbs at BARC, Mumbai. Some floral and bulb characteristics of both control (untreated) and treated plants (265 mutants) were studied. Among 265 mutants, M146 showed early spike emergence (90.00 days) and days to first floret opening (110 days), M158 showed maximum rachis length (36 cm) and floret length (6.1 cm), M_2 recorded maximum perianth tube diameter (8.40 mm), floret weight (1.40 g), bulb weight (212.00 g) and also circumference of bulb (31.5 cm) , M395 showed the maximum number of florets per spike (58.00), M212 recorded maximum flower yield per plant (92.00 g), M490 showed maximum number of bulbs per clump (14.00), M83 recorded maximum average diameter of bulb (3.79 cm) and are considered as desirable mutants which were propagated in further generations.

Whereas, M 490 showed late flowering (324.00 days) and maximum number of days for first floret opening (344 days), M308 recorded minimum rachis length (3.50 cm), floret length (3.50 cm), number of florets per spike (1.00) and low flower yield (0.54 g), M250 recorded minimum perianth tube diameter (3.10 mm), M146 recorded minimum floret weight (0.29 g), M137 and M233 recorded minimum bulb weight (6.00 g), M401 recorded minimum average diameter of bulb (1.04 cm), M376 recorded minimum average length of bulb (1.75 g) and minimum circumference of clump was recorded in M233 (6.50 cm) respectively. The above experimental results were indicated and classified based on ranges of floral and bulb characters, respectively.

Easy harvest bag for mitigating postural discomfort and drudgery reduction in harvesting operation

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A gender friendly multipurpose harvesting bag was designed to increase the picking capacity of harvest and also to correct postural issues occurring during the loading and unloading of harvest. The bag was designed as per the anthropometric dimensions of Indian male and female agricultural. The bag reduced the postural discomfort during the unloading operation which is evident by the lower REBA and RULA scale. Biomechanical analysis also infers reduced the effort of the extensor muscle during the unloading operation (23.10 to 55.1 %). Hence, the bag lowers the force exerted on the L5/S1 joint. The picking capacity for all the postures (reaching, standing, bending, and squatting) increased due to use of the harvesting bag, ranging from 16.2 to 85.3 per cent. Maximum reduction of drudger was observed in the gathering and unloading activities of the harvesting operation. There was a 15-25 per cent reduction in drudgery index, while 20-30 per cent reduction of perceived pain with the use of bag in various crops. After extensive physiological study it was observed that work pulse for both male and female are lower than the limit of continuous performance (40 beats/mins). Also the oxygen consumption for both is lower than the allowable work load (35% of VO2 max). Thus, it can be concluded that the use of designed bag for harvest and transport will not only enhance the picking efficiency but also rectify the posture while unloading operation.

Keywords: Harvesting, ergonomics, agriculture, biomechanics, harvesting bag

Qualitative screening for antioxidants in some plants of Bankura at Different Temperature

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Abstract

Phytochemicals like polyphenols, flavanoids, terpenoids, steroids, alkaloids etc are known to have protective roles against oxidative stress, herbivory and degenerative diseases. Since oxidative stress have been reported to play an important role in causing a number of age-related degenerative diseases in humans like as cancers, diabetes, schizophrenia, brain degeneracy, cardiovascular diseases, ageing, atherosclerosis, Alzheimer's disease, Parkinson's disease, rheumatoid arthritis etc. Since a considerable amount of plant's secondary metabolites have antioxidant activities, these molecules generate an incentive in plant secondary metabolite research. Towards this end, some plants known to have applications in oxidative stress diseases were collected from different areas of Bankura district of West Bengal. Different parts of 28 plants commonly used for treating oxidative stress related diseases were collected for this study. The collected plant parts were air-dried in the dark, shredded to coarse powder followed by extraction with water, methanol and ethyl acetate at room temperature. The extracts were screened qualitatively for total phenol, total flavonoids and reducing sugars. To determine the level of antioxidants, semi-quantitative tests were performed by colour matching method against known standards. The water extracts from most of the plants showed high to medium level of flavonoids content. Extraction of flavonoids with methanol was lower as compared to that using water. Ethyl acetate extracted the least quantity of flavonoids from the targeted parts of the plants. Similar results were obtained on extraction of gallic acid equivalent total phenol contents from the plant water extracts were found to have highest amount of antioxidant potential (gallic acid equivalent) followed by that from methanol and ethyl acetate extracts. About 35% (10 out of 28) of the plants showed the presence of high levels of reducing sugar content in all the three solvents used. Following 10 plants water extracts are used to check their antioxidant activity in different temperature fluctuations like in 30^0 C and 60^0 C. Further analysis of the extract with high antioxidant potential may lead to development of biologically important drug molecules.

Heterotic grouping for photo-thermal response in relation to yield and yield attributes in green gram *(Vignaradiata L.)*

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Abstract

The present investigation in green gram (*Vignaradiata* L. Wilczek) was undertaken with a view to examine the extent of heterosisand to elucidate the combining ability effects of parents and their hybrids using half diallel (excluding reciprocal) mating design. The initial experimental material consisted of forty genotypes selected from different source. Based on some morpho-physiological traits and agro-meteorological six diversed parents sowing different response to heat stress were selected and their fifteen crosses were evaluated in randomised block design for terminal heat stress during *summer*, 2016 on Research Farm, Department of Plant Breeding and Genetics, Tirhut College of Agriculture, Dholi, Muzaffarpur.

Analysis of variance of forty genotypes for the first season clearly indicated that, there was highly significant differences among the genotypes for all the traits studied. The range of

differences in mean value was comparatively wide for almost all the morpho-physiological traits and agro-meterological indices showed greater extent of variability among the genotypes for these traits.

Heat use efficiency showed significant and positive association with Seed yield indicated that their effective utilization for heat tolerance in green gram. Most of the characters were mutually and significantly correlated with each other and these characters must be considered to enhance their yield potential and selection for terminal heat tolerant genotypes in green gram. Regression analysis revealed that the traits *like,* Photo thermal index and Heat use efficiency recorded maximum values of R^2. The stepwise regression analysis showed that 93.30 per cent adjusted R^2 indicated the sufficient variation possessed by four traits/indices.

Based on index score two tolerant genotypes from index IV (PusaBaisakhi and SML-668), two moderately tolerant genotypes from index XV (NDM-12-308 and Pusa Vishal) and two susceptible genotypes from index X (IPM-99-01-10 and Pusa-1231) were selected as diverse parents with Samrat as heat tolerant check and were used in crossing programme.

The estimates of general combining ability suggested that parents PusaBaisakhi and SML-668 were found to be good general combiner for seed yield and yield attributes.As regards to specific crosses, cross combinations PusaBaisakhi X IPM-99-01-10, Pusa Vishal X IPM-99-01-10, PusaBaisakhi X SML-668 and PusaBaisakhi X Pusa Vishal recorded high *per se* performance along with significant sca effects, highly significant standard heterosis for seed yield and its component traits may be utilized for further breeding programme.

Keywords:Agro-meterologicalindices,Correlation, regression GCV, Green gram, Terminal heat.

Impact of thrips (*Thrips tabaci* Lindeman) management on yield and economics of onion under real farming situation.

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Abstract

Thrips (*Thrips tabaci* Lindeman) is a major worrying pest for onion causing considerable loss on yield and income among the onion growing farmers of Indore district. Where area under onion cultivation is 14.34 thousand ha with production of 440.28 thousand Tonnes (2015-16) mainly during rabi. All the way through field visit, interaction with farmers and farm survey it was perceived that onion thrips was major concern for successful onion cultivation during rabi. Failure to manage the infestation of onion thrips causes considerable damage on yield and income to the farmers. To mitigate the problem assessment for onion thrips management were laid out at Village Machal district Indore, Madhya Pradesh by Krishi Vigyan Kendra, Kasturbagram, Indore .(Madhya Pradesh) under real farming situation to find out the effective measure and its economics. It was observed that the use of Sprinkler irrigation along with recommended Practice (installation of blue sticky trap and spraying of Profenofos 0.1%) was most effective than recommended Practice and farmers Practice i.e. use of Lambda Cyhalothrin 2.5% EC.

Keywords – Assessment, Thrips, Onion, Farming situation

Effect of Root Stock on propagation of Aonla and Other Fruit Crops

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Abstract

Aonla (Emblica officinalis) is king of arid fruits which is commonly named as "Indian gooseberry" which is small in size and considered as minor subtropical fruit which grows mostly in Northern part of country and it belongs to the family Euphorbiaceae. In area and production India ranks first throughout the world. Aonla is also known as "Wonder fruit for health" due to its health benefits qualities. Aonla contains vitamin C and minerals in large amount. Aonla is a perishable fruit so to extend its shelf life farmers had to adopt good post harvest management practices which makes it is easier. The major drawback which discourages farmers to adopt aonla cultivation is Post harvest loses. It is possible to extend the shelf life of fruit by the check up of the rate of transpiration, respiration and also by checking microbial infection.

In this present review paper different factors like effect of rootstock on the propagation of aonla and the plant protection from insect pest and diseases were reviewed from the various work done in this field by various researchers.

Keywords: Aonla, Rootstock, Pests, Plant protection, Grafting and Propagation.

Osmo-sonication drying and their effect on bioactive compounds, antioxidant and colour properties of apple rings

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Abstract

The effect of osmo-sonication (OS) drying on retention of bioactive compounds i.e. total phenolic content (TPC), total flavonoids content (TFC) and antioxidant power capacity (DPPH) of apple rings under convective dryer was investigated. Thickness of 4mm apple rings, sucrose concentration of 500B and osmo-sonication time for 30 min optimized through Response Surface Methodology (RSM) were convectively dried until the weight of samples did not change. Thereafter, the effect of osmo-sonication on quality characteristics were

evaluated and compared with osmotically dried rings. Results concluded that osmo-sonication improved the preservation of total phenolic content (TPC) (30.53 mg /100g), total flavonoids content (TFC) (12.00 %) and antioxidant power capacity (DPPH) (30.92 %) as compared to osmotically dried rings. Besides this, osmo-sonication retained the color quality of dried apple rings than the osmotically dried rings. Moreover, osmo-sonication results in lower total color change (ΔE) (4.21) in dried apple rings samples compared to osmotically dried rings (10.59).

Keywords: Osmosonication, Total phenolic content, Total flavonoids, Antioxidant power capacity, Total color change

Role of ICT in Prediction & Forecasting of pest and disease outbreak

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Abstract

An efficient and timely identification of plant diseases is immensely important to prevent yield and quality losses of the agricultural produce. Plant health monitoring, disease detection and forecasting are critical for sustainable agriculture and crop protection. Forecasting a disease or pest outbreak involves all the activities that ascertain the growers in a region that whether or not the conditions are sufficiently favourable for a certain disease or pest outbreak, assess if the application of appropriate control measures will result in an economic gain or not, predict the forthcoming pest infestation level and the critical stage at which management would provide maximum protection. In recent times, numerous computer applications and database management platforms are widely used for pest identification, monitoring, population modelling and exploring control measures. The database can be utilized in the form of an internet based Decision Support System (DSS), expert system (ES) or simulation models. DSS are a highly useful computer based information system designed to help farmers to select one of the many alternative solutions to a plant protection problem and the ES help in the identification of insect-pest, estimating risk along with recommendations on control measures. This would guide farmers to arrange cropping systems, minimise pest damage, reduce yield loss with minimum pesticide amounts, maximise harvest and achieve quality results.

Keywords: ICT, DSS, expert system, computer applications, plant health, pest forecasting.

Impact of Cluster front line demonstration on chickpea in Lalitpur district of Bundelkhand region

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Abstract

Lalitpur is one of the district of Uttar Pradesh state of India. Lalitpur district is a part of Jhansi Division.The district occupies an area of 5,039 km^2.The district lies between latitude

24°11' and 25°14' (North) and longitude 78º10' and 79º0' (East). The climate of the district is sub-tropical, which is characterized by a very hot dry summer and a cold winter. Among the agronomic crops, pulses are the dried edible seeds of certain plants in the Fabaceae family. Pulses are very high in protein and fibre, and are low in fat. Pulses are also nitrogen-fixing crops which improves the environmental sustainability of annual cropping system. Chickpea were grown in the district during the year of 2017-18 in the area of 13726 ha, production obtained 17774 Metric tonne with productivity of 12.95 q/ha. Farmers of the district are not aware about the high yielding variety of chickpea and good package of practices, which increase the productivity of crop. In this perspective, Cluster front line demonstration (CFLD) was conducted to know the impact of chickpea (var. KWR 108) with good package of practices by the Krishi Vigyan Kendra, Lalitpur in 2017-18 during *Rabi* season in nineteen villages *viz*. Kakaruwa, Nayagaon, Arawani, Khitwas, Barod, Gangchari, Siron, Mandawara and Khiriamishra spreading over 3 blocks. In the CFLDs plot, had realized average highest seed yield (19.20 q ha^{-1}) as compared to 13.50 q ha^{-1} under farmers' practices. Forty two per cent increases in the yield were observed under CFLD with improved techniques over farmers' practice. The net return from improved agro-technologies was Rs. 57360 ha^{-1} which is significantly higher than farmers' practices (Rs. 37100 ha^{-1}). The variation in agro-climatic parameters as well as locations of CFLDs programme was effective in changing the attitude, skill and knowledge of the farmers for adoption of improved technology/ HYV of chickpea and further wide scale diffusion to the other farmers. It also improved the relationship between farmers and scientists and built confidence among them.

Morphological Characterization and Growth patterns of *Rhizobium* Isolates

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Abstract

The most interesting type of the biofertilizer in the world today is rhizobial biofertilizer which is used to inoculate legume crops for augmenting its productivity. The proportions of the nodules formed on a particular host are influenced by the survival competence of the inoculated rhizobia, colonisation of the inoculated rhizobia in the rhizophere and occupancy percentage of inoculated rhizobia to the nodule system. *Rhizobia are* known to supply biologically fixed nitrogen directly to the legume plant and also have great relevance in improving pulse productivity. Selection of autochthonous efficient strain is the primary requisite for deriving maximum benefit from inoculated rhizobia. Accordingly, in the present study, three different *Rhizobium sps*.were selected from Chickpea, lentil and gram nodule from Tal land of Bihar. This work aimed to evaluate the potentiality of Tal land *Mesorhizobium* (chick pea) and *Rhizobium leguminosperum* (lentil, pea) isolates in term of growth, Prior to evaluation of potentiality, the targeted isolates were characterised for morphological features. In case of *Mesorhizobium* and *Rhizobium leguminosarum sps*., the morphology and Colony Characteristics on the standard medium was circular shape, entire margin, convex elevation, wet gummy colony appearance and white pigmentation . The growth was increasing with time of incubation and at the endpoint of 72 hours the growth was highest in all the isolates of *Rhizobium*. Among all the isolates the multiplication of the *Mesorhizobium* was markedly faster, as indicated by higher values of OD_{620}(1.60 to 1.85). The targeted *Mesorhizobium* and *Rhizobium leguminosarum* isolates due to autochthonous nature and better growth rate it can be utilized for biofertilizer programme but prior to that its evaluation at field level will be essential.

Keywords: Rhizobia, Isolates, Morphological Characters, Growth, Optical density, Biofertilizer.

Export of Milk and Milk Products from India- Performance, Competitiveness and Determinants

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Abstract

In India, the share of the livestock sector to agricultural Gross Domestic products (AgGDP) exhibited a consistently rising trend in three decades. The impressive growth trends in the livestock subsector were attributed to effective liberalisation policy that was initiated in early 1990's. The liberalisation of Indian economy eased export trade by removing quantitative restrictions on trade, reduced export taxes, direct participation of the private sector to invest in marketing and organising of farmers into cooperatives. The performance of India's milk and milk products in the world's livestock export value showed an increasing trend. The total foreign earnings from export of milk and milk products increased from an average of US$1.41 thousand in TE 1992 to US$ 6.38 thousand in TE 1994. The post WTO period

experienced a huge increase in the foreign earnings from export of milk and milk products as export revenue rose consistently from US$ 5.16 thousand to US$ 130.30 thousand in TE 2014. During the post –WTO period , the export of all dairy products increased in absolute and percentage terms however, skimmed milk powder registered higher share followed by whole milk powder, cheese, whey dried, butter and whole fresh cow milk. Milk exports were significantly influenced by the exchange rate, GDP of importing country and institutional credit while world milk production had negative impact. In milk and milk products, India exhibited little export competitiveness for dry milk exports. However, the NPC's for butter were above unity during pre and post WTO period indicating that India lacked a competitive advantage in export of butter. To strengthen export supply capacity and competiveness, India needs to improve value addition to its livestock exports by subsidising its exports through increased public and private expenditure on processing plants, cold chains and refrigerated trucks. . Also strict adherence with various sanitary and phyto-sanitary requirements should be followed to increase market access to developed countries where India could earn high value per quantity of exports.

Keywords: competitiveness, exports, growth, livestock, milk products

Effectiveness of farmer field school for pest and disease management in jasmine

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Abstract

In Villupuram district, agriculture and horticulture constitute the major portion of national economy but due to the inefficiency of farmers in managing pest and disease occurrence the production is hampered. Flower production constitutes major area in Villupuram district. But the pest and disease are the major constraints in jasmine cultivation and yield loss due to pest and disease ranged from 25-40%. Farmer Field School (FFS) is considered as an extension approach where the farmers are being trained up about different aspects of crop protection technologies in a low cost and environment friendly means through a season long training program. FFS is a very popular extension and education approach worldwide. The aim of an FFS is to build farmers' capacity to analyze their production systems, identify problems, test possible solutions and eventually adopt the practices most suitable to their farming system. Farmers field school on "Integrated pest and disease management (IPDM) in Jasmine" involving group of 25 farmers from Nolambur village of Olakkur block, Villupuram district, Tamil Nadu was organized to create awareness on IPDM among farmers thereby reduce the indiscriminate use of pesticides. Curriculum for farmers' field school was prepared based on the problems faced by farmers in jasmine cultivation by interaction with farmers.

The technical session has been handled at weekly intervals. During the technical session, lectures on suitable varieties, improved cultivation practices, importance of soil application of biocontrol gents and farm yard manure, pest and disease identification, monitoring of pest and diseases and their management practices have been delivered and demonstration has been done at farmers field by providing critical inputs. As part of learning, encouragement has been given to the participants to present their experiences and knowledge in front of the other FFS members. The knowledge level of the farmers has been increased upto 70% and adoption has been extended to 45%.

Keywords: Farmers field school, IPDM, jasmine

Introduction of Amaranthus PLR -1 through Front Line Demonstration in Madurai District of Tamil Nadu

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Abstract

The Krishi Vigyan Kendras (KVK) is of national importance which would help in accelerating the agricultural production and also in improving the socio-economic conditions of the farming community. In most of the areas of the country, traditional agricultural practices with old varieties are being practiced in order to fulfill the needs of the family. The agricultural production can be increased if the production development programmes focusing more and on transferring the new technologies from research institutes to the farmers fields and make them more result oriented. Transfer of Technology (TOT) holds key to rapid development and transformation of rural society. Demonstrations and training of farmers is a critical input for the rapid transfer of agriculture technology. Demonstrations is generally conducted by the Krishi Vigyan Kendras to farmers to introduce new technologies and varieties to the farmers. The study was conducted during front line demonstration (FLD) on amaranthus PLR -1 at the farmers' field of Rengasamipatti and Erumarpatti villages of usilampatti block of Madurai District during Rabi season. The farmers of the usilampatti block of Madurai District cultivating low yield and long duration green varieties in Rabi season. Therefore, to enhance the production and income per unit area, it is very essential to grow high value short duration greens like amaranthus PLR 1, which will not only increase awareness about this crop in this area but also good quality greens to meet out their requirement, which will result in an increased green production and thus, enhance the income of farmer. The present study aims at the transfer of technology by demonstration method among farmers.Findings of the study revealed that most of the farmers reported that frequency of harvest increased and increased yield (19.14%). KVK, Madurai is playing a vital role in disseminating the new varieties, improved crop production technologies and helps in increasing the crop yield among farmers.

Keywords: KVK, TOT, PLR-1, Greens, Demonstration, Yield,

Development of forecasting model for canker in acid lime

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Abstract

Acid lime (*C. aurantifolia*) is grown on a large and commercial scale (e.g., Akola region in central India, Nellore and Periyakulam regions in southern India and Khera region of western India) and canker has become a permanent major problem to the citrus growers of this

country. As in Maharashtra acid lime cultivation is growing very fast occupying near about 75000 ha area. However, due to canker incidence growers has to face the problem such as low market price and economic loss and spend the money on maintenance and control of canker. Weather parameters play an important role in Spread and development of canker. Keeping this in view a relationship between weather parameters and disease development were studied at All India Coordinated Research Project on Fruit, Dr. P.D.K.V., Akola and the forecasting model has been developed. The occurrence of canker in Acid lime can be predicted in advance by given equation based on peak incidence of the disease with favorable parameters. The resulting negative value will indicate absence of disease and positive value will indicate possibility of occurrence of disease.

$$Y= 43.43+3.248X_1-5.543X_2-0.142X_3+2.526X_4-9.266X_5-3.057X_6-7.515X_7-2.770X_8$$

$R^2= 0.940$

Where,
Y=Per cent canker incidence, X_1= Maximum Temperature (^OC), X_2= Minimum Temperature (^OC), X_3= Morning Humidity (%), X_4= Evening Humidity (%), X_5= Wind speed (km/hrs), X_6= Rainfall (mm), X_7= Bright Sunshine (hrs.), X_8= Evaporation (mm)

Population dynamics of soil borne pathogens in Nagpur mandarin orchards

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Abstract

The populations in excess of 10 to 20 propagules per cm^3 soil of total *Phytophthora spp.* are considered damaging factor responsible for lower down the area of citrus. Keeping this in view, population densities of the pathogens in soils were determined by collecting soil sample from feeder root adhered soil under the canopy of citrus. Individual small amounts of soil were collected into plastic bag to retain soil moisture from 20 locations of Katol, District – Nagpur. The soil pathogen population mainly for Pythium sp., Phytophthora spp and Fusarium spp. was calculated by leaf bit method. Based on the data it was found that 10.79 % *Pythium spp*. 6.58% *Phytophthora spp.* and 16.32% *Fusarium spp.* was associated with citrus orchards of Nagpur district

Formulation and development of instant soup mix using *Moringa oleifera* leaf powder

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Abstract

Aimed to prepare (RTR) ready to reconstitute instant soup mix and other ingredient to get acceptable soup for desired health benefits this research work had been carried out. Instant soup mix is a popular energetic snack, consumed and liked by everyone. Instant soup prepared with more than 24% (MLP4) taste Moringa leaf powder along with other ingredients was found acceptable in terms of overall acceptability with the hedonic score 8.04 as compared to control 8.63 respectively. The results indicated that supplementation with Moringa leaf powder significantly enhanced the nutritional characteristics and had a reasonable amount of required nutrients. The developed soup is formed high in protein 13.67%, ash 9.79%, fibre 5.99% and low in fat 3.04% and carbohydrates 54.88% which make the developed soup as an appropriate choice for the fulfillment of nutritional demand of people. Therefore the value added instant soup mix can also play a great role in attaining the nutritional security in the country.

Keywords: - Instant soup mix, physicochemical, vitamins and Organoleptic.

Bio-efficacy and dose standardization of Proclaim Fit 45 WG against *Meridarchis scyrodes* in ber and toxicity to natural enemies

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Abstract

The experiment was conducted to evaluate the bio-efficacy and dose standardization of Proclaim Fit 45 WG against *Meridarchis scyrodes*Meyrick in ber, *Ziziphus mauritiana*under field conditions at instructional and research farm, RVSKVV-College of Horticulture, Mandsaur (M.P.). The treatment Emamectin benzoate 5% + Lufenuron 40% WG @ 31.5g and Emamectin benzoate 5% + Lufenuron 40% WG @ 27g a.i. ha^{-1} proved most effective in term of per cent reduction of fruit infestation with 82.86 and 86.62 % reduction in fruit infestation with higher yield during 2017-18 and 2018-19, respectively.The treatment chlorpyrifos 20% EC @ 600g a.i. ha^{-1} found to be a least effective by giving 63.95 and 68.40 % reduction in fruit infestation during the 2017-18 and 2018-19, respectively. All the three doses of Emamectin benzoate 5% + Lufenuron 40% WG and other treatments found to be safe to the natural enemies *viz*., spider and coccinellids.

Keywords: Emamectin benzoate 5%, Lufenuron 40% WG, *Meridarchis scyrodes*, *Ziziphus mauritiana*.

Indian Agroforestry: Significance of Horti-medicinal & Aromatic Herbages

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Abstract

Medicinal and aromatic plants (MAPs) are an important part of our natural wealth. They are accessible, affordable and culturally which play appropriate sources of primary health care provision of most of the world's population. The Indian systems of medicine 'Ayurveda,''Sidha', 'Unani', and homeopathy to some extent depend on plant materials or their derivatives for treating human ailments. Medicinal plants are one of the most important components of non wood forest products which supplies over 80 per cent of India's net forest export earnings annually. About 80% of the population of most developing countries still use traditional medicines derived from plants for treating human diseases. Since ancient times, plants with therapeutic properties have secured an important place in the healing practices and treatment of diseases. There are about 12.5% of the 422,000 plant species documented worldwide and are reported to have medicinal values. In many developing countries traditional medicines is still the mainstay of health-care and most of the drugs and cures come from natural sources, such as, plants. Out of more than 400 plants species used for production of medicine by the Indian herbal industry, fewer than 20 species are currently under cultivation in different parts of the country. India has 5,662 varieties of medicinal plants and of these trading takes place in 460, while 178 are exported in huge quantities and about 70 per cent of India's population use traditional medicines derived from numerous plant species the growing demand for MAPs makes them remunerative alternative crops to the traditional ones for smallholders in the tropics. Traditionally there is lot of herbs used for the aliments related to different seasons. There is a need to promote them to save the human lives. These herbs had been priced for their medicinal, flavoring and aromatic qualities for centuries. The MAPs require research attention on a wide array of topics ranging from propagation methods to harvesting and processing techniques, and germplasm collection and genetic improvement to quality control and market trends.

Keywords- Herbal medicine, Medicinal and aromatic plants (MAPs), holistic medicine, Ayurveda, homeopathy, health care.

Intervention of Women friendly technologies among tribal women in Rice Farming : An approach towards mechanization

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Abstract

Farm mechanization has become utterly essential for timely operation of agricultural activities leading to increase in production and productivity besides reducing drudgery of labour associated with farm activities. It also enables efficient utilization of agricultural inputs and reduces the cost of production.This could be suitably addressed through introduction of women friendly ergonomically designed farm tools and equipment through well designed and targeted interventions. An attempt has been made to reduce the women's drudgery issues in rice farming, increase their work efficiency and income in two tribal districts (Koraput and Mayurbhanj) of Odisha. A total of 42 villages covering 1800 farm

women were selected as respondents/subjects for getting benefits through women friendly farm technologies. Keeping in the view of the agricultural practices at two different districts, total 14 types of farm implements have been demonstrated for familiarizing with the operation, repair and maintenance of tools. In each village Custom Hiring Centre (CHC) was identified and set up by cluster or village level organization. It was observed that the output of the tools and implements were more than 90 percent in case of all the 14 tools (11 tools are hand operated and 3 tools are power operated). Majority of the respondents expressed that tools are efficient to reduce drudgery of both farm men and women and increase work efficiency with less and easily accessible inputs. These also save time and money.

(Keywords: Women friendly technologies, mechanization, paddy production, tribal women)

Extraction and Characterization of Radish Leaf Protein Concentrates: Preparing Functional Food Ingredients by Green Technology

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Abstract

Leaf protein concentrates (LPC) were extracted from radish leaves by heat coagulation method without using any chemicals/organic solvents and their biochemical and functional properties were evaluated in order to determine their potential as a functional food ingredient. The leaves were macerated and the juice was subjected to heating at 85 °C for 10 min and the coagulated juice was centrifuged to obtain the LPC which were freeze dried and stored. Protein fractions were isolated from the LPC viz. albumins (19.32 %), globulins (9.38%), prolamins (29.07%) and glutelins (42.27 %). Their apparent molecular weights were determined by gel electrophoresis which ranged between 14-60 kDa. Functional properties viz. water holding capacity, oil holding capacity, emulsifying capacity and emulsion stability of the LPC were 545, 347, 51.8 and 49.4%, respectively, all of which were optimum for the to be incorporated as a functional ingredient in food products. The maximum solubility of LPC was observed at pH 8 (43%) whereas the minimum solubility was observed at pH 4 (27%). The least gelation concentration of LPC was 9%. A considerable amount of minerals (both trace and major elements) were present in the LPC, Ca and Fe being the most abundantly present. Both, the LPC and their isolated protein fractions showed high antioxidant activities (FRAP, ABTS and DPPH). Yeast/mould and total plate count of the LPC remained in acceptable limits during 42 and 35 days of storage under refrigerated and ambient conditions, respectively. These results indicated that LPC, extracted from radish leaves using an economic and environment friendly method have desirable functional properties, a considerable mineral content, high antioxidant activity and sufficient microbial stability. Thus they could be used as a functional ingredient to be incorporated in food

products to supplement diet and combat protein deficiency.

Keywords: Leaf protein concentrates, radish leaf, green technology, functional properties, antioxidant activity, electrophoresis

Soil fertility status and productivity of Rice as influenced by Neem Cake-Urea Mixed Application

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Abstract

A field experiment was conducted during kharif-2016 at ICAR-Krishi Vigyan Kendra (KVK), Mangaluru of Karnataka state to study the effect of neem cake urea mixed application on soil fertility status and productivity of rice under submerged condition. The soil of the experimental field was lateritic with acidic pH, medium in available nitrogen, high in phosphorus and low in potassium content. . The experiment was laid out in randomized block design (RBD) replicated thrice with seven treatments comprising of five neem cake and urea mixed application in various combinations along with one treatment as control and one treatment comprising application of recommended dose of nitrogen in form of urea. Soil samples were collected at harvest and analyzed for parameters of soil fertility. The results indicated that soil pH, Electrical Conductivity(EC), available nitrogen, available phosphorus and available potassium were not significantly influenced by treatment combinations of urea and neem cake. The grain yield(55.0 q/ha) and straw yield (4.35 tons/ha) was significantly higher in treatment T3 comprising of 100 % RDN applied in three splits with application of 100% recommended quantity of Neem cake. This was followed by treatment T4 (52.0 q/ha grain yield and 4.28 tons/ha straw yield) consisting of 75% RDN with 100% recommended quantity of Neem cake. The lowest grain yield(38.0 q/ha) and straw yield (3.46 tons/ha) was recorded in control (T1) where nitrogen and neem cake was not applied.

(Keywords: Rice, soil fertility, Neem cake, Urea mixture, productivity, submerged condition)

Crop yield and nutrient availability in mustard crop under the influence of amendment application in table lands of Chambal ravines

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Abstract

Soil health is deteriorating continuously with intensive agriculture practices, higher chemical inputs, soil erosion, etc are major issues in India putting food security and income of farmers at risk. Mustard is major rabi crop grown in Rajasthan and mostly used for oil purpose, beside this it is also used as spice, condiment, mustard leaves as vegetables etc. Poor nutrient management and soil moisture deficit affects the grain quality and yield of mustard crop

especially in semi arid regions. Organic and inorganic amendments like gypsum FYM and crop mulches have direct impact in improving mustard yield and quality. With this background an experiment was conducted with combinations of treatments like T1: Control; T2: Recommended Dose of Fertilizer (RDF) (mustard); T3: RDF + FYM (10t/ha); T4: RDF + Mulches (soybean crop residue); T5: RDF + Gypsum; T6: RDF+ Gypsum + FYM; T7: RDF+ Gypsum + Mulches; T8: RDF + Gypsum + Mulches + FYM. Results showed that highest mustard grain yield was recorded in T8 and T6 treatment of 1.4 t ha^{-1} and was significantly higher than T1 (0.6 t ha^{-1}) treatment. Mustard yield improved by 20-30% in amendment applied plots compared to control plots. Soil organic content improved from 0.34 % to 0.73% in T1 and T8 treatments respectively. Among available nutrients, available N, P and K content varied among treatments. Available nitrogen was in low and available P content was low to medium in soils after mustard harvest. However, available K remained high in all treatments and was on par with each other. Available sulfur status significantly improved among treatments and varied from 4 to 10ppm where gypsum was applied as amendment. Thus, application of these easily available amendments are economically viable options for farmers in improving mustard yield in degraded lands of semi arid regions.

Keywords: Mustard, available sulfur, crop yield, gypsum, mulches

Effect of addition of chocolate waste on egg quality in Japanese quails

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Abstract

The maize which is the major feed ingredient used in poultry feed. The cost of maize is increasing day by day. Hence scientists are focussing on the use of unconventional feed resource in feeds to reduce the feed cost. Chocolate waste is the waste that is produced during production of chocolates due to spillage or due to irregular sizes. Chocolate waste is a good source of energy. Hence an attempt was made in this study to utilize the chocolate waste as an alternate feed resource of energy replacing maize. A biological trial was conducted at PRS, Madhavaram on 300 Japanese quail birds for a period of 10 weeks (7^{th} to 16^{th} week) to study the egg production characteristics. Each treatment contained five replicates; each replicate had 15 quails (10 females and 5 males) with the sex ratio 2:1. The layer trial was conducted for a period of sixteen weeks with layer rations fed from 6 to 16 weeks. The diets were prepared as per BIS (2007) specifications at 0, 5 10 and 15 % chocolate waste. At the end of 16^{th} week, the egg quality of quails fed with chocolate waste was studied. Six eggs per treatment were randomly collected and were used to measure the egg quality parameters such as egg weight, shape index, albumen index, yolk index, haugh unit score, yolk colour and shell thickness. In this study, no significant difference ($P > 0.05$) was observed between the treatments in the egg quality parameters. The shell percentage of Japanese quail eggs decreased with increase in the inclusion levels of chocolate waste at graded levels from 0 to 15 per cent though statistically not significant ($P > 0.05$). Hence, it could be concluded that

chocolate waste can be added in Japanese quail diet without affecting the egg quality parameters.

Keywords: Japanese quail, chocolate waste, egg quality

Makhana seed processing for increasing Resistant Starch and its role in developing 'Ready-to-reconstitute' gruel mix

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Abstract

Makhana (*Euryale ferox*), though bestowed with several medicinal properties, is an underutilized crop of the country, mainly due to the lack of suitable processing techniques and inadequate knowledge of its nutritional content. The prime objective of this study is to develop a gluten free nutritious ready-to-reconstitute mix using makhana as the base ingredient. Makhana flour was subjected to roasting (100 ^{o}C for 3min) to reduce its foul smell and increase the resistant starch content. The roasted flour was combined with wood apple pulp and malted mung bean flour to develop different formulations of ready-to-reconstitute mix. Crude protein and carbohydrates content were appreciably high with the maximum content of carbohydrate and crude protein recorded in T5 and T4 respectively. Crude fibre and calcium content was high in all the formulations and DPPH scavenging activity was also high in all the formulations. These formulations were reconstituted in water/milk for assessing sensory properties and rehydration and viscosity analysis. Rehydration ratio was found to be highest in T8 (60% makhana, 10% wood apple pulp, 30% malted mung bean) and T9 (60% makhana, 30% wood apple pulp, 10% malted mung bean) received the highest in viscosity. T9 (60% makhana, 30% wood apple pulp, 10% malted mung bean) received the second highest rehydration ratio. The high rehydration ratio and viscosity were attributed to the high content of fibre in wood apple (3.50%) and malted mung bean (0.50%). All the formulations received high mean score (≥6.0) for appearance, colour, texture, taste, mouthfeel, flavor, consistency and overall acceptability, which indicates the "likeableness" of the products. T8 received the highest overall acceptability score and was adjudged the best product for formulation of ready-to-reconstitute mix. Roasted makhana flour can thus be incorporated into different cereals, fruits and pulses in suitable proportions to develop nutritious food products.

Keywords: Makhana flour, resistant starch, ready-to-reconstitute, antioxidant activity, malted mung bean, wood apple

Removal of pharmaceutical pollutants from wastewater using algae

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Abstract

Pharmaceuticals are emerging pollutants and their presence in water bodies has become a great threat to the terrestrial and aquatic organisms due to their continuous discharge and persistent nature. They pose a high risk to the living beings, aquatic animals and the surrounding environment even at very low concentrations. For this, a sustainable, eco-friendly and cost-effective reclamation strategy is required. In this regard, removal by microalgae has gained scientific interest due to their numerous advantages over conventional methods. Microalgae have fast growth rate and can adapt themselves according to external environment hence can be regarded as a potential candidate for treating pharmaceutical wastewater.

Keywords: Pharmaceuticals; microalgae; environment friendly; wastewater

Nutritional analysis antioxidants and anti nutritional factors in orange and purple fleshed sweet potato cultivars

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Abstract

Different cultivars of sweet potato are growing in demand in many countries for health food markets as a diversified range of high-quality, competitive products for food, feed, and industry. It has major contribution to household food security and great flexibility in mixed farming systems which make them an important component to improve the welfare of the rural poor and smallholder . The sweet potato could be considered as an excellent novel source of natural health promoting compounds which includes β-carotene and anthocyanin, for the functional food market. Nutritional composition of orange fleshed sweet potato (ST14) and purple fleshed sweet potato (ST13) were taken for the study. Nutritional analysis of OFSP and PFSP revealed that significantly more protein (4.9%) and iron (5.17mg) was noticed in OFSP than PFSP while fibre (4.03%), calcium and vitamin C (108.30 and 21.23mg) was significantly high in PFSP. OFSP contain β-carotene 10.38mg whereas PFSP showed 106.03 mg of anthocyanin which acts as an antioxidants. The DPPH percent inhibition in PFSP (73.09) was significantly more than 61.48 in OFSP.
Anti-nutritional content such as oxalate and trypsin inhibitor activity were measured in both cultivars. Oxalate in raw samples was detected 15.36 and 15.0 mg/100g in OFSP and PFSP respectively. Trypsin inhibitor was 157 and 167 TIU/mg protein in raw OFSP and PFSP respectively. Reduction noted with different heat treatments in both the cultivars. With all its benefits sweet potato flour can be used as substitute part of the wheat flour to make *chapathis* and other baked goods. In addition to serving as a source of energy and nutrients like carbohydrates, β-carotene, Ca, P, Fe, and K, sweet potato flour can add natural sweetness, color and flavour to the processed food products.

Keywords:OFSP , PFSP, antioxidants, β-carotene ,anthocyanin , DPPH percent inhibition , Anti-nutritional content

Analysis of weed control measures in *Kharif*french bean

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Abstract

A field experiment was conducted during *Kharif* 2018 at experimental farm, College of Agriculture, Latur (MS), to study the effects of different weed control measures on yield and economics of *Kharif* of french bean *(Phaseolus vulgaris* L.). The experiment was laid out in Randomised block design with seven treatments viz., T_1- Pendimethalin 30% EC @1.0 kg a.i.ha^{-1} (PE) , T_2- Quizalofop-p-ethyl 5% EC 100 g a.i. ha^{-1} at 20 DAS (POE), T_3 - Pendimethalin 30% EC @1.0 kg a.i.ha^{-1} (PE) + One hoeing at 30 DAS, T_4 - Quizalofop-p-ethyl 5% EC 100 g a.i. ha^{-1} at 20 DAS + One hoeing at 30 DAS, T_5 - One hoeing followed by One hand weeding (farmers practice), T_6- Weed free (Three hand weeding), T_7- Weedy check, replicated thrice. French bean variety HPR-35 was used for sowing. Though the higher seed yield per plant (9.69 g), 100 seed weight (38.33 g) and seed yield (950 kg/ha) were observed in weed free situation. But these parameters were found statistically at par with the application of pendimethalin 30% EC (1.0 kg/ha) as PE + one hoeing at 30 DAS and quizalofop-ethyl 5% EC (100 g/ha) at 20 DAS + one hoeing at 30 DAS. The highest Net Monetary Return (Rs.54850/ha) and BC ratio were recorded with the application of pendimethalin 30% EC (1.0 kg/ha) as PE + one hoeing at 30 DAS. Among different chemical weed control methods lowest dry weed weight (48.17 g/m^2), weed index (4.24%), and highest weed control efficiency (91.25%) were observed with the application of pendimethalin 30% EC (1.0 kg/ha) as PE + one hoeing at 30 DAS.

Keyword:French bean, Post-emergence herbicide, Pre-emergence herbicide, Weed management

Morphological characterization of dragon fruit (*Hylocereus sp*) accessions in Andaman and Nicobar Islands

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Abstract

Dragon fruit (*Hylocereus* spp.), an industrially important tropical fruit belonging to the family Cactaceae, is rich in essential nutrients such as vitamins, minerals, complex carbohydrates, dietary fibres and antioxidants. The Andaman and Nicobar Islands is highly dependent on mainland India for many of the common fruits and vegetables consumed here due to the

limitation in the land area for cultivation. Any crop of high value with maximum returns per unit area is a boon to the farmers and entrepreneurs of the Island. The effort of the researchers in identifying such a crop has led to the introduction of dragon fruit cultivation in the Island. Four accessions (DGF 1, DGF 2, DGF 3 and DGF 4) of dragon fruit belonging to different species were found suitable to grow in the Island as flowering and fruiting were observed only in these four accessions. The four accessions belonged to different species namely *Hylocereus undatus*, *H. megalanthus* and *H. costariscensis*. The stem, flower, fruit and seed characters showed variations among the four accessions were studied.. The margin ribs of the stem was concave in accession DGF 3 whereas convex in all other accessions. The distance between areoles was recorded maximum value in accession DGF3 and minimum in DGF 4. Variation was observed in distribution of spines and was 2 in DGF 3 whereas it was 4 in all other accessions. The fruit shape was elongated in DGF 3, moderately elongated in DGF 1, medium elongated in DGF 2 and moderately rounded in DGF 4. The average fruit weight was maximum in DGF 1 (419.3 g) followed by DGF 2 (267.4g).The peel and pulp weight was maximum in DGF 1 (160.5 g and 258.8 g respectively) and minimum in DGF 3(106 g and 45.6g respectively). The colour of pulp and peel were different in all four accessions and it is one of the important characteristic features for the identification of the species of dragon fruit. The colour of the pulp was White is DGF 1 and DGF 3; Pink in DGF 2 and Dark Purple in DGF 4. The peel colour was Pinkish Green in DGF 1, Pinkish Red in DGF 2, Pink in DGF 4 and Yellow in DGF 3. The number of seeds per fruit were numerous in all accessions except DGF 3. Variation in TSS was observed in all the accessions and it was maximum in DGF 3 (18.3^{o}B) and minimum in DGF 4 (9.1^{o}B).

Keywords: Dragon fruit, Andaman and Nicobar Islands, Morphology, *Hylocereus sp*

Ecofriendly management of invasive Coconut Rugose Spiralling Whitefly, *Aleurodicus rugioperculatus* Martin in Kanyakumari District

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Abstract

Coconut is an important plantation crop in Kanyakumari district grown in an area of 25,055 ha. The crop assumes considerable significance in the district as it contributes much to the rural employment in terms of small scale industries. The incidence of invasive coconut rugose spiralling whitefly, *Aleurodicus rugioperculatus* Martin (Hemiptera: Aleyrodidae) was first noticed in Kanyakumari district during 2017 which slowly spread to the entire district. On farm testing trail was conducted during 2019-20 to assess the management modules against Rugose Whitefly in Coconut. The following modules viz., release of *Encarsia guadeloupae* parasitoid@ 100 Nos/ac, release of *chrysoperla zastrowi silemmi* @ 500 nos/ac, installation of yellow sticky trap (3 x1.5 ft) at 6 -8 feet height @ 10 nos/ac, spraying of water and 2.5% starch solution in sooty mould affected leaf fronds were evaluated under field condition in five farmers field in Rajakkamangalam block of Kanyakumari district.

Trainings and demonstrations on the management modules were disseminated to farmers for the management of coconut rugose spiraling whitefly in coconut. The results revealed that infestation percentage of rugose spiralling whitefly has been reduced (34%) in the management module treatment whereas 50 per cent infestation was observed in farmers practice (check). Natural parasitisation percentage of predator and parasitioids has been increased in the management treatment module (26.86) with low level of infestation index (1.20) whereas farmers practice recorded low level of parasitaization (6.4 %) with infestation index of 2.20. The infestation of rugose spiralling whitefly was category as low in treatment module and medium in Farmers practice. The average nut yield was 14000 per ha in management module treatment whereas the farmers practice (check) recorded 13760 nuts per ha. The data on yield revealed that during the first year of management module treatment, there is no significant increase in the yield when compared to the farmers practice. But adoption of this management module would significantly increase the nut yield with reduction in rugose spiralling whitefly in the subsequent years.

Keywords: Coconut, *Aleurodicus rugioperculatus*, *Encarsia*, *chrysoperla* , incidence, parasitization, Management modules

Genetic variability on Beachpea (Vigna marina) collected from Andaman and Nicobar Islands for salt tolerance using SSR markers

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Abstract

Beachpea (*Vigna marina*) is a halophytic wild leguminous plant present throughout the tropical and subtropical beaches of the world. As QTLs identified for salt tolerance in *V. marina* along with its crossability to other *Vigna* species, the present study has been undertaken to assess the genetic variability to utilize them in pulse breeding programs. Totally, 20 *Vigna* species [15 genotypes of *V. marina* collected from Andaman and Nicobar Islands during August to December, 2018 and five varieties of *Vigna* species as check (three blackgram as IPU-02-43, LBG 752 and VBN 7; two greengram as LGG 544 and TARM 1)] were used. Molecular characterization using 7 SSR markers specific to salt tolerance, only four found with amplification. Number of alleles detected primer^{-1} ranged from 1 to 3, whereas, size of alleles ranged from 100 to 325bp. PIC values ranged from 0.05 to 0.57 with an average of 0.33. H_e values ranged from 0.375 to 0.612. Two SSR loci (CEDG087 and CEDG007) revealed higher PIC and H_e values than 0.40 and 0.50, respectively. Three major clusters, Cluster I, II and III obtained at Jaccard's similarity coefficient value of 0.48 through UPGMA method of cluster analysis. It grouped mungbean and urdbean (Checks) in Cluster I (04) and II (01), whereas, all *V. marina* genotypes in Cluster III (15) and it was further divided into two sub-clusters as Sub-cluster IIIa (05) and IIIb (10). PCoA analysis explained about 85.93% of genetic variation present among genotypes by first three most informative principal coordinates and also confirms the pattern obtained under cluster analysis. This study

indicated the effectiveness of SSR marker in separating cultivated *Vigna* species from wild *V. marina* on basis of salt tolerance.

Keywords: Beachpea, Cluster analysis, Genetic variability, Salt tolerance, SSR marker, QTL

Fruit colours that fascinates us: A review

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Abstract

Colour is one of the important parameters that describe a fruit and considered as the first sensory perception that fascinates everyone. Colourchange from immature to ripe stage during ripening of fruit indicating its maturity. Colours are of prime importance for indicating diversity among the genotypes for selection of elite parents. Colour development is the most fascinating and complex phenomena during the ripening and is mainly governed by pigments. Basically, there are carotenoids and anthocyanins pigments responsible for fruit colours. Anthocyanins impart red, blue and purple Colours, whereas, carotenoids are responsible for yellow, red and orange colours in fruits. Carotenoids and anthocyanins are secondary metabolites formed through the biosynthetic pathways associated with the source to sink flux involving substrate and enzymes contributing to the formation of the specific metabolites. This review focus on the significance of colours, pigments and their biosynthesis in the fruits.

Keywords: coloured fruits, diversity, carotenoids, anthocyanin, pigments, gene regulation

Influence of Varroa mite infestation on body weight of *Apis mellifera* L.

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Abstract

The studies were conducted during 2016-2017 to determine the effect of different infestation levels of *varroa destructor* mites on body weight of honey bees (*Apis mellifera*). The studies revealed that mite infestation had a pronounced influence on the body weight of adult bees (drone and worker bees) and their pupal stages. In case of drones infested with 1-3 mites (slightly infested), the body weight loss was 10.91 (%) followed by drone pupae 12.31 per cent. There was considerable loss in the body weight of adult and pupae worker bees with an average of 10.64 and 10.48 per cent, respectively at an infestation level of 1-3 mites. Studies also revealed that per cent loss in body weight was found more in drone pupae (19.97 %) followed by drone adult bees (18.20 %) at an infestation level of 3-5 mites.Similarly, in case of worker adult bees and worker pupae, the percent weight loss was 17.89 and 16.10 percent,

respectively. Evidently, infested colonies had weak workers and drones and exhibited reduced honey gathering and pollination activities.

Keywords:*Apis mellifera*, Body weight, *Varroadestructor*, Infestation level

Exploring Novel Application of Radiocarbon Labelling to Profile Iron Limiting Stress Tolerant Genotypes of Soybean (*Glycine max* (L.) Merr.)for Adapting Climate Resilient Low Input Agriculture

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Abstract

Iron deficiency is an important abiotic nutrient limiting stress, occur on calcareous and high pH soils, that affects 30% of the cultivated land of the world. Iron deficiency chlorosis (IDC) tolerance in soybean is a complex quantitative trait governed by seven major effect quantitative trait loci (QTL) on seven chromosomes, suggested the polygenic nature. Hence, identification and validation tolerant genotype with molecular markers is extremely difficult. Soybean acquires iron through Strategy I (reduction based) mechanism. A change in the demand for iron within the plant modifies the root activity and induces exudation of low molecular weight organic (LMWO) metabolites. Our understanding based on the research shown that the relative tolerance of soybean plant to iron stress depends on ^{14}C content in the total root exudates ($^{14}CTRE$). Thus, we report here a new application of radiocarbon labelling and the scientific basis for screening of iron efficient genotypes. The present investigation consists of three objectives assessed through three different experiments using soybean as the test crop. In the first study, we have screened 50 diverse soybean genotypes for IDC tolerance, through hydroponic experiment, using modified Hoagland solution with sufficient (+Fe, 25 µM FeEDTA) and low-Fe (-Fe, 2.5 µM FeEDTA). The efficiency of genotype was confirmed by means of relative C-14 exudation and relative chlorophyll content. The plants were exposed to $^{14}CO_2$ in a fabricated air-tight chamber (70 cm x 35 cm x 65 cm). Evolution of $^{14}CO_2$ is favoured by addition of 1.0 N HCl to three ampoules of $NaH^{14}CO_3$ solution (specific activity 185 kBq; Bhaba Atomic Research Center, Mumbai, India). Unassimilated $^{14}CO_2$ was quenched by 15 mL saturated KOH. After 24 h exposure, roots were rinsed in distilled water (pH 4.5), sampled in 50 mL of 0.5 mM $CaCl_2$ solution (4 h). Iron Stress Tolerance Index (FeSTI) and Iron Stress Susceptibility Index (FeSSI) were worked out as per standard protocol and identified NRC-45, IC-18734, J-231 and G-2132 as representative genotypes for iron efficient and responsive (FeER), iron efficient and nonresponsive (FeENR), iron inefficient and responsive (FeIR) and iron inefficient and nonresponsive (FeINR) categories, respectively. In the second study, a pot culture study was conducted in the glass house of National Phytotron Facility. In tandem with FeER genotype, the effect of Sulphitation Press Mud (SPM), as amendment in soil with microbial combinations were gauged for minimising IDC. Among the twelve treatments, FeER + 12.5 mg Fe as $FeSO_4$ kg^{-1} soil + SPM (*Aspergillus niger*) + Arbuscular Mycorrhizal Fungi (AMF) performed the best, associated with the combined effect of LMWO compounds secreted by FeER and that

produced by *Aspergillus niger* through decomposition of SPM. Besides, greater exploited soil volume facilitate by AMF (*Glomus mosseae* and *Glomus fasciculatum*) facilitates better absorption of iron. In the third experiment, a futuristic study was carried out for identifying the interactive effect of pre-identified treatments with the ambient and elevated CO_2 and temperature conditions using plant growth chambers (2 x 6 factorial experiment, 3 replications). The results clearly revealed that, elevated CO_2 and temperature (e-[CO_2+T]) condition adversely affect iron nutrition by dissolving the native $CaCO_3$ through higher partial pressure of CO_2 (Pco_2), induce greater HCO_3^- ion activity, which show antagonistic interaction with Fe^{2+} ion. Soybean grown under e-[CO_2+T] matures 6 days earlier than a-[CO_2+T] condition because of the influence of temperature and the Accumulated Growing Degree Days (AGDD) is significantly influenced by the genotype x environment (G x E) interaction. To combat the constraints in Fe nutrition, especially under e-[CO_2+T], the iron efficient genotype of soybean exude more amount of LMWO compounds. Furthermore, ferric chelate reductase (FCR) activity gets reduced by e-[CO_2+T] through the influence of HCO_3^- ion. The present study revealed that the synergistic effect produced by the combined application partly decomposed SPM with *Aspergillus niger* and composite culture of AMF was more effective in mobilizing iron from soil to plant and can be potentially exploited to minimise IDC. Among the treatment combinations, FeER + 12.5 mg Fe as $FeSO_4$ kg^{-1} soil + SPM + AMF perform the best under ambient condition. Further, because of antagonistic interaction between Fe^{2+} with HCO_3^- ion results in greater iron stress under elevated condition compels to alter the treatment as FeER + 16.25 mg Fe as $FeSO_4$ kg^{-1} soil + SPM + AMF. Thus to conclude, iron efficient genotype can successfully be screened by radiocarbon labelling and the genotype (FeER) identified will be nutrient efficient and fertilizer responsive, can be adapted to climate-resilient low input agriculture.

In vitro study the efficacy of fungicides against false smut and kernel smut diseases on rice

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Abstract

The present investigation was done to evaluate five fungicides suspension i.e. Carbendazim (Bavistin50WP), Trifloxystrobin+Tebuconazole (Nativo 756WG), Propiconazole (Tilt 25 EC), Carbendazim (12%)+ Mancozeb (63%) and Tricyclazole 75% WP were evaluated against False smut and Kernel smut using food poison technique on the PDYA media at 60ppm, 125ppm, 250ppm, 500ppm and 1000 ppm concentrationson rice under In vitro condition at the experimental laboratory of Guru Kashi University, Talwandi Sabo (Bathinda district) during session 2017-18**.** The percent zone of inhibition of pathogens is tested with different fungicides and at different concentrations. The result revealed that out of five fungicide, Tilt 25EC (Propiconazol) and Nativo 75WG (Tryfloxystrobin + Tebuconazole) at all tested concentration followed by Baan 75WP (Tricyclazole) @250ppm evaluated as best

fungicide show 100% zone of mycelium inhibition *in vitro* condition. The remaining tested fungicide treatments were less effective but superior over control.Hence, present study will be significant for rice grower to further confirm the effectiveness of the recommended fungicides, Tilt 25EC and Nativo 75WG against False smut and Kernel smut disease along with other fungicides. Thus, these fungicides can be used as an alternatives to control these two diseases of rice.

Key Words: False smut, Kernel smut, Rice, Fungicide, Management, *in vitro*

Fish Farming Technology Adopted by District Dewas Farmers for Income Generation

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Abstract

Food security for human beings on globe is becoming increasingly important on a worldwide level. Factors responsible for low fish production are lack of scientific information, poor fisheries extension services, feed adulteration, low water quality, high construction cost and non-availability of good source of water. In India, the farming community accounts for 80% under marginal and small farmer's category (GOI, 2011). Farmers under these categories are economically poor working in diverse, risk prone environments and with hardly sufficient to sustain their family. The declining trend in land holding per capita poses a serious challenge to the sustainability and profitability of farming. Considering the efficacy of this viable production system, the study was conducted in purposively selected ponds of farmers which had available space of the pond bundh used for production of horticulture produce. The trial was conducted minimum 06 replications were taken under farm field condition. Vegetable growing in the trellis and dykes is an additional component which helps in maximizing profit from unit area. The data were collected from each treatment for consecutively 03 years to judge the economic profitability and sustainability of the practice. It was observed that better production and sustainable economic return can be achieved through integrated production technology or with dyke vegetable cultivation in pond based integrated farming practices. The data on horticulture (vegetables) component under integrated farming practice. The data were assembled throughout the trial period for 03 years on production parameters of various vegetables, i.e. pumpkin, bitter gourd, ridge gourd and bottle gourd round the year under the dyke vegetables cultivation practices. The results s significantly showed that all the vegetables production in IPT was significantly better than farmer's practice. The gross return, net return and B:C ratio were also higher in IPT (Integrated production technology- fish culture+ round the year dyke vegetables on trellies and on ground). This is a viable option for augmenting overall farm productivity and better economic return of rural pond based farming community. There are lots of options in integrated farming system, but in Dewas district scenario, huge numbers of seasonal ponds so, pond based integrated farming practice may be one of the significant, efficient and viable option for small and marginal farmers.

Keywords: Profitability, Fish, Horticulture cum Fish Culture, Integrated Farming, Sustainable, Vegetable.

Endophytic fungi from high altitude medicinal plants: A bioactive repository of novel chemistries

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Abstract

Endophytes are specific group of micro-organisms which colonize plants internally without apparent adverse effects. Endophytic fungi are potent source of novel organic compounds with pharmaceutically important biological activities and a high level of biodiversity. An array of natural products has been characterized from endophytes, which include anti-cancer, antioxidant, antifungal, antibacterial, antiviral, anti-insecticidal and immunosuppressant activity. The present study was undertaken to investigate the potential endophytic fungal isolates from high altitude medicinal plants for antibacterial, antioxidants and L-asparaginase mediated anti-inflammatory activities. A total of 79 different fungal endophytes were isolated from different plant parts of various medicinal plants viz. *Rauwolfia serpentina*, *Pinus sabiniana*, *R. arboreum* and *C. verum* to create a potent repository. Among the repository, potent antibacterial activity was observed in isolates from *Rauwolfia serpentina* and *C. verum*. All the isolates exhibited free radical scavenging activity but 4 cultures namely LG#OTSBOK, #7RALB, #10RASTB, #13CCBKN showed maximum antioxidant activity and maximum phenolic content was estimated in extracts of 4 fungal isolates i.e. #1RASTB, #9CZLFAB, #17BBSSTB and #13CCBKN. Further, cultures namely #17BSSTB, #9CZLFAB, #LG2 and #13CCBKN showed highest anti-inflammatory potential by inhibiting albumin denaturation. The isolated endophytic fungal isolates were screened for the production of L-asparaginase enzyme. In the L-asparaginase screening assay #11 RASTB, #17 RASTB, #18RALFB, #10RASTB, #9CZLFN and #18CTLFN were found to be potent L-asparaginase producer. One-way ANOVA analysis and Tukey's post hoc analysis revealed maximum L-asparaginase production in #9RASTB with a zone size of 20.3 mm. The present study exhibited potent recovery of fungal endophytes with multiple bioactivities including L-asparaginase production and anti-inflammatory action.The present study has shown an alternate route of harnessing novel compounds of natural origin with potent medicinal values.

Keywords: endophytes, antioxidant, anti-inflammatory, anti-bacterial, L-aspariginase, medicinal plants,

Studying the antioxidant effect of *Ocimum gratissimum*

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Abstract

Secondary metabolites synthesized by plants acts as immunological barrier for them and for us these have been utilized as the elements of ethno-medicine since the time unknown. Among these applications, stress modulation activities especially antioxidant activity of plant derived natural compounds have gained popularity even in recent years. The fragrant plant genus, *Ocimum* traditionally known as 'Basil' has nine different species spread across India containing diverse secondary metabolite profiles. Being a member of this genus, *Ocimum gratissimum* or the 'Clove Basil' is also capable of producing an array of biologically dynamic compounds.

This study has been designed to verify the effect of water soluble secondary metabolites present in the plant *Ocimum gratissimum* on the aged there by stressed cells of *Saccharomyces cerevisiae*. Oxidative stress is a naturally gained phenomenon that comes with age. The chronological aging results in stress that ultimately affects the bio macromolecule and several biochemical reactions occurring inside a cell ultimately leading to age. Our study focuses on the overall protein damage occurring in *S. cerevisiae* due to aging as well as the effect of the extract of *O. gratissimum* on these aged *S. cerevisiae* cells (2 months old culture). To achieve this target firstly the collected leaves of *O. gratissimum* has been air dried followed by the extraction of the secondary metabolites in water. Once the water extract has been made, it is added on the oxidized BSA (*in vitro*) as well as on the aged and stressed *S. cerevisiae* (*in vivo*) and the amount of the stress related protein accumulation is determined by protein carbonylation assay.

Obtained result shows a substantial declining in the stress parameter or protein damage. The rise in the concentration of the basil extract also shows noteworthy increment in antioxidant activity and thus indicating its probable effect on treating the age related stress accumulation on higher eukaryotic organisms. This study actually paves the way for a more detailed study through which the main compound behind this antioxidant activity can be traced and applied commercially for human welfare.

Keywords:*Ocimum gratissimum; S. cerevisiae;* Age related stress; Antioxidant activity;Protein carbonylation assay.

Immobilization of soil copper by use of soil amendments under different soil moisture regimes in the metal contaminated soil

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Abstract

The present study was performed to evaluate the effect of soil amendments like lime, poultry manure and farmyard manure (FYM) on the immobilizationof soil copper (Cu) under two different soil moisture regimes like, submergence and alternate wetting and drying (AWD). Effect of soil amendments and soil moisture conditions on the dry matter yield, Cu content in plant, extractable soil Cu and distribution of Cu invarious fractions of soil were explored in the pot experiment. Poultry manure and FYM were relatively ineffective in terms of immobilization of Cu in the contaminated soil, although these manures brought significant increase in yield over control. Results indicated that mean DTPA-extractable Cu content in post-harvest soil was significantly reduced by 10.2% under AWD over submergence. The mean Cu content in rice grain was significantly reduced by 11.1% due to the liming over control. Readily available fraction of soil Cu was decreased significantly by 19.7% due to the liming over control. The mean value of hazard quotient (HQ) for intake of Cu through consumption of rice grain was significantly lower due to lime application (0.015) over control (0.017). Soil cu immobilization capacity of lime was most effective under AWD soil moisture regimes in the metal contaminated soil. Hence, lime application under AWD may be the best option for remediation of metal contaminated soil.

Keywords: **S**ubmergence; alternate wetting and drying (AWD); immobilization; hazard quotient (HQ), DTPA-extractable Cu; liming

Molecular and insecticidal characterization of *Bacillus thuringiensis* Berliner (Bacillales: Bacillaceae) Cry toxins against the fall army worm, *Spodoptera frugiperda*J.E. Smith (Lepidoptera: Noctuidae)

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Abstract

The Fall Armyworm (FAW) was discovered in India after leaving a path of ruined plants in Africa and the Americas.Bt was re-isolated successfully from the dead larvae of FAW. A

total of 10 putative *B.thuringiensis* isolates were acquired. All of the isolates were discovered to be Gram positive and crystalliferous. Majority of the isolates exhibited the bipyramidal crystal (crystals know to be effective against lepidopteron insects). A new *cry1I* gene from the *B. thuringiensis* re-isolated from dead FAW larva were cloned and expressed in pRSET. Cloned FAW *cry1I* gene sequence showed a typical *Btcry* gene with significant homology to *cry1I* genes with toxic region differences. Predicted using Phyre2 homology modeling, the deduced 3-D structural model of the new FAW *cry1I* shows that the gene contains three domains that participate in the formation of a pore and determine the binding specificity of the receptor. We also assessed the insecticidal activity of *cry1I* gene for the effective FAW management. FAW larvae were evaluated in the first, second, third and fourth instars. The bioassays revealed that the larvae of the FAW were susceptible to indigenous Bt Cry toxins. Compared with the normal HD1 reference strain at 15.5 µg / mL, the purified Cry1I gene was lethal to FAW. The death percentage was observed at 100 percent. At the end of the toxicity test, all the treated larvae were dead, while most control larvae were found to be healthy and successfully complete the life cycle.

Biotic and abiotic stress management in scientific cultivation of Mango (*Mangifera indica* .L) for sustainable yield and quality with environmental safety

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Abstract

The climate change scenarios predict pronounced modification of the climate in the coming decades. Climate change is therefore a great concern agriculture will have to cope with in the coming century. Since a few decades, several research teams around the world carry out a huge work to model the future climatic change during the 21st century, based on several scenarios of greenhouse gas emission. We have to expect rise in average temperatures, in atmospheric CO2 concentration, in soil salinity in some areas, and lower and more irregular rainfall. The climate variability and the frequency of extreme events. Mango is one of the common fruit in most continents, particularly in Asia, Central and South America and Africa. Global production of mangoes is concentrated mainly in Asia and more precisely in India which produces an average of 15 million t (MT) a year. Mangoes are now growing in more than 100 countries of which more than 65 countries produce each more than 1,000 MT a year. There is wide gap between yield & profitability. It is due to poor management practices, biotic and abiotic stresses round the year particularly in flowering and fruiting period. Biotic factors like attack of red banded caterpillar, madhua kit, powdery mildew, mango fruit fly attack. Abiotic stresses are high temperature in January, rain in November – December, high temperature followed by low temperature causes blackening of flowers, westerly wind in January month causes huge loss of flowers particularly early variety like bombay, jardalu, gulabkhas. Rain in November December tends towards vegetative growth in place of flowering. Late flowering leads to delayed harvesting of fruits hits 300 crores of annual export market (The Hindu 2020). Working in Krishi Vigyan Kendra, Bhagalpur from 2009 to till date a keen observation is made on effect of climate change and indiscriminate management practices with no safeguard for environment. To combat the effect of biotic and

abiotic factors study and observation revealed balance dose of fertilizer, proper management of insect and pest, suitable intercrop and use of wind break can be able to mitigate the problems. Farmers are able to harvest good quality of crops and fetch higher prices in the market.

Grafting in Tomato (*Solanum esculentum* L.): A sustainable way of increasing the yield

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Abstract

An investigation entitled "Evaluation of tomato and brinjal grafts for bacterial wilt resistance, yield and yield attributing characters of tomato (*Solanum lycopersicum* L.)" was carried out at the Vegetable Science Research Block, College of Horticulture, UHS campus, GKVK post, Bengaluru, Karnataka during 2018-19. The grafting of commercial tomato varieties on disease-resistant varieties of tomato and wild *Solanum* species was enumerated the grafting success, the influence of rootstocks combinations with scions on tomato fruit yield. The growth and yield of the scion namely PKM-1 grafted onto the *Solanum torvum* rootstockdiffered significantly followed by *Solanum macrocarpon*. The other graft combinations were inferior to non-graft variety PKM-1 for fruit yield. The tomato and brinjal grafts were shown the increased crop duration with more number of harvests attributed to the higher fruit yield. The rootstock *Solanum torvum* found to superior for the grafting parameters, growth and yielding attributes influenced by the scions. In this study, we conclude that the rootstock *Solanum torvum* is best compare to other rootstocks for grafting in the tomato.

Keywords:Tomato grafts, Resistant varieties, Scion, *Solanumtorvum*

Towards Sustainable Rural Livelihood: Evidence from Micro-level Study of Jyotisar Village

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Abstract

Majority part of population of India lives in rural and village areas. Employment generation andpoverty alleviation of these people has been focused goal of Indian planners, policy makers and government since independence. In this direction, government of India introduced Swarnajayanti Gram Swarozgar Yojana in 1999 to train the rural people so that they could be able to start their own gainful enterprise and become self-employed. However,

this scheme suffered some major limitations and its outcome could not be sustainable and desired. Therefore, SGSY was restructured and renamed as National Rural Livelihood Mission in 2011. This scheme operates through SHG and intends to develop skills for generating gainful livelihood and enterprise of people residing in rural areas. Promoting entrepreneurship in rural areas is one of the essential component of NRLM scheme. Rural entrepreneurship plays a vital role in employment generation and industrialization in rural areas and so nowadays, it is a focused area in government policy and scheme. In this backdrop, an empirical survey has been done to explore the role of NRLM in promoting enterprise in village area. Field survey of the beneficiaries of the scheme was conducted in the Jyotisar village of Thanesar block through personal interviewed with the set of structured questionnaire. The results, insight and findings generated through this case study may be useful for the various stakeholders engaged in the policymaking and effective implementation of this program.

Keywords: Rural Entrepreneurship, NRLM, Poverty Alleviation, Village, SHG, Sustainable

Optimization of process protocol for the development of anthocyanin enriched ginger candy

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Abstract

Ginger is one of the principal spice and important cash crop of India and abroad gaining importance in food, pharmaceutical and chemical industries due to the presence of several bioactive compounds. The characteristic flavour of ginger is due to the presence of polyphenol compounds like gingerol, zingiberone, bisabolene, paradols, shogaols and gingerones which possess therapeutic properties and also stimulates digestion, absorption, relieve constipation and flatulence.Ginger candy is a traditionally ready to eat intermediate moisture food (IMF) product having a great demand in confectionary industry due to the acceptable sensorial characteristics and appreciable nutrients especially phenols. In the conventional method of ginger candy preparation, honey may be an effective replacement for sugar which is generally used as a sweetener. The optimized method for preparation of anthocyanin enriched ginger candy (plum pulp and honey) involves 7.5mm slice thickness, blanching in 1.0 per cent lime juice, osmotic dip in 70 per cent immersion solution (plum pulp and honey) for 5 hours and drying in a mechanical dehydrator (55±2^{o}C). The high concentration of fructose and glucose in honey resulted in increased rate of mass transfer other than being a source of natural antioxidants. Nutritionally anthocyanin enriched ginger candy prepared by dipping in hypertonic solution containing plum pulp and honey possessed appreciable amount of anthocyanin (56.64 mg/100g), ascorbic acid (17.46 mg/100g), total phenols (26.95 mg/100g) and antioxidant activity (97.66 %).

Keywords: Candy, Honey, Plum, Anthocyanin Enrichment, Organoleptic Quality

Effect of industrial waste (heavy metal) on fish bod

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Water is the most important natural resource which is abundant in nature and covers about two thirds of the earth's surface. Water is essential for survival and the development of modern technology. The rapid industrialization is one of the main causes for aquatic pollution. Many rivers of the world receive a heavy flux of sewage, industrial effluents, domestic and agricultural wastes that consist of substances varying from simple nutrient to highly toxic hazardous chemicals. Pollutants in any industrial discharge are of different types, such as oxygen demanding wastes, disease-causing agents, synthetic organic compounds, plant nutrients, inorganic chemicals and minerals, sediments, thermal discharges, oil and grease, etc. Industrial effluents containing heavy metals and other toxic chemicals are usually unsusceptible to degradation. These effluents, when discharged into rivers, cause deleterious effects on fish and other aquatic organisms. The impact becomes severe especially when the self-purification properties of a river are destroyed by excessive discharge. Fish are one of the most widely distributed organisms in aquatic environment and, being susceptible to metal contamination, may reflect the extent of the biological effects of metal pollution in waters. Fish are often at the top of aquatic food chain and may concentrate large amount. The presence of heavy metals in the aquatic environment is a major concern because of their toxicity and threat to plant and animal life, thus disturbing the natural ecological balance. The rate at which heavy metals gain entry into the aquatic systems is alarming. The occurrence of heavy metals in aquatic ecosystems in excess of natural loads has become a wide spread problem and a matter of concern over the last few decades. Heavy metals and organic compounds can bioaccumulate in aquatic biota and biomagnifying in food chains.

Migratory Beekeeping: A steps towards promotion of beekeeping

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Abstract

The commercial beekeeping with *A. mellifera* is possible only by adopting migration on regular basis and management practices. Bee flora vary in time and space. Hence, one has to migrate the apiary or honeybee colonies to different areas during different seasons to exploit the available bee flora and obtain maximum benefit from commercial beekeeping through multiple honey extractions. Migratory beekeeping helps to increase the honey yield per colony several times over the stationary beekeeping. Colonies should be migrated early in the morning or late in the evening when there is no bee activity and all the bees are inside the hive. Surplus honey should be extracted at least a week before colonies migration. It is necessary therefore, for *mellifera* beekeepers to have detailed information on the

availability of different floral sources near their apiaries, seasons of their availability and migration schedules for optimal utilization of the available floral resources. The migratory routes for the exploitation of several honey flows that take place in different location at different time periods are the key factor for commercial beekeeping. In Bihar, which is a dominant honey producing state, commercial beekeepers adopt migratory beekeeping mainly for Litchi, Mustard, Jamun, Drumsticks and Karanj. The colonies are migrated from various pockets of the state to Muzaffarpur, Bhagalpur, Gaya and East Champaran during January-April for litchi flow and after litchi flow several beekeepers migrate colonies to Jharkhand till the end of May to avail the karanj honey. Migratory beekeeping increases the honey production manifold as compared to the sustainable beekeeping. In Bihar diversified bee flora like litchi, sunflower, karanj, jamun, drumsticks, mustard and eucalyptus honey have great demand in market and can be sold in their floral brand name and can fetch good market price.

Soil Enzymes Activity under Oak based Silvi-Horti System

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Abstract

Soil enzyme activities were estimated in soil samples collected from oak based silvi-horti system (oak + turmeric) at 0-15 and 15-30 cm soil depth. The experiment was conducted in factorial randomised block design (FRBD) with two variety (*Pant Pitabh* and *Swarna*) and four cutting management i.e. coppicing and pollarding (detopping) at one, two, and three meter height. To study the comparative effect of tree, both the verities were also sown in open condition (without tree). Among various cutting management, pollarding at 3 m height reported highest acid phosphatase (~373 µg p-NP produced/g soil/h), dehydrogenase (~230 µg TPF/g soil/24 h) and B glucosidase (~20 µg p-NP produced/g soil/h) enzyme activity followed by 2 m and lowest in coppicing plots. In contrast, urease enzyme activity was found highest with pollarding at 2 m (~289 µg urea hydrolysed/g soil/h) followed by 3m (287 µg urea hydrolysed/g soil/h) and lowest in coppicing (283 µg urea hydrolysed/g soil/h). Other than phosphatase, higher enzymes activity was observed for *Pant Pitabh* variety and overall tree based cropping system found superior than open condition. All the enzyme activities were declined sharply in subsurface layer (15-30 cm) as compared to the surface layer (0-15cm).

Keywords: Soil enzymes; Silvi-horti system; Turmeric: Cutting management

CASI – a production system beyond conservation agriculture

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Abstract

Successful adoption of CA involves three basic principles: minimum tillage, soil cover and crop rotation. It is very difficult to apply three principles of CA in south Asian regions because our agriculture is linked with animal farming and fisheries; we fallow 2-4 crops in a cycle according to farmers' demand and requirement. On other hand Indian agriculture facing lot of problems-man made problems; 1.Monocropping , 2.Residue burning, 3.Adopting new crops and cropping systems in new location where not fitted with available resources, 4.Intensive tillage and 5.Flood irrigation, under natural problems; climate change issues(like flood, cyclones), abiotic stresses like drought, flood, salinity, acidity etc., along with biotic stresses like new pests. Decreasing ground water table, deterioration of soil health, soil productivity, global warming, ultimately crop production is declining. Now the challenge is to increase our productivity, sustain it and protect it from climate stress. The best solution for addressing all above mentioned problems is CASI -Conservation Agriculture based Sustainable Intensification. CASI is broader than CA and goes beyond. CASI includes CA practices along with efficient uses of external inputs and natural resources. It is economic and viable to farmers, and appropriate to our farming system that addresses our livestock, fish and soil. This will make our farming system more resilient, save energy for our future generation, create cleaner and safer environment, and bring biodiversity back in our soil and thus in our ecosystem. In addition, it brings more income to the farmers, improve nation's economic condition, improve our livelihood, increase our food security and we get better nutrition. Since last 10 years from our own farm-trials, we have found: 5%- 10% increase in production, 8%- 17% of irrigation water saved, 26%- 42% labor saved, 46%- 62% fuel consumption/ energy saved, 16%- 56% increase in farmers' income,11%- 16% reduction in CO_2 emission.

Keywords: Minimum tillage, Monocropping, Residue burning, climate change and CASI.

Preliminary Survey on incidence on Plant parasitic nematodes in Koshi region of Bihar

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Abstract

A survey was conducted in three districts of koshi region of Bihar viz. Purnea, Katihar and Kishanganj to determine the total frequency, frequency distribution and Community

analysis of plant parasitic nematode genera associated with the soils and roots from the rhizosphere of Banana, Tomato and Brinjal crops during the growing season of 2018. A total 51 samples were randomly collected from three districts of kosi region of Bihar. The survey revealed that out of which only 6 samples (11.76%) were infected with root knot nematodes at the time of survey. After a Bioassay experiment especially for root Knot nematode showed that out of 51 samples 27 samples (52.94%) are infected with root knot nematode. In Purnea, a total of 21 soil and root samples were collected in which 2 samples were found infected at survey site and 8 were found infected during bio-assay by transplanting tomato susceptible seedling especially for root knot nematode. Total frequency of root-knot nematode in Purnea district was 47.6%. In Katihar district, out of 18 samples, 2 were found infected at Survey site and 8 were found infected during bio-assay. Thus, total frequency of root knot nematode in Katihar district was 55.6%. Similarly, in Kishanganj district out of 12 samples collected, two were found infected at the time of survey and five were found infected during bio-assay making the total frequency occurrence to 58.3%. A community analysis was also drawn for the soil samples collected from three districts of Koshi region of Bihar presented that two nematodes namely *Meloidogyne* sp.and *Helicotylenchus* sp. were found to be the most prevalent nematode genera and also high frequency distribution in the surveyed districts.

Keywords:**Survey**, Root knot Nematode, Bihar, Koshi region.

Occurrence of Black gram diseases in Koshi region of Bihar

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Abstract

A random survey was carried out during the rabi season of 2018-19 in the black gram growing areas of koshi region of Bihar for disease incidence. The survey was conducted in Black gram growing areas of Purnea, Araria, Kishangunj and Katihar districts for the prevalence areas of the web blight disease. During the survey of the Purnea district, the Bhola Paswan Shastri Agricultural Farm has high disease incidence of 22.24 percent of web bight disease was recorded compared to Parora village in Purnea district with 13.47% of disease incidence. Similarly the survey was conducted in Katihar district where the web blight disease incidence was highest in Kursela (35.31%) compared to Falka (18.37%) village. In the same way the survey was conducted in Araria and Kishanganj districts, where high disease incidence of web blight was observed in Baisa of Kishanganj district and low disease incidence of web blight was observed in Raniganj of Araria district. The overall survey of four districts (Purbnea, katihar , Kishanganj and Araria) revealed that the web blight disease incidence ranges from 13.94 to 35.31 percent.

Keywords-Survey, Surveillance, Black gram, Disease, Bihar

Evaluation hermetic grain pro bag for management of storage insect - pests of maize in dewas district

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Abstract

Maize is an important staple food crop produced by the majority of smallholder farmers that provides household food security through direct consumption and income generation. Stored grains are ravaged by a number of insect pests. The stored grain pests infest grains to fulfill their food and shelter requirements resulting in qualitative as well as quantitative losses. The tropical climate of India is highly favourable for continuous occurrence of storage insect pests throughout the year. A number of insect pests gain access to the grain storage at various stages of processing of food grains/ seeds viz., during the process of development and maturation of seeds/ grains, processing in threshing yards, during transit or while in storage. To reduce these losses, farmers intensively used synthetic insecticides in storage. However, synthetic insecticides have many deleterious effect to human and environments. Alternatively, farmers traditionally have been using various cultural practices and herbal products for the control of postharvest insect pests. However, because of various reasons, for example, lack of knowledge about the side effect of synthetic insecticides, less demonstration of safe and locally available pesticidal plants and immediate action of chemicals, farmers are still intensively using synthetic insecticides to manage storage insect pests. Hermetic storage technology is an alternative method that minimizes postharvest losses. Hermetic storage is based on the principle of generation of an oxygen- depleted, carbon dioxide -enriched interstitial atmosphere caused by the metabolic activity of insects and fungi present in the commodities within the sealed storage system (villers et. al. 2008). Thus it may offer a safe, pesticide-free and sustainable storage suitable for many commodities and seeds, particularly in hot and humid climates. Pro Super bag is a farmer friendly 70 kg storage bag that allows cereal grains to be safely stored for extended periods by using the hermetic storage principle. Therefore, the objectives of this farmers' participatory research was to evaluate hermetic grain pro bag against maize storage insect- pests and adaptation of these safe management options among the farmers.

The objective of this study was to determine the effect of hermetic storage in the pro Super bag compared with traditional storage on the quality of maize seed stored for 6 months. This study was carried out by RVSKVV, Krishi Vigyan Kendra, Dewas, M.P. during three consecutive years from 2016-17 to 2018-19 in the villages of operational area i.e. Narana , Agera and Chandana in Dewas district. The result showed that the reduction of moisture content of maize grain in pro super bags obtained 15.53 % while in traditional way 18.57 percent. The minimum number of insect density (5.93 adults/kg grain) was obtained in pro super bag (5.93 adults/kg grain) as comparison to traditional bags (10.60 adults/Kg grain).The effectiveness of grain storage is greatly influenced by storage period and weight loss during storage duration. The weight loss levels observed in the bags are attributed to insect population in the bags. Maize grains stored in pro Super bags had maintained low weight loss (47.72) as compared to the equivalent grains in traditional bags (39.79) at 6 months after storage. The highest Net profit was recorded in pro super bags treatment (Rs.731.0) as compared to traditional practice (670.24) . The average net profit were observed in pro super bag Rs.605.67 than traditional was Rs. 473.03.The study confirms the effectiveness of pro super bag as a storage method. The initial grain moisture content remained unchanged, while in traditional bags, it reduced.

Keywords- Hermetic, Pro Bag, Grain Storage, Postharvest

Management of alteranria leaf spot of organic mungbean (*Vigna radiata* l.)

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Abstract

Mungbean (*Vigna radiata* L.) commonly known as green gram is one of the important pulse crop in India. It is quite versatile crop grown for seeds, green manure and forage and it is also considered as "Golden Bean" because of its nutritional values and suitability for increasing the fertility of the soil, by way of addition of nitrogen to the soil. Mungbean suffers from many diseases caused by fungi, bacteria, viruses, nematodes.The present investigation was carried out on "management of *Alternaria* leaf spot of organic mungbean caused by *Alternaria alternata*". *In vivo* efficacy of organic products i.e. seed treatment of beejamrut, soil application of mushroom spent compost, foliar spray of BD (Biodynamic) – 501, Indigenous fungicides and combination of these treatments were evaluated to find out their effectiveness against the *Alternaria alternata*. Out of the following treatments, the combined treatments of seed treatment of beejamrut + foliar spray of BD (Biodynamic) – 501 was found most effective against *Alternaria* leaf spot of organic mungbean under natural condition.

Keywords: Mungbean, *Alternaria*, Beejamrut, Biodynamic and Management.

Comparative Studies on Morphological Variability of *Ocimum sanctum* and *Ocimum basilicum* in Solan District of Himachal Pradesh

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Abstract

The present study was carried out on *Ocimum sanctum* and *Ocimum basilicum* during 2017-2018 at the experimental farm of Department of Forest Products, Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni, Solan, H.P. (India). The objective of the study was to characterize the morphological features of two *Ocimum* species. During the time of study, it was observed that *O. sanctum* is a medium sized herb of about 74.28 ± 9.00 cm in height, leaves 4.58 ± 0.44 cm long and 2.55 ± 0.31 cm wide across and gradually tapering towards the terminal tip. The length of the spike is 8.81 ± 1.42 cm and having 23.49 ± 5.55 spikes per plant. Flowers are small, light purplish and 4.63 ± 0.64 mm in length. The fruit is schizocarpic, carcerulus, length 1.47 ± 0.12 mm, diameter 1.16 ± 0.03 mm and dark brown at the time of maturity. Seeds are small, length 1.30 ± 0.09 mm, diameter 0.91 ± 0.13 mm, dark brown and round to oval in shape with smooth surface, whereas, *O. basilicum* is a small sized herbaceous plant of about 62.69 ± 7.18 cm height, leaves are 3.83 ± 0.39 cm long and 1.74 ± 0.25 cm wide across and gradually smaller towards the terminal tip. The length of the spike is 13.97 ± 2.35 cm and having 94.65 ± 12.60 spikes per plant. Flowers are medium, purplish white and 6.30 ± 0.30 mm in length. The fruit is schizocarpic, carcerulus, larger than the fruits of *O. sanctum*, length 2.28 ± 0.35 mm, diameter 1.35 ± 0.24 mm and dark brown at the time of maturity. Seeds are large, length 1.72 ± 0.19 mm, diameter 1.04 ± 0.11 mm, black and round to oval with smooth surface. Although the genera *Ocimum* has a large number of species exhibiting huge differences in their morphological features, but there is also an ample amount of similarities shown by some species, which creates a state of confusion. The present study will provide an insight into the morphological similarities and differences amongst *O. sanctum* and *O. basilicum*.

Keywords:Morphology,*Ocimum sanctum*, *Ocimum basilicum*

An Easy and Efficient Method to Study *Ralstonia solanacearum* Pathogenicity in Eggplant (*Solanum melongena*) Seedlings

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Abstract

Ralstonia solanacearum is a Gram-negative plant pathogenic bacterium, it causes a lethal bacterial wilt disease in wide range of plant species across 52 different botanical families including many important vegetable crops such as eggplant, tomato, potato and chilli. This work reports, standardization of an easy and efficient method to study *Ralstonia solanacearum* pathogenicity in eggplant seedlings by root inoculation approach. Though the approach is very close to my earlier published work on tomato seedlings while in case of eggplant seedlings, seed germination, recruited seedling age , symptom timing and disease progression rate are unlike to tomato seedlings . During pathogenicity assay, *R. solanacearum* inoculation was performed in to 10-12 days old eggplant seedlings, inoculated seedlings exhibited the wilted symptom within 72 h and the pathogenicity assay can be completed nearly in three weeks. Pathogen colonization in wilted as well as infected eggplant seedlings were studied by using gus staining as well as fluorescence microscopy. The standardized root inoculation method in eggplant seedlings was also found to be very potent to distinguish mutant strains pathogenicity behavior of different crucial virulence genes such as hrpB, phcA and pilT from wildtype *R. solanacearum*. Due to its consistency and

reproducibility in various eggplant cultivars, the standardized method observed as an easy and efficient way to study R. solanacearum pathogenicity in early stage eggplant seedling .

Keywords-Ralstonia solanacearum, Bacterial wilt, Eggplant seedlings, Pathogenicity, Method

Microgreens for Better Nutrition and Livelihood

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Diet related diseases such as obesity, diabetes, cardiovascular disease, hypertension, stroke and cancer are escalating both in developed and developing countries, in part due to imbalanced food consumption patterns. In developing countries like India, 13.5% people are chronically undernourished with Western-Asia and Sub-Saharan Africa, the most severely affected regions. Vegetables are oftenly referred to as protective food in view of nutritive and medicinal values and serve as one of the important components of Indian agriculture towards nutritional security of people. Households in India spend 50-80 per cent of their incomes on food and nutritional deficits in macronutrients and essential micronutrients are common. Now-a days, non-availability of fresh and pesticide residue free vegetables for consumption is increasingly becoming major concern for vegetarian population of our country. So, Microgreens; a new class of edible vegetables with lots of potential in term of nutritional ability to cure various deficiencies presents a homestead option towards nutritional security. These include seedlings of edible vegetables, herbs or other plants, ranging in size from 5 to 10 cm. They have three parts namely, central stem, cotyledon leaves and first pair of very young true leaves. Based on growth stages of plant, microgreens fall in the stage older than "Sprouts" and younger than "Babygreens". These can easily be grown in urban or peri-urban areas, where land is often a limiting factor, either by specialized vegetable farmers or the consumers themselves. Microgreens are 4-6 times more nutrient dense than their mature counterparts. In recent years, consumption of microgreens has increased along with consumer awareness and appreciation for their tender texture, distinctive fresh flavours, vivid colours and concentrated bio-active compounds such as vitamins, minerals, antioxidants etc. There are more than 25 plants species whose microgreens are commercially grown all over the world. Celery, basil, parsley, beetroot, coriander, amaranths, fenugreek, fennel and broccoli are the important one.

The first report of erythrina gall wasp, *Quadrastichus erythrinae* Kim.infesting *Erythrina* Spp.(Coral tree) from Nagaland

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Abstract

The first occurrence of the exotic invasive gall inducing insect, Erythrina gall wasp (EGW), *Quadrastichus erythrinae* Kim (Hymenoptera: Eulophidae: Tetrastichinae) from North Eastern Indian state of Nagaland. It was first found attacking the *Erythrina* spp. during 2000

in La Reunion and widely spread over different parts of the world. EGW was first reported in India during 2005. It induces galls on leaves, petiole, shoot axis and flowers of *Erythrina* spp. In view of this, a study was taken up to enumerate the distributions, biology, ecology and natural enemies of this new invasive Erythrina gall wasp at Bidhan Chandra Krishi Viswavidyalaya at Kalyani, Nadia, West Bengal during the period between October 2011 and December 2015. A survey was conducted in different parts of West Bengal and North eastern States of India. During the survey the presence of EGW in the Medziphema Town of Nagaland was recorded and it is first record of EGW from NE region of India. It was found inducing galls on the developing new shoot axis, petiole, rachis and leaflet of *Erythrina* spp., causing substantial damage to *Erythrina* plants, affecting more than 90% of developing shoots.

Keywords: Erythrina, *Quadrastichus erythrinae* Kim, Nagaland, first report, invasive, exotic

A novel DOF transcription factor from *Brassica juncea* L. leads to enhance salt tolerance and also improve growth under low nitrogen condition in transgenic Arabidopsis

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Abstract

The plant specific Dof transcription factor plays a diverse role in plant growth, development, regulating carbon and nitrogen metabolism and fatty acid biosynthesis. However, not much is known about their role under various abiotic stresses. In present study, a DOF gene designating as *BjDof1* was isolated from *Brassica juncea* cv. Varuna.*BjDof1* encoded a putative protein of 438 amino acid residues, with a characteristic DOF domain. We report that transgenic Arabidopsis overexpressing *BjDof1* gene exhibited enhance tolerance under salt stress. *BjDof1* overexpressing plants showed increase chlorophyll, proline and total soluble sugar content as compared to WT plants under salinity stress. Moreover, overexpression of *BjDof1* also leads to upregulation in the expression of several stress-related marker genes such as *Rd29A*, *Rd22*, *LEA14*, *LTP4*, *P5CS*, *COR15a* and *COR6.6* on exposure to salinity stress. The further characterization of *BjDof1* transgenic plants showed that besides involving in plant salt stress response, it also plays important role in enhancing plant growth under low-N condition. The expression of several genes involved in nitrogen assimilation (GLN, *GLN2*) and organic acid metabolism (*PEPC1*, *PEPC2*, *PK1*, *PK2*) were found to be upregulated in transgenic plants under low N-condition. Moreover, transgenic plants also showed better growth performance as compared to WT plants when grown under low N-conditions. Integrating all these results, we propose that *BjDof1* could enhance salt tolerance in Arabidopsis and also improve plant growth under low N-condition and hence therefore might be useful in improving crop abiotic stress tolerance.

Socio-economic Profile of farm family households in different Agro-climatic zones of J&K UT

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Abstract

Agriculture plays a vital role in the Indian economy, although its contribution to Gross Domestic Product (GDP) is now around one sixth, it provides employment to 56 percent of the Indian workforce as its primary source of livelihood. In India, 67 percent of the farmers are having marginal land holding and 17 percent are small farmers with an average land holding of 1.15 ha whereas, in Jammu and Kashmir Union Territory 94 percent and 5 percent of the farm family possessed marginal and small land holding respectively, with an average landholding of 0.67 ha (DES, 2014). To meet the expenditure on daily basis an average farm household required the monthly average income of Rs. 20,000 but in reality, the farm families earn Rs. 5,000 to meet monthly expenses as per National Sample Survey Organization (NSSO) of 2013-14 which has nearly a gap of 75 percent between expenditure and earning of the farm family which is the main reason of distress among farm family households. Diversification strives to smooth out unsystematic risk events in a portfolio so that the positive performance of some investments neutralizes the negative performance of others. So, to study the trends on diversification among rural livelihood in J&K Union territory the study was carried out in 2016 with a total sample size of 630 in different agro-climatic zones namely Sub-tropical, Intermediate, Temperate and Cold-arid zone. The results of the study revealed that about 95.20 percent of the sample households' heads were male followed by the nuclear family structure which were 58.10%. In terms of land holdings majority (78.25%) were marginal farmers and 28.89% of the sample farmer family households possessed the land holdings between 0.002-0.25 ha. Regarding technology 89.10% of the farmers family households had mobile connection out of which 12.60% of the farmers family households have internet connection in their respective phone. The amenities hold by the farm family households revealed that least percent of farming families in cold-arid zone (8.90%) had Antoyada Anna Yojana ration card (AAY) followed by temperate zone (6.60%) and intermediate zone (7.80%). None of the farm households in sub-tropical zone possessed AAY ration card. From Below Poverty line ration cards (BPL) were held by 62.20 percent of the farm households in intermediate zone followed by temperate (55.60%), cold arid zone (48.80%) and sub-tropical zone (41.12%). Under Above Poverty Line ration card holders (APL) category, most of the farming families were found in sub-tropical zone (58.88%) followed by cold arid zone (42.30%), temperate zone (37.80%) and intermediate (30%). Overall, BPL ration card was possessed by 52.40 percent of the farming families.The study further suggested that there is need to develop a number of strategies especially for the marginal farmers to facilitate successful livelihood diversification. This includes the development of rural infrastructure in terms of road, market, electrification, telecommunication, storage facilities, etc. and also institutional innovations to reduce entry costs and barriers for rural farm households.

Keywords:- Diversification, Income and Livelihood

Evaluation of different *Brassica* species and selected *Brassica* genotypes under natural epiphytotic conditions for finding resistant sources against white rust disease of rapeseed mustard

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Abstract

White rust or white blister disease caused by oomycete fungi, *Albugo candia* is one of the major devastating disease of rapeseed mustard. Continuous emergence of new races of the pathogen is responsible for breaking down of the resistance of the already existing resistance cultivars. So need for the evaluation of already existing resistant cultivars as well as continuous screening of new Brassica cultivars has arisen for finding out stable resistance sources against the disease In this context, 82 cultivars of different Brassica species were evaluated in field, under natural epiphytotic condition for the confirmation of resistance sources against *Albugo candida* for two successive years. 3-4 observations at 10 days time interval were recorded for disease severity, 90 DAS. Out of germplasm from different Brassica species (25 in number), 6 lines were found immune while 10 lines of diverse species were found highly resistant. Among different UDN and NDN germplasm, which have been found resistance in different studies, , 13 germplasm (out of 20 NDN germplsm) were found highly resistant while 2 germplasm and 6 germplasm were found immune and highly resistant respectively out of 11 UDN germplasm. Among other resistant germplasm (23 no.), collected from different Brassica centers, 1 germplasm was found immune while 10 germpalsm were found highly resistant. Rest of the germplasm were ranged between moderately resistant to highly susceptible according to 0-6 disease rating scale of Conn. By evaluating these lines under field conditions, many Brassica species such as *Brassica juncea, Brassica rapa* var. *toria, Brassica. nigra, Sinapis alba, Eureca sativa, Brassica olerecea. Brassica napus, Brassica rapa, yellow sarson, Brassica rapa* var. brown sarson, *Brassica rapa* var. toria were found suitable for the selection of host differentials studies under glasshouse condition to find out the new pathogenic race of *Albugo candida* pathogen, for developing durable effective management strategy against the white rust disease of rapeseed mustard.

Keywords: White rust, disease severity, disease rating scale, *Albugo candida*, rapeseed mustard, management.

Trends and techniques for thiamethoxam residue estimation in different vegetables and fruits

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Abstract

At this present day, the use of pesticides has become an important part of farming practices for our farmer as well as for public health. Pesticides are being used globally in such an inflated rate that many of them are on the way of becoming a serious threat to the biosphere. Besides providing a very good coverage over various pest infestations, they bring additional hazard to non-targeted organisms, application surfaces and harm to the applicator. All-round use of pesticides had resulted in tainting of all the basic necessities of life, i.e. air, water and food. The incessant use of pesticides has caused the deleterious effects to ecosystem as well. In response to this, numerous methods have been developed by several regulatory agencies and private laboratories which are being applied perpetually for the qualitative and quantitative quantification and monitoring of multi pesticide residues in different vegetables and crops. The main intent of the review is to document access and analyze the results of the former data on levels of different pesticides in various fruits and vegetables in India and abroad. The findings of the previous studies clearly indicated that approximately more than 50 % of the samples were contaminated with organophosphate, pyrethroids and organochlorine pesticides. Many studies reported that among fresh fruits and vegetables tomato, apple, melon, mango, grapes, and plum crossed the FAO/WHO permissible limits for these contaminants residual levels.

Keywords:Pesticides, residues, environment, QuEChERS, half-lives, Gas chromatography.

Invitro evaluation of fungicides against karnal bunt and black point diseases on wheat

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Abstract

The present investigation was done to evaluate three fungicides suspension i.e. Tilt 25EC (Propiconazol), Folicur 25EC and Contaf 5EC at five different concentration (5, 25, 50, 100 and 250 ppm) through cavity slide method against Karnal bunt and Cabriotop, Captaf and Milstin (250, 500, 750, 1000 and 2000 ppm) by using poisoned food technique against Black point diseases on wheat under In vitro condition at the experimental laboratory of Guru Kashi University, Talwandi Sabo (Bathinda district) during session 2017-18. The result revealed that out of three fungicide, Propiconazol (Tilt 25EC) @ 250 ppm is most effective against Karnal bunt whereas Cabriotop at all selected concentrations showing complete control of black point incidence *in vitro* condition. Hence, present study will be significant for wheat grower to further confirm the effectiveness of the recommended fungicides, Tilt 25EC against Karnal Bunt and Cabriotop against Black point disease along with other fungicides. Thus, these fungicides can be used as an alternatives to control these two diseases of wheat.

Keywords: Karnal bunt, Black point, Wheat, Fungicide, Management, *in vitro*

Pseudomonas fluorescence: A promising biocontrol agent in plant disease management

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Abstract

Plant diseases are the major cause of crop losses in the entire world. Mainly fungal and bacterial plant pathogens damage crops heavily at both pre harvesting and post harvesting period. These plant pathogens can be managed by using chemical pesticides but their inappropriate applications leads to harmful effect on the environment and the risk of pesticide resistance development also prevails. So, the use of biocontrol agents is an effective eco-friendly tool to control plant pathogens. Biocontrol agents are the natural living organisms and their products which can suppress the growth and development of harmful organisms. These agents mainly consist of parasites, predators, fungi, bacteria and bacteriophages. Among these agents, *Pseudomonas fluorescence* is one of the most promising bacterial bio-agent which can suppress several fungal and bacterial plant pathogens in economically important crops. It is mainly a gram negative, chemotrophic, rod-shaped bacteria with polar flagella. Microbial suppressions occur either by producing antibiotics or by inducing plant systemic defence with the help of siderophores. The consequent competition for spaces and nutrients also limits the growth and development of pathogens. It also promotes the growth of plants by producing phytohormones, siderophores and by solubilising phosphorous in soil. These are the unique features of *P. fluorescence* which separates it from other fungal and bacterial bio-agents and justify its scope an important integrated disease management component.

Keywords:*Pseudomonas fluorescence*, biocontrol, integrated disease management

Development and morphological evaluation of double low advanced breeding lines in Indian mustard (*Brassica juncea* L.)

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Abstract

Indian mustard (*Brassica juncea* L. Czern & Coss) is an important source of edible oil and meal in India. However, traditional Indian mustard varieties accumulate high amount of erucic acid and glucosinolate in their seeds. These quantitatively inherited anti-nutritional factors reduce the utility of mustard derived seed oil and meal for consumption purposes. The present study aimed at development and evaluation of double low advanced breeding lines (seed oil with < 2% erucic acid and glucosinolate content < 30 µmoles/gram defatted seed meal) in Indian mustard. A total of 44 double low lines developed from different crosses between high yielding and quality parents through pedigree method of breeding following selections in single plant progeny rows. The erucic acid content, oleic acid content, glucosinolate content and beta carotene content in these 44 double low lines were ranged from 1.87-2.02%, 19-42%, 19-30 µmoles/gram defatted seed meal and 1.66-4.64ppm

respectively. These lines along with 4 checks were evaluated in random complete block design in three replications during *rabi* 2017-18. Analysis of variance indicated significant differences for plant height, main shoot length, fruiting zone length, primary and secondary number of branches, number of siliquae on main shoot, seed yield per plot, seed yield per hectare, 1000 seed weight, days to 50 % flowering, day to maturity, oil content and oil yield indicating sufficient variability for effective selection. High heritability estimates (broad sense) were observed for seed yield (95.77%), oil yield (94.50%) and 1000-seed weight (95.33%). Oil yield (kg/ha) showed positive and significant genotypic and phenotypic correlation with seed yield (kg/ha) and 1000-seed weight.The principal component analysis revealed that first principal component (PC-I) explains 99.91% of variation, while other principal components. PC-I showed significant positive correlation with plant height, main shoot length, fruiting zone length, silique on main shoot, number of primary branches, days to 50 percent flowering, days to maturity and oil content.

Keywords:Double low lines, Erucic acid, Glucosinolate, Beta carotene, PCA, Indian mustard

Economics of *Bt* (*Bacillus thuringiensis*) cotton hybrid in response to different method of application and nitrogen scheduling

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Abstract

Nitrogen is an important nutrient required by *Bt* cotton to ensure adequate N throughout the growing season, split application of nitrogen is required. Rationalising dose of nitrogen is critical for optimizing profit in *Bt* cotton production. Since it is volatile and to minimize its losses method of application is also important particularly in cotton, a wide spaced crop. Keeping these points in view, the present investigation was conducted at Cotton Research area of CCS Haryana Agricultural University, Hisar, during *kharif* 2018. The experiment comprising seven treatments: T_1 (control), T_2 (100% of RDN band application in 2 splits at sowing and flowering), T_3 (75% of RDN; band application in 2 splits at sowing and flowering), T_4 (75% of RDN; Placement spot application in 2 splits at sowing and flowering), T_5 (75% of RDN; Placement spot application in 4 splits at sowing, squaring, flowering and boll development), T_6 (T_5+ foliar application of 1% urea 3 times at squaring, flowering, boll development) and T_7 {T_5+ raising of moong between rows incorporated before flowering (50-55 DAS)} was conducted in randomized complete block design with three replication. Spot application of 75% recommended nitrogen in four splits (sowing, squaring, flowering and boll development) along with incorporation of two rows of moong at 50-55 days after sowing gave the highest gross return (Rs. 284004 ha^{-1}), net return (Rs. 145519 ha^{-1}) and benefit cost ratio (2.05) followed by treatment T_6 (T_5+ foliar application of 1% urea 3 times at squaring, flowering, boll development) where we obtain net return (Rs. 135517 ha^{-1}) and benefit cost ratio (2.01). The lowest net returns (Rs. 47049 ha^{-1}) and benefit cost ratio (1.46) obtained in control.

Keywords:*Bt* cotton, nitrogen scheduling, net return, benefit cost ratio

Performance of an improved breed of common carp – Amur (Hungarian strain) in Rohtas district of Bihar

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Abstract

The present study was conducted to evaluate the growth performance of Amur common carp strain under polyculture with Indian major carps (Catla and Rohu) and Pangassius in selected earthen ponds of Rohtas district of Bihar. Fry of uniform size (5.16 ±0.46 gm) were given to 6 farmers at different location of Rohtas district. The trial of Amur carp were evaluated for the period of 30 weeks and compared with the existing comman carp strain. The mean growth of Amur strain was recorded as 557.16±46.8 gm while the comman carp growth was found to be only 391.16±36.16 gm. The mean final weight of Amur strain was significantly higher than that of local strain ($p<0.05$) in polyculture systems. The Amur strain registered 42.43 percent higher growth rate than the comman carp strain. Amur strain of comman carp showed better growth potential over existing comman carp strain in all the trials. It may be inferred that Amur strain of common carp has greater potential in earthen pond aquaculture systems in Rohtas district of Bihar due to its better growth than the existing strain.

Keywords: Amur common carp, Breeding, Growth, Rohtas

Soil Site Suitability Evaluation of Cumin (*Cuminum cyminum)* in Irrigated and Rainfed Land Management Units of Porbandar Taluka, Porbandar District Gujarat, India

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Abstract

The study area falls under AESR 5.1 (Central Kathiawar peninsula, hot dry semiarid ESR with shallow to deep clayey black soil, medium AWC) along the Arabian Sea coast. It lies between "21013'to 21058'N latitude and 69022' to 70001"E longitude. The temperature regime is mega thermic in hill slope, upper piedmont and lower piedmont and iso-mega thermic in piedmont plain and coastal area. Average rainfall of the taluka is 877 mm with the length of growing period (LGP) is 90-120 days. Soil survey of the taluka has been conducted on 1:10000 scale using existing base maps and IRS P6 imagery. Sixteen representative soil series of four landforms *viz.*, hill, pediment, piedmont & alluvial plain and coastal plain have been identified from study area. Based on homogeneity of permanent characters of soils and cropping/production systems soils have been summarized into ten land management units

(LMU). Out of which cumin cultivation has recorded in four irrigated and two rainfed LMUs. Soils of LMU 1 (Sisli) are shallow, clayey on very gentle slope with organic carbon content of 1.09%, $CaCO_3$ content 9.34 %, pH 8.18, EC content 1.16 dsm^{-1} and CEC content of 56 cmol (p^+) kg^{-1}.Soils of LMU 2 (Ishvariya) are moderately shallow, fine, on very gentle slope with organic carbon content of 0.68%, $CaCO_3$ content 7.33%, pH 8.55, EC content 0.51 dsm^{-1} and CEC content of 54 cmol (p^+) kg^{-1}. Soils of LMU 3 (Sodana) are deep, fine on very gentle slope with organic carbon content of 0.68%, $CaCO_3$ content 4 %, pH 8.77, EC content 1.51 dsm^{-1} and CEC content of 74 cmol (p^+) kg^{-1}. Soils of LMU 4 (Visavada) are deep, fine on very gentle slope, strongly saline and slightly sodic with organic carbon content of 0.72%, $CaCO_3$ content 23.77 %, pH 8.54, EC content 0.21 dsm^{-1} and CEC content of 53 cmol (p^+) kg^{-1}. Soils of LMU 5 (Sinjhar) are shallow, loamy skeletal on very gentle slope with coarse fragment 40-50% and organic carbon content of 1.65%, $CaCO_3$ content 7.56 %, pH 8.57, EC content 0.31 dsm^{-1} and CEC content of 27 cmol (p^+) kg^{-1}. Soils of LMU 6 (Palakhada) are shallow, clayey on gentle slope with organic carbon content of 1.17%, $CaCO_3$ content 0.28 %, pH 7.88, EC content 0.12 dsm^{-1} and CEC content of 26 cmol (p^+) kg^{-1}. Soils of these LMUs has been assessed for suitability of cumin as per the criteria given by Naidu *et al* 2004. Based on suitability criteria given for cumin, LMU 1, 2, 3 and 4 found moderately suitable for cumin cultivation due to good physical and chemical characters of soils whereas LMU 5 observed with marginally suitable class due to shallow depth and coarse fragment (40-50%). LMU 6 found not suitable for the cultivation of cumin due to shallow depth and poor ground water availability.

Keywords**:** Soil site suitability evaluation, cumin and climate.

Assessment of Rotavator for Garlic Crop in Mandsaur District of Madhya Pradesh

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Abstract

Among different agricultural operations i.e., tillage, fertilizer, seed and weed management, tillage is the most important operation followed in irrigated as well as rainfed farming situation for sustainable development of agriculture and enhancement of productivity. The tillage operations facilitate improving water intake, storage in-situ rain water storage, and absorption of water from the soil by plant roots, controlling weeds and enhancing soil aeration. So, with this context field experiments were conducted by Krishi Vigyan Kendra, Mandsaur in adopted villages for two consecutive years i.e., 2013 and 2014 to assess the performance of tractor operated rotavator as tillage implement and compared it with commonly used conventional tillage implement cultivator for garlic crop. The soil inversion provided by single operation of rotavator was quite high (89.46%) as compared to cultivator (62.40%). Rotavator (Cost of operation Rs 1825/- per ha) was found more economical for tillage as well as for weed control and provide better tilth than cultivator (Cost of operation Rs. 2850/- per ha). The plant growth attributes such plant height, polar & equatorial bulb diameter and bulb weight was observed superior in the fields prepared by rotavator over cultivator. On an average, rotavator prepared fields gave 10.8% higher yield owing to good water use efficiency (WUE, 40%) as compared to fields prepared by cultivator (WUE, 33%)

in garlic crop. Benefit-Cost ratio was higher for garlic crop grown on field prepared by rotavator (3.94) as compared to cultivator (3.40).

Insect Pest Complex in Yard long bean with Special Reference to Sucking Pests and their Management

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Abstract

The present investigations were carried out on 'Insect pest complex in yard long bean with special reference to sucking pests and their management' under field cultivation during 2018-19 at Agricultural and Horticultural Research Station, Bhavikere UAHS, Shivamogga, Karnataka. The survey was conducted at fortnightly intervals during the crop growth period during 2018-19 in the farmer fields of Shivamogga and Udupi district. The results of survey revealed that eight species of insect pest were recorded *viz.,* aphids, *Aphis craccivora,* Leafhopper, *Emposca terminalis*, mites, *Tetranychus urticae,* thrips, *Megalurothrips usitatus,*Spotted pod borer, *Maruca vitrata,* Gram pod borer, *Helicovepa armigera,* pod bug, *Riptortus pedestris* and green plant bug, *Nezara viridula* (Linn.) and natural enemies like *Chrysoperla zastrowi*, Spiders and Coccinellids like, *Coccinella transversalis* and *Cheilomenes sexmaculata*. The maximum population of insect pests and natural enemies were recorded in *Rabi* as compared to *Kharif* in in Shivamogga district. Whereas, in Udupi district highest poupation of insect pests and natural enemies recorded in *Kharif* as compared to *Rabi*.Seasonal incidence of sucking pests revealed that during *Kharif* season, the peak population of aphids was recorded during first week of September, leaf hoppers during third week of September, mites in first week of November and thrips during fourth week of September. During *Rabi* season, the aphid population was maximum during first week of January and thrips population during second week of March. While, leafhopper and mite population was highest during second week of February. Among the different insecticides tested imidacloprid 17.8 SL and acetamiprid 20 SP were found effective against aphids, leaf hoppers and thrips. Whereas, spiromecifen 22.9 SC and diafenthiuron 50 WP proved highly effective against mite. The fruit yield and C: B ratio was relatively higher in imidacloprid (15.57 t/ ha and 1: 4.76) treated plots followed by acetamiprid (15.10 t/ ha and 1: 4.73) as compared to untreated control plots which recorded lowest yield and C: B ratio (8.47 t/ ha and 1: 2.82).

Transmission of Chickpea chlorotic dwarf virus in Chickpea by the aphid Aphis craccivora in Bihar, India

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Abstract

Transmission of *Chickpea chlorotic dwarf virus*by aphid *Aphis craccivora* which causes chickpea stunt disease (CpSd) is an important disease of chickpea in Bihar, India. Diseased plants can be easily identified in the field conditions by their yellow, orange or brown discoloration of leaves, shortened internodes and stunted growth of plant. In kabuli type chickpea, the colour of leaves becomes yellow while in desi type chickpea leaves shows brown or red discoloration. Kabuli type chickpea was more susceptible than desi type. The temporal dynamic of aphid population showed that early sown crop aphid population was maximum during second week of January and recorded minimum during last week of December. In mid sown crop the aphid population was maximum during first week of January and minimum during third week of February. Similarly during late sown crop, aphid population was maximum in second week of January and it was observed minimum in third week of February. Similarly, temporal dynamic of chickpea stunt disease was recorded highest in early sown crop followed by mid sown crop and least in late sown crop. The incidence of disease was positively correlated with population of aphid in three different dates of sowing.

Keywords: chickpea; aphid; *Aphis craccivora*; stunt disease; transmission

Effect of different dates of sowing on the occurrence and severity of sheath rot disease in rice

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Abstract

Avoidance or escape is one of the safest principles of plant disease management. Field experiment was conducted to find out the best sowing time to avoid sheath rot disease, one of the emerging diseases of rice crop. Rice variety MTU 1001 was sown three times during kharif season at 15 days interval as early, mid and late sown crop. It was found that the disease appeared late in early sown crop and consequently the disease severity in terms of Percent Disease Index (PDI) was also lowest (36.4 %) as compared to mid and late sown crops recording 41.95 % and 47.22 % PDI respectively. So, early sowing i.e. sowing within the last week of June is found to be the best sowing time to escape sheath rot disease. This will render less damage to the crop ultimately increasing the yield level of the crop.

Keywords:rice, sheath rot, date of sowing

Evaluation of fungicides against blast disease of rice (*Pyricularia grisea*)

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Abstract

Blast is the most destructive disease of rice which causes a yield loss of about 40-75% under favourable conditions. Presently a number of fungicides are available for its control but to keep novel fungicides effective against it in the pipeline, evaluation of chemicals should be a continuous process. With a view to this, a field experiment was conducted to find out an effective fungicide to manage the disease at AICRIP, RRTTS, Chiplima during kharif season of 2016 and 2017. A number of chemicals were used for both seed treatment and spraying and all of them were found effective to manage the disease as compared to untreated control. Among 11 treatments, seed treatment with tricyclazole @ 3g/kg seed followed by 2 spraying of tricyclazole 75 WP @ 0.6 g/l recorded lowest leaf and neck blast severity with highest BC ratio of 1.7 followed by seed treatment with vitavax power @ 2.5 g/kg seed and 2 foliar spraying of isoprothiolane 40 EC @ 1.5 ml/l. Both of them were statistically at par with respect to leaf blast infection and yield but differed significantly in neck blast incidence.

Keywords:rice, *Pyricularia grisea*, fungicide

Influence of potassium silicate on photosynthetic pigments and antioxidant enzymes of mango malformation

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Abstract

Mango (*Mangifera indica* L.) is the fifth largest cultivated fruit crop globally with the yields of approximately 40 million tonnes, second only to banana among the tropical fruit species. Mango malformation (MMD) is an ambiguous disease of mango with the tremendous economic importance throughout the mango growing regions. The most effective management of disease includes the avoidance of inoculums, selection of resistant varieties and the potential control of disease are targeted to eradicate the causative agent. Physical alteration followed by chemical treatment like Prochloraz and benomyl spray results in the reduction of disease incidence and increment of yield. In the present investigation Potassium Silicate was sprayed thrice in a week at flowering stage and a field experiment with two mango cultivars (Amrapali and Desheri) was performed using factorial randomized block design in the three replications. The impact of potassium silicate (0.25, 0.50, 1, 2 and 5%) on photosynthetic pigment content and antioxidant enzyme activity was evaluated. The result revealed that the total chlorophyll content and total carotenoids were increased with increasing potassium silicate concentration as compare to control. It was found that Chlorophyll content was more in Amrapali as compare to Desheri. The activity of SOD was also enhanced with increasing Potassium Silicate concentration while maximum SOD activity was observed in Desheri as compared to Amrapali. It was concluded that SOD is the most effective intracellular enzymatic antioxidant which is ubiquitous in all aerobic organism and in all subcellular compartments prone to ROS mediate oxidativestress.

Keywords : Mango Malformation, Potassium silicate.

Doubling farmers income by 2022: New prospects and innovations

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Abstract

With the country's growing population, Indian agriculture also faces challenges such as a decline in productivity growth factor, poor soil health, loss of soil organic carbon, water-related stress, increased incidence of pest and diseases, increased input costs in addition to adverse impact of climate change which leads to a decline in farm profits. Approximately 48 per cent of the country's population depends on agriculture for their livelihoods, which contributes about 17 per cent to the gross domestic product (GDP) of the country. A persistent low income for farmers can have serious adverse effects on the future of agriculture in the country. In order to secure the future of agriculture and improve the livelihoods of half of India's population, adequate attention needs to be paid to improving the welfare of farmers and raising agricultural incomes. In today's world the, main concern of around 138 million Indian farmers' is about declining farm income on the one hand and the increasing cost of inputs on the other. The government has set a target to double the farmers' income by the year 2022 with the sense of security beyond food security and safety for our farmers. It is possible to double farmers' income by increasing productivity, adjusting crop patterns, efficient use of resources, promoting crop diversification towards high value crops. Farmers income can be increased by setting up of processing units in the districts/ block level which will also increase employment generation for farm women. Furthermore, the assured procurement of crops by the government agencies will solve dual purpose of doubling farmers' income and crop diversification. About 1/3rd of farmers' income can be increased easily by improving price performance, effective post-harvest management, competitive value chains and adoption of allied activities. These strategies can help making Indian farmer self-sufficient and face-lifting of Indian agriculture in world map.

Keywords: Allied activities, Crop diversification, Double income, increase productivity, income security, value addition

Medicinal and aromatic plants: Potential in Disease Treatment and Prevention

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Abstract

Aromatic plants are valuable bioresources that have garnered immense attention of various fields because of their multifarious applications. The colossal biodiversity of such plants offer a great opportunity to alleviate various problems that are being faced by the rapidly growing population of modernized societies. They have been found to be promising resources in

various fields including food, feed, cosmetics and most importantly medicine. Such aromatic plants contain various aromatic compounds having pharmacological activities which are extracted from plant parts such as leaves, roots, stem, bulb and fruits. So far it has been estimated that about 10,000 different compounds are produced from such medicinal and aromatic plants which have the ability to be used as potential drugs. Antibacterial, antimicrobial, anti-inflammatory, anti-cancerous and many more such activities have been widely explored of such plants for the prevention and treatment of diseases such as cancer, inflammation, cardiovascular diseases and many other bacterial and fungal infections. Some of the widely explored medicinal and aromatic plants include *Ocimum sanctum, Allium sativum, Withania somnifera, Zingiber officinale, Cymbopogon citrates, Catharanthus roseus,Syzygium aromaticum,Curcuma longa* and many more. The extensive amounts of phytochemical constituents that they possess have been exploited by various scholars to determine their potential for the treatment of certain diseases. The potential present in such plants has been explored by subsequent bioprospecting which lead to the discovery of novel pharmacological compounds produced from them thereby elevating their utilization in pharmaceutical industries. The enormous biodiversity of plants present on Earth also present an unexplored potential to treat certain untreatable diseases. In this conference I will present the outcomes of various medicinal and aromatic plant's bioprospecting studies involving different valuable phytochemical compounds produced from them and their respective potentials in the prevention and treatment of diseases.

Keywords:Medicinal plants, Aromatic plants, Phytochemical constituents, Pharmacological activities

Incidence of Army worm *(Mythimna separata)*in rice in Koshi region of Bihar

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Abstract

Koshi region of Bihar, particularly in Saharsa, Supaul, Madhepura, Araria and Purnea rice is grown by farmers in large area and they use good agricultural practices for cultivation of rice. Among different types of pests attack on rice causing damage to the plant, it has been

observed that the magnitude of problem of Army worm *(Mythimna separata* has increased in this area due to suitable weather parameter and use of local variety of rice.

Army worm (*Mythimna separata*) is potential pest of rice. Its outbreak occurs in particular pockets of rice growing areas. Suitable abiotic factors *i.e.* temperature, relative humidity and failure of rainfall may causes of outbreak of this pest. Generally its outbreak comes when Hathia rainfall fails in the month of Sept-October. The caterpillar of this pest cause damage to rice ear head and green cut part of ear head fallen on rice field. Caterpillars are nocturnal in nature and start cutting part of ear head from evening to whole night. Its attack is so heavy that in a night this pest cut ear head of complete one field and shifted to side by side another rice field. In the morning caterpillars hide in cracks and middle portion of hills of rice and excrete huge amount of excreta in middle of hills. These excreta are sign of identification of infestation of this pest.

So we can say green cut part of rice ear head in rice field and huge amount of dark brown pellet of excreta of caterpillar is sign of presence of this pest in rice field and causes huge loss. Sometimes farmers harvest paddy before ripening of rice due to attack of this pest. So, outbreak of armyworm is uncertain when rice field prevailing long dry and causing substantial yield loss in rice. It can be effectively managed by spraying after4.0PM with Chlorpyrifos 50% + Cypermethrin 5% EC @ 1 ml/lit.

Status of micronutrients in soil and Basmati grain of Ludhiana district, Punjab

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Abstract

Basmati rice is one of the important export commodities of India, through which the country earns considerable amount of foreign currency influencing Indian economy. Thus, maintaining the quality of Basmati rice is very important. Micronutrients influence both yield and quality of basmati rice. The present study was carried out to monitor the micronutrient status of soil and Basmati grain in Ludhiana district of Punjab. In all, 102 paired soil (0-15 cm) and Basmati grain samples were collected covering the whole district of Ludhiana following grid of size 2 km × 2 km. DTPA extractable and total Zn, Fe, Cu and Mn in soil and Basmati grain, respectively, were determined through ICP-MS. The content of Zn, Fe, Cu and Mn in Basmati grain of Ludhiana district varied from 10.3 to 20.0, 11.5 to 15.5, 2.10 to 4.35 and 7.55 to 13.9 mg kg-1, respectively. DTPA extractable Zn, Fe, Cu, and Mn in soils varied from 0.07 to 9.60, 1.06 to 106, 0.18 to 5.69 and 1.59 to 14.1 mg kg-1, respectively, with the corresponding mean values of 3.17, 38.6, 1.47 and 4.75 mg kg-1. DTPA extractable micronutrients of the whole district were mapped using the frequency distribution class of

micronutrients proposed by Shukla et al. (2015). The maps of DTPA extractable Zn, Fe, Cu and Mn showed that 6.58, 2.53, 8.70 and 8.28% of the total gross area of Ludhiana is deficient in Zn, Fe, Cu and Mn, respectively, while, 18.82, 5.35, 38.75 and 4.77% of the total gross area of Ludhiana comes under medium status for Zn, Fe, Cu and Mn, respectively. The rest areas for the corresponding micronutrients come under high status for the respective micronutrients. This indicated that majority of soil samples collected from the Ludhiana district were adequately supplied with micronutrients for sustaining productivity of various crops.

Keywords: Micronutrient; soil; Basmati rice grain; Ludhiana

Comparative Studies of Late Planted Capsicum (*Capsicum annum*) for Growth and Yield under Polyhouse and Open Field Condition as Influenced by Different Growth Regulators

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Abstract

A study was conducted on late planted capsicum under two production system i.e polyhouse and open environment condition with three different hormonal treatments viz. application of triacontanol @ 0.5 ml/ litre at full bloom stage, application of planofix (4.5% NAA) @ 0.25 ml/ litre at full bloom stage, application of Ethrel @ 0.3 ml/ litre at full bloom stage along with a control. Growth and yield of capsicum were significantly influenced by different hormones under both conditions. Among the hormones, planofix had best effect to result highest fruit weight (122.2g and 97.4g), number of marketable fruits per plant (5.6 and 4.2) and yield (39.4 t/ha and 28.2 t/ha) in polyhouse and open field condition respectively. Whereas, ethrel treatment resulted highest number of total fruits (8.2 and 7.2) in polyhouse and open field condition respectively. Again polyhouse was more effective to increase yield of quality fruits in capsicum than open environment condition. About 40% yield increment was recorded under planofix treatment in polyhouse than open field.

Keywords: Capsicum, Hormone, Polyhouse, Open field.

A new and rare rust fungi Nyssopsora toonensis sp. nov., order Pucciniales (pucciniomycetes, pucciniomycotina) on Toona serrata (Meliaceae) described from Uttarakhand, India

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Abstract

This paper describes and illustrates a new species of rust fungi *Nyssopsora toonensis* on *Toona serrata* (Royle) M. Roem from Uttarakhand. Morphological characters were extensively studied using light microscopy and (SEM) scanning electron microscopy. Molecular characterisation of this genus was also done by using LSU and ITS markers. Detailed morphological study revealed that *Nyssopsora toonensis* produced an uredial stage along with telial stage in its life cycle. *N. toonensis* is distinguished from all other previously reported species of *Nyssopsora* on the basis of Molecular investigation and a set of robust morphological features.

Keywords: Nyssopsora toonensis, Raveneliaceae, rust fungi, Uredinales, LSU, ITS.

Physiological and agro-morphological responses of rice genotypes grown under multi-stage drought conditions prevailed in Eastern India

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Abstract

Most of the current high-yielding rice varieties grown in the drought-prone areas of eastern India are highly susceptible to drought. In the present climate change scenario, the multi-stage drought tolerance rice genotype is required to improve rice productivity in drought-prone rainfed areas. Keeping in view, present study was conducted to explore the multi-stage drought (MSD) effect on rice genotypes sown in the field condition. Twenty four rice genotypes were evaluated under MSD and non-stress (irrigated) conditions during Kharif 2017-2018. The mean grain yield was significantly declined (66.78%) compared to non-stress trial with negative effect on the yield attributes, RWC and membrane stability (MSI). Grain yield of different genotypes was varied from 0.103 to 1.88 t/ha and 4.03 to 5.67 t/ha under MSD and non-stress conditions, respectively. Among rice genotypes, IR84899-B-179-

16-1-1-1, IR 84899-B-183-20-1-1-1, IR84899-B-182-3-1-1-2, IR84894-143-CRA-17-1 & IR83929-B-B-291-2-1-1-2 were identified promising for MSD tolerance as compare to Sahbhagi Dhan. MSD also caused significant reduction in yield attributes. Present studies also revealed that mean photosynthetic rate, stomatal conductance, chlorophyll, starch and protein content were declined under MSD compared to non-stress conditions. However, TBARS content and peroxidase activity increased under MSD. Overall, the study suggested that occurrence of multi-stage drought significantly affected the physiological and agro-morphological traits performance of rice plant but the tolerant genotypes sustained their yield by maintaining their physiological and biochemical function. Finding of this study has also great significance in terms of its uniqueness to identify multi-stage drought tolerance rice genotype which may ensure food security in drought-prone areas prevailing in eastern India.

"Genome editing by CRISPR/Cas9 for Potyvirus resistance in Tomato"

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Abstract

Genome editing of agriculture crops can be accomplished by using the components of the CRISPR/Cas9 (clustered regularly interspaced short palindromic repeat/CRISPR associated Cas9) technology. Here, we present the development of RNA-guided Cas9 system for genome editing in tomato cv. 'Arka Vikas'. We have selected eukaryotic translation initiation factor (eIF) gene family, including eIF4E and its paralogue eIF(iso)4E. Following assemblyof sgRNA, ligation should be used to ligate an assembled sgRNA expression cassette into vector. Primers created and the method used to assemble a sgRNA expression cassettes works. A 4140 bp Cas9 forming construct comprising eukaryotic initiation factor 4E genes fragments was mobilized into pBI121 binary vector between CaMV 35S promoter and Nos terminator and designated as pBI 121 Cas9-ChiVMV binary vector. This construct was mobilized into Agrobacterium tumefaciens (EHA 105 cells) for Agrobacterium-mediated transformation to generate Cas9-ChiMVM transgenic tomato Cv. 'Arka Vikas' plants. The transgenic plants were screened for the presence of pBI 121 Cas9-ChiVMV by PCR analysis. The CRISPR/Cas9 binary vector targeting the 4E genes was then transformed into tomato plants by Agrobacterium tumefaciens-mediated transformation, resulting in efficient target gene editing in the T0 generation. The reporter was activated by Chilli Venial Mottel virus which was engineered to contain sgRNA for the system. However, the results suggest that viral recombination of the sgRNA insert can lead to a loss of the effect over time. A valuable tool for future plant CRISPR/Cas9 development will be the positive readout transactivation system developed in this thesis. We demonstrated the effectiveness of an optimized RNA-guided Cas9 system that can be used for generating homozygous knockout mutants in the progeny of transgenic tomato cv. 'Arka vikas' plants.

Insilco gene characterisation and Promoter analysis of drought inducible *MYB* gene from *Eleucine coracana*

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Abstract

Drought is a major abiotic factor that limits agricultural crop production and productivity. Plants experience drought stress either due to limited water supply to roots or when the transpiration rate becomes very high. These two conditions often coincide under arid and semi-arid climates. Plants such as millets, sorghum and maize which are native to such climate have acclimatized themselves in such a way that they can survive better. Finger millet is most important among them as it grows widely and is staple food of South Africa and many parts of Asia. It is nutritionally rich, contain high amount of calcium and good for diabetic patient due to low glycaemic index. Therefore, finger millet can be taken as a model plant for investigating the pathway underlying drought tolerance in plants. Present study was focussed on isolation of full-length gene corresponding to the online publically available EcMYB gene partial transcript from the UGENE transcriptome data of *Eleusine coracana* and open reading frame was deduced from it. The protein BLAST results and the presence of DNA binding domain and helix turn helix domain ensured that the isolated full transcript was MYB gene from *Eleusine coracana*. In order to predict their ABA responses, the ABRE (ABA Responsive Elements) was predicted in the promoter of MYB gene from *Oryza sativa* that was homologous to MYB gene in Finger millet with more than 80% identity. Thus, EcMYB follows ABA dependent signalling pathways and accumulation of ABA in response to several abiotic stress is responsible for up and down regulation of several gene especially transcription factors which provide drought tolerance to plants.

Effect of COVID-19 on agriculture in India

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Abstract

Agriculture is the backbone of Indian economy . Many citizens of India are dependents on agriculture for their livelihood. COVID 19, a pandemic originated from China is spreading with a surge in India. To combat with this prevailing situation government has implemented the state of lockdown. During this lockdown conditions most of the farmers are unable to do their regular agricultural activities. It is highly difficult to get a harvested crop and export it. Farmers are facing problems and difficulties in finding labour, Machinery availability, fertilizers, transportation and finally sustainable prices. Hence we could co that COVID-19 pandemic lockdown situation has shown a drastic negative impact on agriculture in India.

KeyWords : Agriculture, COVID-19 effect, Negative impact

Allometric Equation Development and Carbon Storage Potential of Few Promising Agro-Forestry Trees of Subtropical Zone of Western Himalayas

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Abstract

Agroforestry as a landuse system is acknowledged as a mitigation and adaptation tool to climate change. The contribution of this landuse to climate change mitigation has to do with the organic carbon storage in trees *i.e.* huge potential of carbon sequestration in their living biomass. A study was made at presenting an overview of the current knowledge on allometric relations for estimating aboveground biomass of promising agroforestry tree species on the basis of Diameter at Breast Height (DBH) in the mid hill zones of Himachal Pradesh. A total of 210 trees belonging to seven tree species were selected including for the present study. Several allometric equations were fitted with the measured DBH values of the trees and the best fit equations with maximum adj R^2 value and minimum standard error were found out for the trees, which proves to be the best estimator of the biomass in that particular region. In *Albizia chinensis* the quadratic function showed the highest adj R^2 (0.993) on the basis of DBH *i.e.* Above Ground Biomass=0.22-0.10D+12.41D^2. On the other hand for the other six species, power function was the best in terms of highest adj R^2. The best fitted allometric equations along with their R^2 values are- *Albizia lebbeck* -AGB=12.98$D^{0.96}$ (R^2-0.964), *Acacia mollissima* -AGB=2.89$D^{0.20}$ (R^2-0.992),*Melia composita* -AGB=9.41$D^{2.15}$ (R^2-0.990), *Dalbergia sissoo* -AGB=11.25$D^{1.97}$ (R^2-0.992), *Toona ciliata* -AGB=4.82$D^{1.10}$ (R^2-0.888) and *Ulmus villosa* -AGB=22.92$D^{1.98}$ (R^2-0.990) recorded on the basis of DBH. The allometric equation selected in the present study can be utilized for future allometric relations for estimating biomass and carbon storage of species under study. The carbon storage potential of agroforestry tree species in this sub-tropical region of Western Himalayas was found to be in the order of *Toona ciliata >Melia composita >Albizia lebbeck >Dalbergia sissoo* > U*lmus villosa >Albizia chinensis >Acacia mollissima*, hence their preference should be made in this order.

Keywords- Agroforestry, Allometric equation, Carbon storage, Carbon sequestration, Climate change.

Survey and Incidence of Pokkah Boeng Disease of sugarcane in Bihar

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Abstract

Sugarcane (*Saccharum officinarum* L.)is one of the most important crops for the sugar production in the world as well as in India. Sugarcane is subjected to suffer from number of diseases out of which Pokkah boeng is an emerging fungal disease that can cause losses, varied from (40 to 60 per cent) in susceptible varieties. Increasing trend of disease incidence was observed ranging between 1 to 90 per cent depending upon the locality and varieties of sugarcane. During the survey of different sugarcane areas of last few years it has been observed that the incidence of Pokkah Boeng disease increases and affects popular verities (CoS 767, CoPb 91, Co 99214 CoPant 3220 CoS 8436 CoC 671, CoC 8014, CoS 8315, CoS 8436, Co 7219, CoH 151, CoJ 85, CoSe 95422 cultivated in different part of the country. To know the disease status and varietal susceptibility in sugarcane an extensive survey are being conducted during 2017-18, 2018-19 and 2019-20 cropping season in different cane growing areas of Bihar. Occurrence of Sugarcane diseases viz, sett rot, smut, wilt, RSD, GSD, leaf spots and Pokkah Boeng were observed in almost cane growing areas of Bihar. Among the diseases pokkah boeng is becoming major concern during recent years. However, the severity of the major diseases particularly red rot, wilt and smut were under manageable condition. This disease was a minor disease for long time but now the disease is emerging very fast in cane growing areas of Bihar. On the basis of result obtained, several varieties viz; Bo 41, Co 0232, Co 0238, CoLk 94184, Co 0235, CoSe 95422, CoSe 92423, Bo 146, Co 0118, CoS 8436, CoJ 64 and Bo 154 etc were observe affected with pokkah boeng disease. The maximum (30.2%) incidence and minimum (3.2%) incidence was observed in different cane growing areas as well as Pusa and Kalayanpur farm in moderate to severe form**.**

Enhancement of sorghum production through application of Micronutrients

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Abstract

Afield trial was carried out during the *kharif* season of 2009 to 2011 with an objective to find out the response of *Kharif* sorghum to micronutrients (Zn& Fe). The experiment was carried out at the farm of Sorghum Research Unit Dr. P.D.K.V., Akola. The experiment was laid out in three replications in RBD. There were ten treatments with combination of Zn and Fe as **T1:** RDF + Zn SO4 25 kg/ha (Soil application at sowing) ,**T2 :**RDF + Fe SO4 25 kg/ha (Soil application at sowing),**T3:** RDF + 0.2 %/Zn SO4 foliar application at 15 and 30 days after sowing,**T4:** RDF + 0.5 %/Fe SO4 foliar application at 15 and 30 days after sowing,**T5 :**RDF + 15 kg Zn SO4 at sowing + 0.5 % Fe SO4 foliar application at 15 and 30 days after sowing,**T6:** RDF + 15 kg Fe SO4 at sowing + 0.2 % Zn SO4 foliar application at 15 and 30 days after sowing,**T7:** RDF + soil application of 15 kg ZnSo4 + 15 kg FeSo4,**T8:** RDF + foliar application of 0.2 % ZnSo4 + 0.5 % FeSo4,**T9 :**RDF alone ,**T10 :**Control (Native fertility). From the three years data it is concluded that application of RDF to sorghum with soil application of 15 kg ZnSo4 + 15 kg FeSo4 produced significantly highest grain yield, fodder and input output ratio.

Effect of liquid inoculants of *Azospirillum brasilense* and phosphate solubilizing bacteria on growth and yield of sorghum (*Sorghum bicolor*)

Seema M. Nemade, Debesh Kumar Panda and Nilesh Mohod

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Abstract

A field experiment was undertaken during the kharif season of 2018 at Sorghum Research Unit, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (Maharashtra), to study the effect of co-inoculation of liquid bio-fertilizer of Azospirillum brasilense and phosphate solubilizing bacteria (PSB) on growth and yield of sorghum (Sorghum bicolor). Experiment was laid out in the factorial randomized block design in three replications. There were twelve treatment combinations consisting of three different levels of RDF viz., F1 - 50% RDF, F2 - 75% RDF, F3 -100% RDF (80:40:40 kg/ha of N:P2O5:K2O) and four seed treatments viz., S1 -Control (without seed treatment and only application of fertilizer), S2 - seed treatment with Azospirillum brasilense and phosphate solubilizing bacteria @ 25 g each/kg seed, S3 - seed treatment with liquid Azospirillum brasilense and phosphate solubilizing bacteria @ 2 ml each/kg seed and S4 - seed treatment with liquid Azospirillum brasilense and phosphate solubilizing bacteria @ 4 ml each/kg seed. Among different levels of RDF, 100% RDF recorded significantly higher plant height (203.68 cm), total dry matter (g/plant) accumulation (145.50 g), grain yield (43.06 q/ha) and fodder yield (92.75 q/ha). However, application of 50% RDF recorded significantly higher rhizospheric effect (cfu/g of soil) of both Azospirillum and PSB at flowering stage. Seed treatment with liquid Azospirillum brasilense and phosphate solubilizing bacteria @ 4 ml each/kg seed recorded significantly higher plant height (198.93 cm), total dry matter (g/plant) accumulation (140.79 g), grain yield (43.27 q/ha), fodder yield (93.78 q/ha) and rhizospheric effect (cfu/g of soil) of both Azospirillum and PSB at flowering stage. However, S4 - seed treatment with liquid Azospirillum brasilense and phosphate solubilizing bacteria @ 4 ml each/kg seed was statistically at par with S3 - seed treatment with liquid Azospirillum brasilense and phosphate solubilizing bacteria @ 2 ml each/kg seed in both growth and yield of sorghum. Thus, application of 100% RDF and seed treatment with liquid Azospirillum brasilense and phosphate solubilizing bacteria @ 2 ml each/kg seed found promising over other respective treatments.

Enhancement of sorghum production through application of Micronutrients

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Abstract

Afield trial was carried out during the kharif season of 2009 to 2011 with an objective to find out the response of Kharif sorghum to micronutrients (Zn& Fe). The experiment was carried out at the farm of Sorghum Research Unit Dr. P.D.K.V., Akola. The experiment was laid out in three replications in RBD. There were ten treatments with combination of Zn and Fe as T1: RDF + Zn SO4 25 kg/ha (Soil application at sowing) ,T2 :RDF + Fe SO4 25 kg/ha (Soil application at sowing),T3: RDF + 0.2 %/Zn SO4 foliar application at 15 and 30 days after sowing,T4: RDF + 0.5 %/Fe SO4 foliar application at 15 and 30 days after sowing,T5 :RDF + 15 kg Zn SO4 at sowing + 0.5 % Fe SO4 foliar application at 15 and 30 days after sowing,T6: RDF + 15 kg Fe SO4 at sowing + 0.2 % Zn SO4 foliar application at 15 and 30 days after sowing,T7: RDF + soil application of 15 kg ZnSo4 + 15 kg FeSo4,T8: RDF +

foliar application of 0.2 % ZnSo4 + 0.5 % FeSo4,T9 :RDF alone ,T10 :Control (Native fertility). From the three years data it is concluded that application of RDF to sorghum with soil application of 15 kg ZnSo4 + 15 kg FeSo4 produced significantly highest grain yield, fodder and input output ratio.

Evaluation of herbicide resistance in *Chenopodium spp.*

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Abstract

Weeds are a big impediment in realizing the potential yield of crops. *Chenopodium album* is a major broadleaf weed of *rabi* season and is a serious problem of cotton/pearl millet-wheat rotation areas in Haryana as well as in other regions of the Indo-Gangetic plains of India. Manual weeding is cumbersome and is less efficient. So herbicides application is most effective method for weed control but complaints of poor efficacy of several herbicides against *C. album* and *C. murale* have been reported recently from the farmer fields of different locations of Haryana State. Therefore, it is pertinent to know the status of herbicide resistance to different herbicides against *Chenopodium spp.* In addition, there is need to evaluate alternate herbicidal options for its management. The present investigation entitled, "**Evaluation of herbicide resistance in *Chenopodium spp.* and management in wheat**" was conducted during the *rabi* season of 2017-18 in the screen house of Department of Agronomy, Chaudhary Charan Singh Haryana Agricultural University, Hisar (Haryana). Pot experiment was conducted in completely randomized design, replicated thrice using different herbicides *viz*. isoproturon, pendimethalin and carfentrazone applied at three doses (0.5X, X and 2.0X) as pre or post-emergence against *Chenopodium spp* seed collected from Siswal (1& 2), Saharwa, Charkhi Dadri, HAU 1 and HAU 2. Herbicides were sprayed using backpack sprayer fitted with floodjet nozzles delivering 375 L water volume/ha. Control pots were maintained for all the species for comparison. The results in general indicated that *Chenopodium* populations Siswal 1, Siswal 2 and Saharwa showed greater resistance against carfentrazone even at double of the recommended dose except HAU 1, HAU 2 and Charkhi Dadri populations. Higher value of plant height, chlorophyll fluorescence, fresh weight and dry weight and lower values of EC were observed in the herbicidal treatments showing poor efficacy against the test populations. Pendimethalin PRE and isoproturon as POE provided complete control of all the populations. Pendimethalin PRE has already been recommended for the management of *Phalaris minor* in wheat crop and can take care of *Chenopodium* populations. The information generated from this study will facilitate proactive management of herbicide resistance through PRE or POE herbicides.

Keywords:*Chenopodium*, pre-emergence, post-emergence, herbicide resistance, efficacy, management.

Covid-19; Opportunities and Threats for Environment

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ABSTRACT

The mother Earth is the only planet in the universe where life in any form perhaps sustain and that is because of the balance of various nature's bounty such as oxygen, CO_2,nitrogen, the land form, the forests, the water etc. The human being for making things ease of and for very fast development performed everything at the cost of nature without being serious about the loss of other forms of life. We have witnessed the environmental pollution in terms of water, air, noise etc. The disease Covid-19 outbreak which is highly contagious in nature could show and made the entire world to realize and re-think about the approaches which are being taken for development in all forms. The first and foremost important step for its control is to stop its spread from person to person and from material to material in any form. Immediately countries started doing lockdown to contain the disease so that the diseased can be treated in a better way. The rapid decreases in different pollutants' level were seen within 2-3 days of start of the lockdown across world and in different cities in India. This led to clear wind everywhere. The wild lives got confused and started to come to the urban areas. These were the signature of real natural habitat where there is place for everyone. Human may not be happy with the Covid-19 but the nature earth has shown its happiness for our safety. We should think and re-think about this. In future lockdown for some days keeping ultra essential services continued may be practiced for making breathe to the Earth.

Evaluation of physicochemical properties, antioxidant activity and shelf life of bread made of black mulberry powder

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Abstract

The mulberry fruit are edible, good texture, delicious taste and nutritional qualities. The mulberry fruit called super fruit also. Because of their nutritional qualities the black mulberry powder was used in the production of bread. Firstly, the proximate nutrients, some vitamin and minerals, non nutrient compounds and antioxidant compounds were assessed in dry black mulberry powder. Then the products were prepared by incorporation of black mulberry powder. The bread were prepared in four variants- variant A (5% black mulberry powder), variant B (10% black mulberry powder), variant C (20% black mulberry powder), variant D (30% black mulberry powder). All the variants were examined for sensory acceptability. The most acceptable variant of bread found was variant C. The proximate composition, mineral and vitamin content, physical evaluations and shelf life analysis were performed on all the variants. And the some differential nutrients components like soluble carbohydrate, amylase,

amylpectin, resistance starch, saturated fatty acid, linoleic acid, selenium, zinc and vitamin E were performed only the most acceptable variant of bread (variant C). In proximate analysis, mulberry powder was found to be rich in carbohydrate, ash, vitamin C and calcium. The mulberry powder was low in crude fiber, fat, moisture and iron. In non nutrients compounds mulberry powder was found to contain saponins, alkaloids and the powder was low in total polyphenol, tannins and total flavonoids. In antioxidant activity DPPH was rich in mulberry powder and metal chelating activity was found low in mulberry powder.

Keywords- Mulberry, bread, compounds, vitamin E, selenium

Distribution and saptial vairiability of the important physic-chemical properties of soil of Ashoknagar district.(M.P)

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Abstract

The study was conducted during 2016-17 at Ashoknagardistrict (M.P.) having 150 GPS based surface soil samples (0-15 cm) collected from five blocks (namely; Mungaoli, Chanderi, Ishagarh, Ashoknagar and sadora) of Ashok Nagar district. The samples were prepared and analyzed for physico-chemical properties and different forms of potassium.The texture of the soils of Ashoknagar district varied from sandy clay loam to clay loam. Under investigated area sand, silt and clay percent varied from 36.6-56.7, 03.9-38.0 and 25.4-42.4with mean value 47.1, 17.0 and 39.9, respectively the range of 7.8-8.6 under different villages with the average value of 8.0 Electrical Conductivityin range of 0.32-0.64 under different villages with the average value of 0.45 dSm^{-1}.Organic carbon range of 2.14–7.15g kg^{-1} under different villages with the average value of 0.5 g kg^{-1} .Calcium carbonate range of 0.50 – 3.50 % under different villages with the average value of 1.18 %.

Keywords:Soil pH, sand silt and clay,Electrical Conductivity, Organic CarbonandCalcium Carbonate.

Effect of zinc fertilization on phosphorus and zinc content of indigenous rice varieties in Sub-Himalayan region of West Bengal

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Rice is a major staple food crop among the world population and also considered as the backbone of Indian food security. Soil analysis revealed that a major part of West Bengal including Darjeeling, Jalpaiguri, Coochbehar have deficiency of zinc (Zn). Several indigenous cultivars are grown by farmers even without application of zinc in the Zn-deficient soil of Sub-Himalayan region of West Bengal. Indigenous rice genotypes may have different capacity of zinc mobilizing and zinc use efficiency. On the other hand, zinc is

reported to have inverse relationship with phosphorus in soil and plant system. Therefore, evaluating indigenous rice genotypes traditionally grown in West Bengal is of immense importance to understand their zinc use efficiency. A field experiment was conducted at the Research farm of Uttar Banga Krishi Viswavidyalaya comprising four indigenous rice varieties *viz*. Kalonunia (aromatic), Fulpakri, Dudhkalam and Gobindobhog (aromatic) along with a high zinc rice variety (DRR Dhan 45) under split-plot design containing three main plots *viz*. without zinc application (Z_0), soil application of zinc (Z_S- 5 kg Zn ha^{-1} as basal) and foliar spray of zinc (Z_F- at maximum tillering and at booting stage) with three replications. Higher values of leaf phosphorus (P) were observed when Zn was not applied (Z_0). Indigenous varieties were comparable among each other and also with the high Zn variety in terms of Zn accumulation in leaf tissues. The accumulation of Zn in the grain of indigenous varieties was found in the following order Dudhkalam>Gobindobhog>Kalonunia>Fulpakri.

Keywords: zinc, phosphorus, indigenous rice varieties, DRR Dhan 45, foliar spray

Water logging tolerance in soybean at reproductive stages: traits and donors identified

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Abstract

Soybean (Glycine max L. Merrill) is an important oilseed crop for food, feed and of many industrial applications.Waterlogging, being a serious abiotic stress in soybean, caused a loss of nearly 18 percent in production in India during *kharif* 2019 (SOPA). The flooding at reproductive stages is more deleterious to yield losses than any other crop stage. The experimental material comprised of 24 diverse soybean genotypes along with checks and were evaluated at R1 stage in natural flooded field in water logging stress of 15 days to identify the potential donors.Among the genotypes, six were evaluated in natural field and artificial water-logged (pots) conditions for 12 water-logging tolerance related morpho-physiological traits with the objective to identify the potential trait for selection. Optimum moisture was maintained in non-stressed control field and pots. Genotypes depicted an array of variability for percentage reduction in seed yield.$plant^{-1}$(5.6 - 72.9%), percentage reduction in 100 seed weight(1.2 - 45.2%), percentage increase in plant height (-33.1 -56.2%), percentage reduction in no. of pods per plant (5.23 - 51.66%), percentage reduction in total chlorophyll content (4.75 - 54.33%) in water logged conditions in relation to non-stressed control field during screening trail. Genotypes viz., JS 20-38, Hardee, JS 71-05, C-2797 and NRC 128 identified as prominent genotypes for water logging tolerance on the basis of percentage reduction of seed yield.$Plant^{-1}$. Correlation analysis among the traits studied in six genotypes revealed percentage reduction in seed yield per plant was positively correlated with percentage reduction in total dry weight per plant (0.68), seed size (0.78), SPAD readings (0.67) and chlorophyll content (0.54) in relation to water logging tolerance. Among the traits studied, crop susceptibility index for seed yield, number of pods, SCMR (SPAD Chlorophyll Meter Readings) and root nodules dry weight found relevant to select tolerant genotypes. Identified traits and donors will be helpful in soybean breeding programme to develop climate smart soybean varieties.

Maturation and fecundity of large macrobrachium species in the river ganga, Patna, Bihar, India

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Abstract

The river Ganga is the largest perennial river in India which originates from Gangotri Himalaya and flows through Uttrakhand, Uttar Pradesh, Bihar, Jharkhand, West Bengal state and enters in to Bay of Bengal. The fishery resources including prawns are declining in river Ganga. In the present investigation the maturation and fecundity of large size *Macrobrachium* species like *M. gangeticum* and *M. malcolmsonii* were estimated for the period of two years from January 2000 to December 2001. Maturity and fecundity of prawn were evaluated by the size of prawn, ovary and breeding frequency. The developing ovaries were observed small light yellowish green but at stage II and mature gonad of *M. gangeticum* were observed yellow green mass in the carapace, whereas in *M. malcolmsonii*the developing stage of ovaries was observed large yellowish in colour and matured female gonad were found comparatively in large and deep yellow in the carapace. The gravid females observed long setae at the base of genital aperture and 1- 4 pleopodes in both species. These two species, female releases of eggs, her ovaries displayed either stage resting or zero characteristics. The species of *M. gangeticum* possess minimum of 8000 eggs with size 75 mm and the maximum 76,240 eggs with respective size 190 mm, whereas *M. malcolmsonii* the minimum fecundity observed 8100 eggs with size 75 mm and the maximum fecundity was 81,200 eggs of 190 mm size. The total weights of the eggs per female as well as the mean number of eggs were increased with increasing length and weight. The breeding frequency of both species were found four times and the number of eggs in first breeding was found less, but it increased moderately in second and third breeding and got reduced again in fourth breeding.

Keywords: *Macrobrachium gangeticum,M. malcolmsonii*, Maturation, Fecundity

Fish transportation and marketing in dumraon and buxur south Bihar

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Abstract

Marketing of any fresh food item is the backbone of the food chain. Fish being one of the very important commodities, the bulk of them have to be transported and marketing either in live or fresh condition. Fish transportation and marketing in Shahabad special reference to Dumraon & Buxar were studied during 2017-2019. It is based on a survey of fish market with help of direct observations and interview technique. This paper attempted to identify infrastructure facilities; present fish market structure and the factor influence the fish

marketing system. The fish market chain from producer to retailers goes onward through a number of intermediaries, fish market structure, species of fish, quality of fish; size and weight of fish have an influence on the price of fish. It was found that the prices of fish were increases and varied per kilogram according to weight, size and species wise. It was marked that there was not any taking part fisherwomen in transportation and marketing of fish in this area. The study revealed the problem of fish seller during marketing times, which are briefly discussed in the present communication.

Keywords: Fish marketing system, structure, fish seller problem, Dumraon, Buxar

Aromatherapy: An Alternative Source of Medicine

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Abstract

The integrated use of alternative and complementary therapies with mainstream medicine has gained the momentum in recent years. Aromatherapy is combination of creativity and science which use plant materials and aromatic plant oils, including essential oils, and other aromatic compounds as the major therapeutic agents for the purpose of altering one's mood, cognitive, psychological or physical wellbeing. It is a holistic approach which uses pleasant smelling essential oils such as rose, lemon, lavender, peppermint, chamomile, basil, rosemary, etc. These compounds are extracted from the flowers, barks, stem, leaves, roots, fruits and other parts of the plant by various methods. Inhalation, local application and baths are the major methods used in aromatherapy that utilize these oils to penetrate the human skin surface with marked aura. The aroma inhaled from several essential oils is believed to stimulate central nervous system and physical absorbance through skin in the form of bloodstream promotes whole body healing. This type of therapy utilizes several permutation and combinations to get relief from numerous ailments like depression, indigestion, headache, insomnia, muscular pain, respiratory problems, skin ailments, swollen joints, urine associated complications *etc*. The increasing intervention of scientific community towards aromatherapy has given the new hope to reduce the unwanted effects of modern medicine and if explored to its full potential it can also benefit common man.

Keywords:Aromatherapy, alternate medicine, essential oil

Characterization and Evaluation of okra [*Abelmoschus esculentus* (L.) Moench] genotypes for yield traits

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Abstract

Okra [*Abelmoschus esculentus* (L.) Moench] is a popular crop of the world grown for vegetable purpose. It belongs to family Malvaceae. A total of 62 accessions of okra which consisted of Indigenous, exotic and improved varieties were raised and characterized during Kharif 2017 at ICAR-National Bureau of Plant Genetic Resources (ICAR-NBPGR), Regional Station, Akola. Out of 62 accessions, 13 accessions with desirable traits along with three checks were evaluated during Kharif 2018 at four locations (Akola, Buldhana, Katol and Hiwra) located in Vidarbha region of Maharashtra State. Observations were recorded for Days to 50% flowering, Plant height (cm), Length of fruit (cm), Girth of fruit (cm), Average fruit weight (g), Number of fruiting nodes/plant, days to first harvest, number of fruits per plant, Inter-nodal distance (cm), number of branches per plant, marketable fruit yield (Kg/plot). A significant variation was observed in various qualitative and quantitative traits. Earliness was recorded in accessions IC7856-A (51days) followed by EC359939 (57days). For plant height EC359995 was tall (145.43cm) whereas EC359939 (62.90cm) was dwarf among all accessions. Highest fruit length was recorded in IC7856-A (12.36cm). Very short inter-nodal length was recorded in EC 359939 (2.73 cm) followed by IC 003304-C (2.92 cm) and these genotypes also exhibited cluster type of fruiting habit. Marketable fruit yield per plot was highest in IC4378 (67.73kg) followed by 3304-C (63.66kg). High fruit yielding, early and genotypes with short intermodal distance can provide better parents to develop the early and high yielding okra cultivars.

Keywords:Cluster fruiting, dwarf, earliness, yield and yield components.

Yield gap analysis in sunflower (*Helianthus annuus* L.)through front line demonstrations in Bellary District of Karnataka

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Abstract

The constraints in the production of sunflower crop were identified with a major emphasizes against the pest and diseases in the sunflower. The critical inputs required were identified from the recommended package of practices of Karnataka and their usages were discussed in practicing farmer's trainings at the farmer's field. The average five years data revealed that an average yield of demonstrated plot was obtained 14.99q/ha over local check 13.23 q/ha and the average percentage increase in yield over local check was 12.33 per cent. The average extension gap was found to be 0.95. The hybrid RSFH –1887 and KBSH-53 performed better at front line demonstrated plot as compared to local check. Further, benefit: cost ratio was recorded to be higher under demonstrated plot against local check during the study. Further, average higher benefit- cost ratio (1.77) was recorded under demonstrated plot against check (1.53). The results clearly indicate the positive effects of FLDs over the existing practices towards enhancing the yield of the sunflower hybrids. Findings of the study clearly indicate the positive effects of FLDs over the existing practices towards enhancing the yield of the sunflower hybrids.

Keywords: Extension Gap, Frontline Demonstrations, Yield, Performance, Sunflower

Efficacy of chemicals and botanicals against bacterial blight of pomegranate caused by *Xanthomonas axonopodis*pv. *Punicae*

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Abstract

Pomegranate (*Punica granatum* L.) is an ancient commercially important fruit crop of India and other subtropical countries. There are many biotic and abiotic factors responsible for the reduction in production of pomegranate. Bacterial blight disease is a major biotic constraint in pomegranate producing states of India. The present investigation was carried out on "Biology and management of *X. axonopodis* pv. *punicae* causing bacterial blight of pomegranate". *In vitro* efficacy of antibiotics (Neomycin, Tetracycline, Erythromycin, Kanamycin and Streptocyline), fungicides (Copper hydroxide, Carboxin and Copper oxychloride) and botanicals (Garlic, Ginger, Turmeric, Kalmegh, Tulsi and Neem oil) were evaluated to find out their effectiveness against the growth of the test bacterium. On the basis of *in vitro* efficacy, single best highest concentration of most effective chemicals and botanical were used in pot and field experiments, the combined treatments of Tetracycline @ 250 ppm + Copper hydroxide @1000 ppm + Garlic cloves extract @ 2×10^5 ppm were found to be most effective, followed by combine application of two standard checks, Streptocycline @ 250 ppm + Copper oxychloride @ 1000 ppm, respectively.

Keywords:Streptocycline, Copper oxychloride, Garlic, Bacterial Blight and Pomegranate.

Different approaches for weed management in India

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Abstract

Weeds are the major deterrent to the development of sustainable crop production. Since weeds dictate most of the crop production practices and causes enormous losses (37 per cent) due to their interference. Farmers follow several practices for managing weeds in different crops/cropping systems, of which at present the use of herbicides are on the top due to the scarcity of labors. The sustainability of these systems is being questioned because of environmental, social, and economic concerns caused by global competition, production cost, soil erosion, environmental pollution, and concern over the quality of rural life. Enhancing the crop competitiveness through preventive methods, cultural practices, mechanical methods, plant breeding, biotechnology, biological control and crop diversification will be the central thesis in new paradigms of weed management. Integration of above techniques will be key to sustainable weed management that maintain or enhance the crop productivity, profitability and environmental quality. This article explores the scope of sustainable weed management, growing concerns over herbicide resistance, environmental and health hazards of pesticides including herbicides and declining profitability are the major challenges of 'high input' agriculture. The goal of this review is to facilitate the development of ecologically based alternative methods for sustainable weed management that will support crop production systems, which require less tillage, herbicide and other inputs. To accomplish this goal, research efforts must be radically expanded in crop ecology and in the development of ecologically based technologies for weed management. Adoption of sustainable agricultural practices reduces the intensity of soil manipulation thereby creates an unfavorable condition for weed seed germination, reduces the organic matter depletion and soil erosion. Thus, the sustainable approaches could be an option for weed and soil management which leads to sustainable crop production.

Keywords: Allelopathy, cover crops, residue, sustainable agriculture, tillage and weed

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Effect of nutrient levels and irrigation frequency on yield and quality of tomato under Soilless cultivation

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Abstract

In Andaman and Nicobar Islands, the production of vegetables is a great challenge due to hostile weather conditions, degraded soil, soil related pest and diseases. The soilless cultivation is therefore, a possible alternative which reduces the soil related problems experienced in the conventional crop cultivation. Under this context, the experiment was conducted at Garacharma farm, ICAR-Central Island Agricultural Research Institute, Port Blair during 2018-20 in a naturally ventilated polyhouse to study the performance of tomato hybrid 'Arka Rakshak' under different nutrient concentrations (100%, 75% + foliar spray, 50% + foliar spray, and 25%+foliar spray) and irrigation frequencies (daily and alternate days) in CRD units with four replications. Tomatowas grown in grow bags (24 x 24 x 40 cm size) containing coco peat + sawdust (1:1) as growth media. Cooper nutrient solution wasused for the study. Among different concentrations of nutrients, application of 100 % concentration recorded significantly higher plant height (123 cm), dry matter production (116 g plant^{-1}), number of branches plant^{-1} (7.6) and early flowering (29 days after transplanting) followed by 75 % nutrient concentrations. Similarly, 100 % nutrient concentrations recorded maximum number of fruits/plant (17.3), fruit weight (53.5 g fruit^{-1}) and finally fruit yield (909 g plant^{-1}) as compared to reduced nutrient levels with foliar spray. Irrigation frequencies (daily and alternate days) did not have significant influence on performance of tomato. Maximum TSS (7.8 ºBrix), titrable acidity (0.37), ascorbic acid (17.63 mg/100 g) and lycopene (7.3 mg/ 100 g) contents were recorded by 100 % nutrient concentrations followed by 75 %. Minimum quality parameters were recorded by reduced nutrient levels. From this study, it is concluded that 100 % nutrient concentration and alternate day irrigation are required for higher tomato yield under soilless cultivation in islands.

Keywords: Soilless cultivation, nutrient concentration, irrigation, tomato yield and quality.

Edamame cultivation: An opportunity to Income generation for Doubling the Income of Farm Women

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Abstract

To enhance the economic condition of rural families Krishi Vigyan Kendra (RVSKVV) Ujjain (M.P) conducted an On Farm Testing (OFT) at village Chintaman Jawasiya and Kalyanpura, (Dist. Ujjain) which is the adopted cluster area of the KVK, Ujjain. Total 10 farm families were selected. The edamame (vegetable soybean) variety Karune was introduced to farm women's. The main purpose was to create the awareness among farm women regarding vegetable soybean which could be utilized or consume in fresh Green stage as they were not aware though the Madhya Pradesh is the main state of soybean production but its medicinal value and utility in diet is not so popular. The edamame is having medicinal values and its contents 125 gm calories, protein 12.1 gm, carbohydrates 13.1, calcium 9.3,

iron 2.7 and so on. 65.0 production qt/ha and cost of cultivation Rs 31500/ha whereas in 15.0 qt /ha and cost of cultivation 27000/ha in conventional soybean. In case of B:C ratio 1:4.12 in edamame and 1:1.94 in field soybean means 1:3.82 more profit gain in edamame as compare to normal soybean. The economic role of the Edamame is marketed in several ways Whole plants, Pod only, Bean only, Frozen type and Dried etc. Farmers and farm women need to consider which markets to target. Its appearance like green peas which found only in the Rabi season. So in the Kharif season it could be used as substitute of the peas. These edamame is new for the Malwa region hence there could be a bright chances of doubling the income of farm women.

Evaluation of Bio-efficacy of Flumioxazin against Weed Complex of Soybean in Malwa Plateau of Central India

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Abstract

Field experiments were conducted during Kharif season for two consecutive years, 2018 and 2019 to evaluate the efficacy of Flumioxazin against weed flora in soybean in Malwa plateau of Central India at KrishiVigyan Kendra Ujjain, under RajmataVijaya Raje Scindia Krishi Vishwavidyalaya. The experiment was laid out in Randomized block design consisting of eight treatments. Flumioxazin 50% SC as pre-emergence application was tested at 75,100,112.5,125 and 150 g.a.i./ha and compared with Chlorimuron Ethyl at 9 g.a.i./ha and Pendimethalin at 1000 g.a.i./ha. Results indicated that, Flumioxazin 50% SC at 125 g.a.i./ha provided significant reduction in weed density and dry matter thus increased the WCE at 30 and 60 days after application of herbicides in both the years. This was found at par with its higher dose at 150 g.a.i./ha with respect to weed dry weight, weed density as well as grain yield. Application of Flumioxazin 50% SC at 125 g.a.i./ha was also found more effective in enhancing seed yield of soybean (1835 kg ha-1) as compared to (964 kg ha-1) in weedy check. No phytotoxic effects were found on soybean as well as in the succeeding chickpea crop. Weed control efficiency of 96 per cent was observed at 60 days after sowing.

Excretion of enrofloxacin residues in poultry droppings after pulse water medication in broiler chicken – an environmental concern

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Abstract

The presence of antibiotics in manures can represent an environmental and human health concern. Residues of antibiotics excreted into animal manures enter the environment either by spreading of livestock wastes onto agricultural fields as fertilizer or in the form of sludge after manure collection and storage. Livestock manure is a major source of veterinary antibiotics residues in agricultural fields as well as in the overall environment; hence analysis of these antibiotics is obviously important. Twelve one-day old broiler chicks were randomly divided into control (6 nos) and treatment group (6 nos). Treatment group received enrofloxacin @ 10 mg/Kg body weight, through drinking water for five consecutive days from 43rd to 47th day of age, whereas control group received non-medicated water. Dropping samples of control and treatment group were collected at different time points during the withdrawal period at 48 hours interval on day 1, 3, 5, 7 and 9 post treatments. Enrofloxacin and ciprofloxacin residues in poultry dropping samples were analysed by a validated High Performance Thin Layer Chromatography-Fluorescent Densitometry method. Enrofloxacin residues could be detected in droppings even up to 7^{th} day after treatment. Owing to the presence of antibiotics in droppings even after cessation of the administration of enrofloxacin, it warrants environmental concern. These antibiotic residues in animal faeces may potentially bring ecological risks. The present study stresses the need for stringent regulation for the use of antimicrobial drugs in the poultry industry.

Keywords: Enrofloxacin residues, poultry droppings, environment, HPTLC

Effect of Liquid Biofertilizers (*Bradyrhizobium* and PSB) on Yield and Quality of Green Gram (*Vigna radiata* L.)

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Abstract

The field experiment was conducted on **"**Effect of liquid bio-fertilizers (*Bradyrhizobium* and PSB) on growth, yield and quality of green gram" during *Kharif* seasonof the year 2016-17 at the Research Farm of College of Agriculture, Latur. The present experiment was laid out by using randomized block design with four replications and five treatments *viz*. T_1 – Control , T_2 – RDF, T_3 – RDF + 5ml *Bradyrhizobium*, T_4 – RDF + 5ml PSB and T_5 – RDF + 5ml *Bradyrhizobium* + 5ml PSB. The recommended variety BM-4 of green gram was used for this experiment.The results of field experiment indicated that the yield attributing characters *viz*., number of pods (16 plant^{-1}), grain yield (1861 kg ha^{-1}) and straw yield (3591kg ha^{-1}) of green gram were significantly increased due to seed inoculation with 5 ml of *Bradyrhizobium* kg^{-1} seed + 5 ml of PSB kg^{-1} seed treatment (T_5) over rest of the treatments. Quality parameters like protein content (23.7 %) and protein yield (253.33 kg ha^{-1}) were also significantly improved due to dual inoculation with 5 ml of *Bradyrhizobium* kg^{-1} seed + 5 ml of PSB kg^{-1} seed treatment (T_5) over rest of the treatments.

Keywords: Liquid Biofertilizers, Bradyrhizobium, PSB, Yield and Quality.

Estimation of technical and allocative efficiency of cabbage farm in Bilaspur District of Chhattisgarh State

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Abstract

The study investigated the technical efficiency and allocative efficiency of cabbage farm in Bilaspur District of Chhattisgarh, using a stochastic frontier production function. The primary data were collected from 154 randomly selected respondents. The study revealed return to scale on as 1.998, 2.35, 3.81 and 2.177 on marginal to large farms of cabbage respectively that indicates the production of cabbage falls into stage one of production surface. Overall the sum value of estimate were 2.045 indicates an increasing return to scale falling into first stage of production surface. The coefficient value of gamma (γ) found positive but non-significant which showed that variation in output was due to random factor.
The mean technical efficiency of the pooled sample accounted to be 94 per cent that means there is scope to increase technical efficiency by 6 percent. The two inputs land size and seed were over utlised as allocative efficiency valued less than unity while other four inputs viz fertiliser, agrochemicals, labour and irrigation were valued greater than unity which indicated under utilisation of these resources. The study suggested that to maximize the production of cabbage inputs land size and seed must be decreased while other inputs like fertiliser, agrochemicals, labour and irrigation must be increased.

Keywords: Technical efficiency, Allocative efficiency, Stochastic Frontier Production, Maximum Likelihood Estimates, Return to Scale.

Genetic Variability, Heritability And Genetic Advance For Yield Contributing Traits In Aromatic And Pigmented Rice (*Oryza sativa* L.)

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Abstract

The knowledge of genetic variability in a given crop species for characters under improvement is important in any plant breeding programme. Heritability with genetic advance are more helpful in predicting the gain under effective selection. Twenty-five aromatic and pigmented genotypes of rice along with 3 checks were evaluated during kharif 2017 to estimate the genetic variability, heritability and genetic advance for 19 quantitative traits. Among the traits, grain yield per plant, biological yield per plant, 1000 grain weight, number of tillers per plant exhibited high estimate of genotypic coefficient of variation and phenotypic coefficient of variation. Highest board sense heritability was obtained for 1000 grain weight, biological yield per plant, number of filled spikelets per panicle, number of

tillers per plant and grain length. High magnitude of heritability along with genetic advance was obtained for number of filled spikelets per panicle.

Keywords:Genetic variability, heritability, genetic advance, rice, *Oryza sativa* L.

Bioefficacy of Imazthapyr on N Uptake, Nodulation and Microbial Population of Chickpea Sown after Soybean in Chhattisgarh Plains

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Abstract

A field investigation was carried out during the winter season of 2010-11 and 2011-12 at the Agronomy Research Farm of IGKV, Raipur, to evaluate the effect of tillage and weed management practices on chickpea crop. Results indicated that, among the tillage management practices, higher N uptake, number of nodules and microbial activities were obtained with CT which was followed by MT and ZT. Among the various weed management practices, N-uptake and number of nodules were maximum under one HW at 20 DAS, followed by the treatments of POE application of imazethapyr @ 90 g ha^{-1} and POE imazethapyr @ 80 g ha^{-1}, respectively.Whereas,microbial population, basal soil respiration and dehydrogenase enzyme activity of experimental field was significantly higher under weedy check plot, followed by one HW at 20 DAS and POE application of imazethapyr @ 90 g ha^{-1} during both the years.

Key words Imazethapyr, Nodulation, Chickpea, N Uptake, Microbial activities

Impact of Climate Change on Natural Control of Insect Pests

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Abstract

Climate change is describe as a gradual increase in the average temperature of the Earth's atmosphere and its oceans i.e., a change that is believed to be changing the Earth's climate forever. It is well known fact that insects are cold-blooded organisms because of which the temperature of their bodies is approximately the same as that of the environment. Therefore, temperature is probably the single most important environmental factor which influences the insect behaviour, distribution, development, survival, and reproduction. Anthropogenic CO2 is almost twice more important for temperature increase than other long-lived greenhouse gases combined. Although increased CO2 should not directly deleteriously affect insects, the temperature increases particularly driven by the increase in anthropogenic CO2 already affect insects in profound ways including their distribution, nutrition, phenology and their role as disease vectors. (Ponnusamy, 2018)

Natural enemies of insects are likely to undergo diverse effects due to changes in atmospheric CO_2 levels, increase in temperatures and shifts in precipitation. Plants respond to elevated levels of CO_2 with higher biomass. (Prasad *et. al.*, 2010) As a result, there would be a dilution effect on nitrogen levels and those chemical constituents that require nitrogen. Lower nutritional value of plants adversely impacts insects that feed on them directly and also their parasitoids and predators indirectly. Increased temperatures can alter both plant and herbivore phenology with likely impact on synchronization between the two again indirectly influencing the activity of natural enemies and the effectiveness of their natural control. (Trnka *et al*., 2007) Variability in rainfall reportedly has an adverse influence on parasitism levels of several caterpillar pests. Sucking pests like cereal aphids are less susceptible to climate change effects. Adaptation and mitigation practices to combat climate change such as conservation of agriculture practices are likely to have a positive effect on parasitoid and predator abundance with resultant benefits on natural pest control. An attempt has been made in this paper to illustrate examples of natural regulation of insect pests in India in the context of climate change and variability.

Keywords:Climate change, climatic variability, herbivores, natural enemies, predators, natural control

Field efficacy of different insecticides and bio-pesticides against Okra jassid

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Abstract

The experiment was conducted during 2018-19 at BTC CARS, Bilaspur (IGKV), Chhattisgarh to evaluate theinsecticides and bio-pesticides against okra jassid under field condition. Two insecticides viz. Cartap hydrochloride 4 G @ 1kg a.i./ha, Fipronil 0.3 G @ 60g a.i./ha and three bio-pesticides viz. *Beauveria bassiana* @ 10g/lit., *Bacillus thuringiensis* @ 2g/lit., *Metarhizium anisopliae* @ 10g/lit. Fipronil 0.3 G soil application after the germination followed by spray with *Beauveria bassiana* was found to be most effective against okra jassid, as it was recorded overall less jassid populatìon (1.62/plant). The maximum jassid populatìon (2.89/plant) was recorded inCartap hydrochloride 4 G soil application after the germination.Fipronil 0.3 G soil application after the germination followed by spray with *Metarhizium anisopliae* was recorded highest fruit yield (89.89q/ha) with benefit cost ratio 1.38:1.00.

Development of product through bio fortification using Beet greens and Sensory Evaluation

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Abstract

Beta Vulgaris L. is an herbaceous biennial which is grown today as annual crop.It has several varieties with bulb colour ranging from yellow to red.Commonly,people in India use beet and leaves are discarded while it contains various nutrients.So,to utilize this underutilized part of beets,this study was planned.The main objective of the study was to develop low-cost food product using beet greens for population who are facing problem of iron deficiency anaemia.Beet root greens were collected,washed and sun dried for a week for making powder of it. Popular snacks Mathari was supplemented with powder of Beet root green leaves.Amount of DBGLP per serving were used 5gm and 10gm.Sesnory evaluation was done with the help of 9 point hedonic rating scale.Proximate analysis of product showed Moisture 5.43%,Ash 3.4%,Fat 42%,Protein 20.21%,Carbohydrate 28.96%,calorie- 487.8Kcal and Iron 14%(values as per 100 gm). Both ratio of 5gm and 10gm of DBGLP in product preparation showed same acceptability as it is noticed that beet greens are delicious too,if they are picked and cooked at the right time. As Beet greens are loaded with different nutrients and it is an underutilized part of the plant.So,we can use the powdered or fresh form of it to biofortify or supplement to make low cost food products for micronutrient deficiencies.

Effect Of Method Of Sowing And Seed Rate On Soil Physico-Chemical Properties And Nutrient Content OfWheat (*Triticum aestivum* L.)

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Abstract

A field experiment was conducted at the Instructional Cum Research Farm of the Indira Gandhi Krishi Vishwa Vidyalaya, Raipur, Chhattisgarh during winter seasons of2015-16 and2016-17 to study the effect of method of sowing and seed rate on soil physico-chemical properties of wheat (*Triticum aestivum* L.). The treatment combination of 3 methods of sowing viz. Broadcast methods of sowing (M_1), Line sowing (M_2) and Criss cross methods of sowing (M_3) as main plot and 5 seed rates based on 100 kg ha^{-1} (SR_1), 125 kg ha^{-1} (SR_2), 150 kg ha^{-1} (SR_3), 175 kg ha^{-1}(SR_4) and 200 kg ha^{-1} (SR_5) sub-plot was laid out in split plot design with three replications. Results revealed that NPK content in grain and straw was obtained non-significant under methods of sowing and seed rates. However, maximum NPK content was observed in broadcast methods of sowing and seed rates 100 kg per ha^{-1}. Different methods of sowing and seed rates were also found non-significant in available NPK in soil after harvest.

Key words: Methods of sowing, seed rates and physico-chemical properties of soil, grain and straw

Role of veterinarians in management of Covid-19 pandemic

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Abstract

The ongoing world-wide Covid-19 pandemic is caused by the recently discovered RNA novel corona virus infection.Though initially, it was supposed to be transmitted from animals as a zoonotic disease but no evidence proved it factually so far (OIE 2020).The most common symptoms of Covid-19 disease are fever, cough, sore throat, headache, etc. as seen in other respiratory tract infections in humans.Considerable proportion of asymptomatic patients has been found to be adults. Data by gene sequencing has suggested that the Covid-19 virus is a close relative of other corona viruses that mutates in *Rhinolophos* bats. There is a possibility that an intermediate host may be involved in the transmission to humans (OIE 2020).In order to reduce the infection of animal corona viruses and the problems faced by livestock owners during the pandemic, animal health workers have a special role. During this difficult times of Covid-19 pandemic, keep promoting livestock products to serve the livestock industry.Veterinary health workers have the responsibility of protecting themselves, animal owners and animals during their working.Veterinary personnel must always wear face masks, gloves and dangri or apron. They should wash the uncovered body parts with soap and water and drink lukewarm (light hot water) as frequently as possible. The clothes, mask etc. be washed after removing preferably in the hospital itself. In order to treat the animals, let the farmers enter the hospital one by one and let the next animal and its owner to enter only after the first animal has been treated and released. Least number of people should be allowed to come in with an animal for treatment. The farmers must have encouraged for applying hand sanitizer on their hands after entering and leaving the hospital. Farmers and hospital staff should avoid touching hospital walls and other items. Hospital staff should keep a distance of two meters while interacting with farmers. If, for some reason, there is a conversation with the livestock by sitting on the chair, then the chairs should be sterilized as soon as they go out of the veterinary hospital. Everyone must wash hands with soap and water before and after touching the animals that have come to the hospital and then apply the hand sanitizer. Livestock owners are also facing situations like economic slowdown due to lockout. If a veterinarian has to go to the animal owner's house for the treatment of animal(s), then proper precautions be taken religiously and meeting people unnecessarily be avoided. The livestock or pet owners should be guided for proper vaccination of their animals during pandemic. In case of doubt of disease, get test done immediately.

Population dynamics of insect pests and natural enemies in direct seeded and transplanted rice

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Abstract

Rice is the one of the cereal food crop half of the population of the world, it is an an important target crop to provide food and livelihoods for millions. In this view, CR Dhan 200, CR Dhan 201, CR Dhan 202, CR Dhan 203, CR Dhan 204, CR Dhan 205, CR Dhan 206, CR Dhan 207, CR Dhan 209 rice varieties was sown in experimental plots of Faculty of Agriculture, Annamalai University, Chidambaram. The experiment was laid out in Randomized Block Design with three replications. To monitor the pest and natural enemies by using net sweeping and yellow pan trap method was used. The results showed that the maximum number of yellow stem borer was observed in the transplanted rice variety of CR Dhan 205 (5.00) and leaf folder population was maximum in the transplanted rice variety of CR Dhan 204 (6.00).The peak population of grasshopper and green leaf hopper was recorded in the direct seeded rice variety of CR Dhan 204 (16.00), CR Dhan 204 (6.66). The maximum number of Braconidae was observed in transplated rice variety of CR Dhan 205 (3.00) and Ichneumonidae was recorded highest number of direct seeded and transplanted rice in the variety of CR Dhan 202 (3.00). The parasitoid family Chalcididae was collected maximum numbers in transplanted rice variety of CR Dhan 207 (2.66). The peak population of Trichogrammatidae was recorded in direct seeded rice of CR Dhan 207 (3.66). The presence of Platygastridae was high in transplanted rice variety of CR Dhan 201 (8.66). The presence of Eulophidae was high in the direct seeded rice variety of CR Dhan 201 (10.66), respectively. The results obtained provide a better basis of conservation of natural enemies for the control of pest under natural conditions and the direct seeded rice showed the best result.

Key words: Rice, Net sweeping, Yellow pan trap, Insect pests, Parasitoids

Genetic variability studies in germplasm accession of pigeonpea [*Cajanus cajan* (L.) Millsp.]

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Abstract

Sixty genotypes of pigeonpea accession were evaluated for genetic variability, heretability and genetic advance. Observation were recorded on days to flower initiation, days to 50% flowering, days to maturity, number of primary branches per plant, number of secondary branches per plant, plant height, number of pods per plant, number of pod clusters per plant, number of pods per cluster, pod length, number of seeds per pod, 100 seed weight and seed yield per plant. Analysis of variance revealed that the mean sum of squares due to genotypes were highly significant for all the characters indicating existence of sufficient variability among the genotypes. Among the different yield attributing traits, number of pods per cluster had the highest magnitude of GCV and PCV. The high magnitude of GCV and PCV was observed for number of pods per cluster followed by secondary branches per plant number of pod clusters per plant, number of pods per plant, seed yield per plant which is an indicative of the genetic variability exists in the pigeonpea germplasm accessions. High heritability coupled with high genetic advance as percentage of mean was found for number of pods per cluster, secondary branches per plant, number of pod clusters per plant, number of pods per plant, seed yield per plant, which indicated that the predominance of additive gene action in

the expression of these characters

Keywords:Pigeonpea, genetic variability, heritability, germplasm, genetic advance.

Studies on the performance of various locally available mango types for screening potential rootstock in Jalandhar conditions of Punjab

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Abstract

An investigation was conducted at University Orchard, Lovely Professional University, Punjabto access the potentiality of various locally available mango types for usage as rootstocks. Observations included 'Days taken for germination', 'Plant height', 'Plant girth', 'No. of leaves per plant', 'Leaf length', 'Leaf width' and 'Leaf area'. The results of the study revealed that Observations on 'Days taken for germination' shown Totapuri as best with minimum the 'number of days taken for germination' (21.83). In case of plant height, Safeda registered maximum the value for 'Plant height (9.26 cm)' whereas Totapuri registered maximum the value for 'Plant girth (1.12 cm)' at 30 days after sowing. Among the various mango rootstocks, Totapuri retained superiority for 'leaf related characters' at all the stages of observation, whereas minimum the value recorded in Dashehari.

Keywords: Mango, Rootstock, Morphological characters, Totapuri and Dashehari.

Evaluation of eco-friendly approaches for the management of pod borer complex of Pigeonpea [Cajanus cajan (L.) Millsp.]

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Abstract

The field experiment conducted to evaluate the relative efficacy of different biopesticides against gram pod borer complex Helicoverpa armigera (Hübner) and pod fly, Melanogromyza obtuse (Malloch) infesting Pigenopea during Kharif season 2018-19. The population was recorded at different days after spraying of insecticides and it was found that the number of larvae varied non-significantly different from the control in both spray application. The pod borer H. armigera was found lowest in Chlorantraniliprole 18.5 SC @ 30 g a.i/ha (6.25%), followed by Azadirachtin 1500 ppm @ 5.0 ml/l (7.33%) and Bt. kurastaki @ 1.0 g/l (9.33%) as compared to control (13.89%). Grain damage varied from minimum (8.42%) due to pod fly, M. obtusa and pod borer, H. armigera (3.35%)

Chlorantraniliprole 18.5 SC @ 30 g a.i/ha followed by Azadirachtin 1500 ppm @ 5.0 ml/l (14.25%) as compared to (27.63%) due to pod fly, M. obtusa
and (13.89%) pod borer, H. armigera in untreated control.

Key words: Biopesticides, Pod borer, Pod fly, Pigeonpea and Management

Contact and ovicidal toxicity of plant essential oils against pulse beetle, Callosobrucus chinensis Linn. (Coleoptera: Bruchidae)

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Abstract

Contact and ovicidal toxicity of the nine plant essential oils, viz., Cinnamonum camphora, Cymbopogon citrates, Cymbopogon flexuosus, Mentha longifolia, Lavender agustifolia, Ocimum basilicum, Polargonium graveolens, Elethia cardmomum and Foeniculum vulgare on C. chinensis adults. Residual film bioassay was employed in Petri dish (5 cm dia.) for contact and ovicidal studies and inner surface of petri dish (9 cm diameter, surface 63.6 cm2) were used for testing contact and ovicidal activities. Maximum contact toxicity was recorded in lavender oil at 24, 48, 72 and 96 h after exposure different concentrations, the values being (10.00, 10.00, 12.23 and 17.75%), (13.75, 13.75, 28.61 and 42.87%) and (13.75, 17.26, 17.57 and 48.11%), respectively. The highest percent hatching inhibition rate was recorded in lavender oil at all the three dose of 0.25, 0.5 and 1% after 35 days, the values being 37.17, 58.37 and 89.80%, respectively.

Key words: Pulse beetle, Ovicidal activity, Contact activity and Essential oils

Fall army worm is one of emerging pest in Maize: Review article

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Abstract

Fall armyworm, Spodoptera frugiperda, is a lepidopteran pest that feeds in large numbers on the leaves, stems and reproductive parts of more than 350 plant species, causing major damage to economically important cultivated grasses such as maize, rice, sorghum, sugarcane and wheat but also other vegetable crops and cotton. Native to the Americas, it has been repeatedly intercepted at quarantine in Europe and was first reported from Africa in 2016 where it caused significant damage to maize crops. In 2018, S. frugiperda was first reported

from the Indian subcontinent. It has since invaded Bangladesh, Thailand, Myanmar, China and Sri Lanka). The ideal climatic conditions for fall armyworm present in many parts of Africa and Asia, and the abundance of suitable host plants suggests the pest can produce several generations in a single season, and is likely to lead to the pest becoming endemic.

Keywords: Fall army worm, Cultural control,Biopesticide, Larvae,Moth.

Morpho-cultural, and pathogenic variability among isolates of *Stemphyliumvesicarium [(Wallr.) E. Simmons]*, causing Stemphylium blight in onioncollected from different geographical regions of Kashmir valley

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Abstract

Stemphylium blight is the most destructive disease of onion crop and pose a grave threat to the very existence its cultivation in Kashmir. Thirty six (36) isolates of *Stemphyliumvesicarium* [(Wallr.) E. Simmons] were collected from different locations and characterized for cultural, morphological, and pathogenic variation**.** Colonies of *S. vesicarium* exhibited either velvety, cottony, or fullfy mycelial growth with colour ranging from whitish, light to dark grey, olivaceous with greenish tinge to brownish in colour with filliform, entire and undulate margins. Significant variation in colony diameter and sporulation was observed among isolates. Mean hyphal width ranged from 3.11 to 5.48 µm. Conidiophore length varied from 20.07µm to 92.56 µm. Similarly, mean conidiophore breadth varied from 2.84 µm to 7.58 µm. and were either light brown, light brown to brown, brown and dark brown in colour. Conidial colour of isolates varied from light brown, brown, light brown to brown and dark brown and are ovoid, ovoid to oblong and oblong in shape. Transverse septation varied from 0 to 6 and longitudinal from 0 to 5. Average ascus size of isolates varies from 103.74-204.24×23.00-33.11µm. Average ascospore size varied from 12.08-41.96×10.06-17.38 µm among the isolates. Transverse and longitudinal septation varied from 3 to 7 and longitudinal from 0 to 6. Ascospores were light brown, light brown to brown, brown and dark brown in colour and were oblong with rounded base and conical apex, oblong with rounded base and conical apex to oblong with both ends rounded and ellipsoidal in shape. Isolates exhibited variations in incubation period, number, size and colour of the lesions.

Keywords: Onion, stemphylium blight, *Stemphylium vesicarium*, variability, Incubation period

Natural enemies of mustard aphid and their management

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Abstract

The present investigations were conducted at the experimental site of entomological research farm ,College of Agriculture,Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, Madhya Pradesh during 2011-12 and 2012-13. Bio-efficacy of nine insecticides namely, acephate , acetamiprid, oxy-demeton methyl, dimethoate, Imidacloprid, carbosulphan, flonicamid ,thiamethoxam and fipronil were studied against mustard aphid, *Lipaphis erysimi*(Kalt.) and their effect on its natural enemies, *Coccinella septempunctata* under field condition. Mean beetle population (after three sprays, average taken over two years) showed significant superiority of insecticide treatments against control. Imidacloprid, Thiamethoxam and Oxy -dameton methyl were highly effective against mustard beetle. All the treatments were effective significantly in reducing the beetle population (0.25to 0.74 beetle /10 cm apical twig) over untreated control (1.00 beetle / 10 cm apical twig). Minimum and significantly less beetle population (0.25beetle /10 cm apical twig) was recorded in plots treated with imidacloprid followed by thiomethoxam (0.31beetle /10cm apical twig) and oxydemeton methyl (0.34 beetle /10cm apical twig) than rest of the treatments .Among the treated plots, maximum beetle population was recorded in plots treated with flonicamid (0.74 beetle / 10 cm apical twig) which was at par with carbosulphon (0.66 beetle /10cm apical twig).

Performance of TJT 501 Pigeon pea (Cajanus cajan) in Dindori district of Madhya Pradesh

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Abstract

Pigeon pea is an important source of proteins, of the pigeon pea production in the world where it is mostly consumed as dehusked splits or dhal. important pulse crop of Uttar Pradesh. It is also one of the most Krishi Vigyan Kendra, Dindori (M.P.) conducted 25 frontline demonstration of pigeon pea crop in the different locations of entire district. Theresults were compared with full package of practices rate, proper spacing, plant population, balance fertilizers, plant protection etc. and farmers practices included local/old variety, no seed treatment with fungicides, improper spacing and imbalance use of fertilizer that highest yield of pigeon pea 8.1q/ha ha 55.7 per cent more over the farmers practices (4.5 q/ha net return was recorded (Rs. 17750/-(Rs. 927650/-) with variety TJT 501 technology index was recorded 25.3 per cent. The technology gap ranged between 2.1 to 4.2 q ha technology gap under three years of FLD program was 8.25 q ha has given a good impact

over the farming community of Dindori district as they were motivated by the new agricultural technology applied in the FLD plots.

Keywords: Pigeonpea, Front line Demonstration, Yield

Impact Assessment of Integrated Nutrient Management on growth, yield and economics of Garlic (*Allium sativum* L.) cv. G-282 through Front Line Demonstration

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Abstract

A field trials on Integrated Nutrient Management (INM) in garlic were conducted with farmers participation in Dewas district of Madhya Pradesh for four consecutive years from 2016-17 to 2019-20 to assess the impact of INM on the performance of garlic crop. Demonstration on INM were conducted by applying FYM (15 t/ha) + NPKS (75:40:40:40Kg/ha) + Zinc (5 Kg/ha) + Azospirillum and PSB each @ 5 Kg/ha. The study revealed that the application of recommended dose of inorganic fertilizers, organic and bio-fertilizers enhanced the growth, yield and yield attributing characters as well as economic performance of garlic. The plant height, number of leaves per plant, neck thickness, bulb diameter and bulb weight was found highest in demonstration plots as compared to farmers practice. The average bulb yield recorded in demonstration plots was 106.74 q/ha which was 16.86% more than farmers practice (91.94 q/ha). An average of Rs. 1,30,618 per hectare net profit was recorded under demonstration plots while it was Rs. 1,04,977 per hectare under farmers practice. The benefit cost ratio was highest in demonstrations (2.74) as compared to farmer's practice (2.44).

Keywords: Impact assessment, Integrated nutrient management, Garlic, Azospirillum, Azotobacter, Technology gap, Extension gap

The Nature-Based Solution for Pandemics

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Abstract

Biodiversity includes different variety of plants and animals living together and contributing a major role in maintaining the ecological balance on the Earth. Due course of time, there are several changes takes place in the ecology worldwide, in the result the different equation of ecological balance developed. In the process the evolution of new genetic combination results a new life which becomes the part of nature. It may be good or bad for human being in due course of time. When, it goes into a negative way, the pandemic occurs. There is several numbers of pandemics which occurred time to time globally and caused a huge loss to the mankind. Pandemic diseases are the global threat. Talking about the current situation, COVID-19 is the present pandemic with which we all are fighting and facing the different

losses due to its spread over all around the world. The death rate is going on increasing trends and the economy of all around the world is falling down in a very speedy manner. The current situation of COVID-19 is not under control due to unavailability of its medicine and insufficient equipment's to handle the outbreak of this resistant viral strain. In the current situation, the human interventions are not working against it. Therefore as an option, biodiversity available in nature in the form of natural products play an important role in combating the pandemics. This paper deals with the use of products present in the nature and nature itself in controlling the various pandemics that occurred before.

Keywords:Pandemics, Nature, Natural products and COVID-19.

Evaluation of Physical And Frictional Properties Of Safflower Seed As A Function Of Change In Moisture Content

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Abstract

The physical properties of cereal and pulse grains and oilseeds can strongly influence their movements in agricultural machines as well as in air. Dimensions are important in the design of cleaning, sizing, grading, extracting and milling machines. This study aimed at development of simple empirical equations to predict physical properties of safflower seeds (cult. *PBNS-40*). The physical and solid flow properties of safflower seeds were evaluated as a function of change in moisture content from 8.11 to 29.24% wet basis (w.b.). The dimensions of length, width and thickness varied from 8.08 to 8.52 mm, 4.24 to 4.77 mm and 3.505 to 3.833 mm, respectively whereas the mean diameter increased linearly from 4.93 to 5.38 mm. The surface area and projected area increased from 76.49 to 91.04 mm^2 and from 26.93 to 31.96 mm^2, respectively with corresponding increase in moisture contents. As the moisture content increased from 8.11 to 29.24% (w.b.), the true density, bulk porosity and thousand grain weight were found to increase from 1015.25 to 1087.66, from 36.84 to 47.90 kg/m^3 and from 37.95 to 45.53 g, respectively; whereas the bulk density was found to decrease from 641.07 to 566.53 kg/m^3. In frictional properties, the angle of repose and coefficient of friction were found to increase from 37.35 to 49.36° and 0.385 to 0.700, respectively with the corresponding increase in moisture content of seeds.

Assessment of Rotavator for Garlic Crop in Mandsaur District of Madhya Pradesh

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Abstract

Among different agricultural operations i.e., tillage, fertilizer, seed and weed management, tillage is the most important operation followed in irrigated as well as rainfed farming situation for sustainable development of agriculture and enhancement of productivity. The tillage operations facilitate improving water intake, storage in-situ rain water storage, and absorption of water from the soil by plant roots, controlling weeds and enhancing soil aeration. So, with this context field experiments were conducted by Krishi Vigyan Kendra, Mandsaur in adopted villages for two consecutive years i.e., 2013 and 2014 to assess the performance of tractor operated rotavator as tillage implement and compared it with commonly used conventional tillage implement cultivator for garlic crop. The soil inversion provided by single operation of rotavator was quite high (89.46%) as compared to cultivator (62.40%). Rotavator (Cost of operation Rs 1825/- per ha) was found more economical for tillage as well as for weed control and provide better tilth than cultivator (Cost of operation Rs. 2850/- per ha). The plant growth attributes such plant height, polar & equatorial bulb diameter and bulb weight was observed superior in the fields prepared by rotavator over cultivator. On an average, rotavator prepared fields gave 10.8% higher yield owing to good water use efficiency (WUE, 40%) as compared to fields prepared by cultivator (WUE, 33%) in garlic crop. Benefit-Cost ratio was higher for garlic crop grown on field prepared by rotavator (3.94) as compared to cultivator (3.40).

Studies on inheritance and allelic relationship of gene (s) governing resistance to brown planthopper (*nilaparvata lugens* stal.) In some donors of rice

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Abstract

Mode of inheritance and allelic relationships of genes conforming resistance to brown plant hopper (*NILAPARVATA LUGENS* STAL.) was investigated in three rice (*Oryza sativa* L.) genotypes viz. R1723-1413-3-357-1, R1519-773-3-581-1 and R1243-1224-578-1. Eight-ten days old seedlings were infested with first- and second-instar nymphs of brown planthopper and seedling injury was recorded 7 to 10 days after infestation. Inheritance studies revealed presence of a single dominant gene for resistance in R1723-1413-3-357-1 and R1243-1224-578-1. Allelic tests revealed that gene for brown plant hopper resistance present in R1519-773-3-581-1 was non-allelic to the genes *bph5* (ARC10550), *bph7* (T12), *Bph1* (MTU15) and Bp*h6* (Swarnalata). The cross of resistant donor R1723-1413-3-357-1 with MTU15 showed no segregation for BPH resistance in the F1 and F3 generations, indicating that the genes conferring resistance are common. The dominant gene control of BPH resistance of resistant donors can be used for easy incorporation of BPH resistance into susceptible high yielding rice varieties.

Keywords: Brown planthopper, Nilaparvata lugens Stal., Genetics, Insect resistance, allelic relationships. Oryza sativa L.

Natural Resource Management and Forest Sustainability

Economic profitability and environmental efficacy ofTree borne Oilseed species (TBOs) based silvipasture systems for rehabilitation of Chambal Ravines in India

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Abstract

Ravine lands are highly degraded dry lands associated with several constraints for vegetation growth due to severe land degradation. The best scientific utilization of these areas is by using perennial plant productive systems. Tree, shrub and grass species have been evaluated and identified for arresting extension of ravines. But for productive utilization of ravines, introduction of suitable multipurpose trees (MPTs), oilseed species and fruit trees are always desirable. Ravine rehabilitation requires an integrated approach of using soil and water conservation measures along with selection of suitable tree species. (Chaturvedi *et al.* 2014). A study was conducted with tree borne oilseed tree species for increasing suitability, adaptability and production potential in degraded chambal ravines of Rajasthan. Three promising oilseed tree/shrub species namely *Azadirachta indica* (Neem), *Pongamia pinnata* (Karanj) and *Jatropha curcus* (Ratanjot) alongwith *Dicanthium annualatum* grass species were evaluated in the research farm of ICAR-IISWC, Research centre, Kota-Rajasthan. Eight years of evaluation indicated that, *Pongamia pinnata* along with half moon shaped micro catchments impacts on higher growth which resulted as height (6.12m), collar diameter (22.38 cm), DBH (10.50cm) and crown spread (45.71m^2) compare to other treatments. Among three TBO species evaluated on ravine land, highest seed yield of 2.92 kg/tree was observed in *Karanj(Pongammia pinnata*). Due to impact of half moon shaped micro catchment moisture conservation measure, the performance of karanj species were fetched higher biometric growth and survival performance when compared to control. In initial years, *Dicanthium annulatum* species gives average yield of 6-7 tons/ha /year upto seven years after that itmay reduce due to shade effect of Karanj trees. Hence, cultivation of grass is possible up to 7/8 years for getting average yield under inter-spaces of *Pongamia pinnata* on ravine humps. However, canopy management option is not feasible frequently for oilseed species. Because seed yield directly depends on level and intensity of branch development by trees. Karanj based silvipasture system gives direct income /benefits from oilseed, oil cake, small firewood, leaf fodder, dry leaves as mulch material and green fodder grass yield as an additional income. Apart from direct benefits, this silvipasture system might play significant role on resource conservation and carbon sequestration service under ravine ecosystem as an ecosystem or intangible benefits. The B: C ratio of the system is 1.32. Hence, Karanj based silvipasture technology is highly suitable for productive utilization of medium and deep ravenous lands along the bank of the major rivers like Chambal Yamuna, Kalisindh, Mahi, and their tributaries in the states of Rajasthan, UP, Madhya Pradesh and Gujarat. Therefore, use of multipurpose oilseed trees species are well suited to arid and semi-arid region due to

meet the twin concerns of livelihood enhancement and environmental protection - the key components for developing these resource poor lands.

Keywords: Karanj, soil erosion, Gullies, Ravines, Oilseed, silvipasture, rehabilitation.

Pre-treatment with GnRH analogue improved the efficiency of superstimulatory protocol in water buffalo (*Bubalus bubalis*)

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Abstract

The superstimulatory protocols during the multiple ovulation embryo transfer programme has yielded poor embryo recovery in buffalo due to presence of large/dominant follicle(s) at the start of superstimulatory regimen. The present study evaluated the effects of pretreatment with gonadotropin analogue on the number of total as well as viable and transferrable embryos recovered during MOET programme in Murrah buffaloes. Buffaloes (n=27) were enrolled into two treatment (groups A and B with n=9 in each group) and one control (group C, n=9) groups, were administered with 600 mg of follicle stimulating hormone (FSH) in 10 tapering doses at 12 hourly interval for continuous five days. Additionally, buffaloes were administered with a single dose of GnRH analogue in group A (10 µg) and group B (06 µg) as a pre-treatment on 2.5 day prior to the start of FSH. Two doses of prostaglandin were also administered in all the buffaloes alongwith the 7^{th} and 8^{th} dose of FSH. Embryos were collected non-surgically on day 5.5 post-insemination. Number of total, transferrable and the non-transferrable embryos recovered were recorded in the 3 experimental groups. Total as well as the viable transferrable number of embryos recovered were significantly higher ($p < 0.05$) in the buffaloes of group B compared to the control (3.0 vs. 1.33 and 2.33 vs. 1.0, respectively). In all the three groups, about 75% of embryos recovered were of transferrable grade. The results of study indicated that administration of GnRH as a pre-treatment in superstimulatory regimen improved the superstimulatory response in buffalo.

Keywords: Buffalo; embryo; follicle stimulating hormone; GnRH

Diversity Of Wild Edible Mushrooms In Korea District Of Chhattisgarh

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Abstract

Chhattisgarh state has the huge diversity of mushroom flora among which some are edible. Survey was conducted in Korea district during rainy season for naturally grown wild edible mushrooms. Forty three village of five Tehsil covered under survey and 55 tribal/ rural peoples were contacted from different villages for information about wild edible mushroom flora at their surrounding locality. Wild edible mushrooms were encountered during survey are: *Astreaus hygrometricus, Astraeus odoratus, Termitomyces umkowaani, Termitomyces heimii, Termitomyces longiradicatsu, Termitomyces* sp., *Cantharells* sp., and *Russula rosea.* Urban/Local market also visited where collected wild edible mushrooms were sell out by tribal/rural peoples of village. Wild edible mushroom are used for consumption and it provides monetary benefits by sold out. Forty three villages were surveyed from five Tehsil of Korea district and forest area was visited for collection of wild edible mushrooms. Local market and roadside sell proved that which mushrooms were collected for livelihood by tribal and rural. The mushrooms which found in district were: *Astreaus hygrometricus, Astraeus odoratus, Termitomyces umkowaani, Termitomyces heimii, Termitomyces longiradicatu, Termitomyces* sp., *Cantharells* sp., and *Russula rosea.* These mushrooms were collected from forest area and surrounding of village and it's known by local name at village of all Tehsil in Korea. *Astreaus* spp. collected *by* scratching the surface of soil and looking for white matrix. Wherever white matrix seen on the surface or subsurface, it is a perfect indication that troops of immature fruit bodies prevail in its surroundings. *Termitomyces* spp. is mostly found in termite infested soil. The emergence of the fungus has also been noticed from termite comb. Found mainly in shady moist places. Both epigeous and hypogeous in nature, scattered occurrence.*Cantharellus* sp. found associated with bamboo root because it's a mycorrhizal fungus and *Russula rosea* grows on decomposed substrates of tree leaves and grasses in sal forest land. Edible mycorrhizal and mutualistic symbionts fungi (*Astreaus and Termitomyces*) found in large quantity than *Cantharellus* and *Russula* sp. and these two mushrooms is not mush popular among people that is why market rate also lowest.

Keywords:Edible, survey, *Termitomyces*, *Cantharellus* and *Russula.*

Assessment of Performance of different Weeding Tools in Cultivation of Maize in Koshi Region

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Abstract

Keeping in view of hazardous effect of herbicides a trial has been conducted to assess the performance of some specific weeding implements in rabi maize cultivation by KVK, Saharsa in two consecutive years 2017-18 and 2018-19. Different crop specific weeding implements had been kept under trial from time to time in rice, soybean and vegetable crops and it had been found that application of a weeding tool for interculturing and weeding operation also provided better aeration to crop roots, enhanced organic contents of the cultivable area along with combating the hazardous situation due to application of herbicides. A twin wheel hoe and a grubber have been kept under assessment with the use of a spade, a

common tool for interculturing operation among farming communities. The field capacity of the twin wheel hoe has found the highest among the implements under trial. The B:C ratio (2.35) and the yield (95.7 q/ha) have also been observed the highest in the plots where the twin wheel hoe has been applied for the purpose.

Keywords: Twin wheel hoe, Grubber, weed control efficiency, field capacity and Benefit Cost ratio

Section (C)
Invited/Lead Lecture

Sericulture: Global and Indian Scenario

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Abstract

India ranks second among the silk producing countries of the world accounting for about 22% of the total global silk production. The country has the unique distinction of being the only country producing all the known commercial varieties of natural silk, viz., Mulberry, Tropical Tasar, Temperate Tasar (Oak Tasar), Eri and Muga. Mulberry sericulture is largely practiced accounting for 76 per cent of the country's entire silk production. Production of raw silk of all varieties increased steadily since last 10 years. Among the four varieties of silk produced in 2018-19, mulberry accounts for 71.45% (25,344 MT) followed by eri 19.48% (6,910 MT), tasar 8.40% (2,981 MT) and muga 0.0.65 % (233 MT) of the total raw silk production of 35,468 MT. India is biggest consumer of silk and country's raw silk production is lesser than the demand. During the year 2018-19, domestic demand of raw silk stands at 38,046 MT compared to production of 35,468 MT. In order to meet out the demand about 2-3 thousand MT of silk is imported every year. India exports silk products rather than raw silk to some countries like USA, UAE, Nigeria, Sudan, Thailand etc. The export earnings during 2017-18 were Rs. 1,649.48 crores. In India sericulture industry provides employment opportunity and livelihood security to about 9.12 million persons. Of these, a sizeable number of workers belong to the economically weaker sections of society, including women.

Introduction

Silk is a natural fiber secreted by some *sericigenous insects mainly caterpillars called silkworms*. Silkworm has four stages in its life cycle viz., egg, larva, pupa and moth. They feed on the selected food plants and spin cocoons with continuous filament before entering into the inactive pupal stage for its protection to perpetuate the life. Man interferes its life cycle at cocoon stage to obtain the silk. Very few species of silkworms are known to produce silk fiber suitable for processing to make fabrics or other desirable end products. Sericulture primarily comprises agro-based activities viz. cultivation and or utilization of food plants, silkworms rearing and production of cocoons. It is followed by machinery based activities viz. reeling of cocoons to produce silk yarn, processing of yarn including twisting, throwing, wet processing, dyeing etc, weaving the yarn into fabric, designing, printing, garment manufacturing and marketing.

History of silk

There is evidence in ancient Sanskrit literature that certain kind of wild silks were produced and used in India from the time immemorial. But historical evidence shows that silk was discovered in China during 2640 BC and that the industry spread from there to other parts of the world. The earliest authentic reference to silk is to be found in the Chronicles of Chou-King

(2200 BC), where silk figured prominently in public ceremonies as a symbol of homage to the emperors. The silk industry originated in the province of Chan-Tong and the secret was jealously guarded by the Chinese for about 3000 years.

According to some sources, the first country after China to learn the secret was Korea where Chinese immigrants started sericulture in about 1200 BC. The industry later spread to Japan and other countries. According to Western historians, mulberry tree cultivation had spread to India through Tibet by about 140 B.C. and the cultivation of mulberry trees and the rearing of silkworms began in the valleys of Brahmaputra and Ganges rivers. Rearing of silkworm was domesticated first time in the foothills of Himalayas. After the British arrival in India, the silk industry had flourished and spread to many other areas.

Global Silk Production

China is largest producer of silk contributing about 75% of global silk production. India ranks second (22%) while the biggest consumer of silk. The major silk producing countries in the world are China, India, Uzbekistan, Brazil, Japan, Thailand and Vietnam. Few other countries are also engaged in the production of cocoons and raw silk in negligible quantities. The major silk consumers of the world are India, USA, Italy, Japan, France, China, United Kingdom, Switzerland, Germany, UAE, Korea, Viet Nam, etc.

About 1 million workers are employed in the silk sector in China. Silk Industry provides employment to 7.9 million people in India, and 20,000 weaving families in Thailand. China is the world's single biggest producer and chief supplier of silk to the world markets and India is the world's second largest producer. Therefore, the major silk producers are in Asia contributing 90% of mulberry production and almost 100% of non-mulberry silk. Sericulture can help keeping the rural population employed and to prevent migration to big cities and securing remunerative employment. It requires small investments while providing raw material for textile industries. The global silk production details for past five years are given in Table 1.

Table 1: Global Silk Production (in Metric Tonnes)

Sl.	Countries	2014	2015	2016	2017	2018
1	Bangladesh	44.5	44	44	41	41
2	Brazil	560	600	650	600	650
3	Bulgaria	8	8	9	10	10
4	China	1,46,000	1,70,000	1,58,400	1,42,000	1,20,000
5	Colombia	0.5	0.5	-	-	-
6	Egypt	0.8	0.8	1.2	1.1	1.25
7	India	28,708	28,523	30,348	31,906	35,261
8	Indonesia	10	8	4	2.5	2.5
9	Iran	110	120	125	120	110
10	Japan	30	30	32	20	20
11	Madagascar	15	5	6	7	7
12	North Korea	320	350	365	365	350
13	South Korea	1.2	1	1	1	1
14	Philippines	1.1	1.2	1.82	1.5	2

15	Syria	0.5	0.3	0.25	0.25	0.25
16	Thailand	692	698	712	680	680
17	Tunisia	4	3	2	2	2
18	Turkey	32	30	32	30	30
19	Uzbekistan	1,100	1,200	1,256	1,200	1,800
20	Vietnam	420	450	523	520	680
Total		178057.62	202072.83	192512.27	177507.35	159648.00

Types of commercial silks

There are four types of natural silk namely mulberry, tasar, eri and muga which are commercially known and produced in the world. But owing to their contribution to silk production, they are grouped in two categories viz. mulberry silk which contribute to about 90% of the total silk and rest tasar, eri and muga silks which are collectively termed as non-mulberry or wild silks.

Mulberry Silk

Bulk of the commercial silk produced in the world comes from this variety and often generally refers to mulberry silk. Mulberry silk comes from the silkworm, *Bombyx mori L.* which solely feeds on the leaves of mulberry plant *(Morus spp.).* These silkworms are completely domesticated and reared indoors. Mulberry silk contributes to around 90 percent of the world silk production.

Non-Mulberry Silks

Tasar silk

Three species of tasar silkworms namely *Antheraea pernyi* (China), *Antheraea mylitta* (India) and the *Antheraea yamamai* (Japan) are commercially important. These silkworms are wild in nature and reared under natural conditions (outdoor rearing). The Chinese and Japanese tasar worms feed on oak leaves and Indian tasar worms feeds on the leaves of *Terminalia arjuna*, *T. tomentosa* and several other secondary host plants.

Eri silk

Eri silkworm, *Samia cynthia ricini* is domesticated and polyphagous in nature but reared mainly on castor (*Ricinus communis*) leaves. Unlike mulberry and tasar cocoons, the eri cocoons cannot be reeled as it does not have continuous filament. Therefore, the moths are allowed to emerge and the pierced cocoons are used for spinning to produce the spun eri silk yarn.

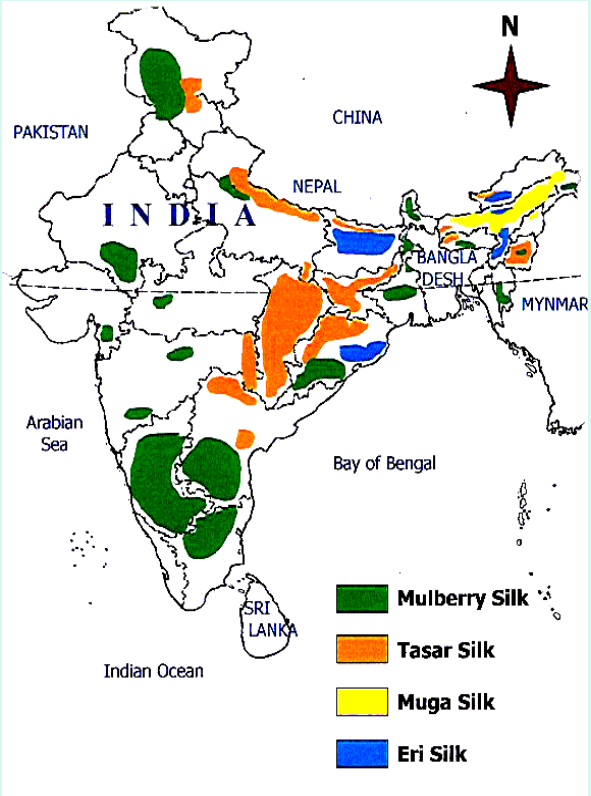
Muga silk

The muga silkworms, *Antheraea assamensis* also belong to the same genus as tasar worms, but produce an unusual golden-yellow silk thread which is very attractive and strong. These are found only in the state of Assam, India. It feeds on *Persea bombycina* (Som) and *Litsea monopetala* (Sualu) leaves.

Indian Sericulture

India has the unique distinction of being the only country producing all the known commercial varieties of natural silk, viz., Mulberry, Tropical Tasar, Temperate Tasar (Oak

Tasar), Eri and Muga. India ranks second among the silk producing countries of the world accounting for about 22% of the total global silk production. Mulberry sericulture is largely practiced accounting for 76 per cent of the country's entire silk production.



Sericulture map of India

In India, Mulberry silk is produced mainly in Karnataka, West Bengal, Jammu & Kashmir, Tamil Nadu and Andhra Pradesh although some other States have also made some progress recently. These five major mulberry silk producing states collectively account for more than 80% of the total area under mulberry cultivation and 97% of raw silk production in the country with productivity level of 65 kg/ha. Now, as a result of growing realization, sericulture is gaining importance in non-traditional areas too.

Table2: State wise production of different silk during 2018-19

Sl.	State	Mulberry		Tasar Silk (MT)	Eri Silk (MT)	Muga Silk (MT)	Total (MT)
		Cultivation (ha)	Silk (MT)				
1	Karnataka	104578	11592	-			11592
2	Andhra Pradesh	41915	7476	5	-	-	7481
3	Telangana	4383	214	10	-	-	224
4	Tamil Nadu	20128	2072	-	-	-	2072
5	Kerala	148	16	-	-	-	16
6	Maharashtra	7913	496	23	-	-	519

7	Uttar Pradesh	3754	231	22	37	-	289
8	Madhya Pradesh	3088	82	18	-	-	100
9	Chhattisgarh	261	9	340	-	-	349
10	Rajasthan	-	-	--	-	-	--
11	Gujarat	-	-	--	-	-	--
12	West Bengal	15400	2365	25	4	0.16	2394
13	Bihar	598	8	38	9	-	55
14	Jharkhand	502	3	2372	-	-	2375
15	Orissa	537	3	123	5	-	131
16	Jammu & Kashmir	8183	118	-	-	-	118
17	Himachal Pradesh	2743	34	-	-	-	34
18	Uttarakhand	3305	36	0.04	0.4	-	36
19	Haryana	206	1	-	-	-	1
20	Punjab	1159	3	-	-	-	3
21	Assam	2370	52	-	3563	157	3772
22	Bodoland	413	17	-	1201	36	1254
23	Arunachal Pradesh	300	3	0.002	54	3	59
24	Manipur	3300	137	5	320	2	464
25	Meghalaya	3209	49	-	1104	34	1187
26	Mizoram	4094	83	0.05	8	1	92
27	Nagaland	394	13	0.06	606	1	620
28	Sikkim	185	0	-	-	-	0
29	Tripura	1935	230	-	-	-	230
		2,35,001	**25,345**	**2,981**	**6910**	**233**	**35468**

Tasar silk is generated by the silkworm, *Antheraea mylitta*, which mainly thrives on the food plants such as Asan and Arjun. The rearings are conducted in natural conditions on the trees. Tasar silk is mainly produced in India in the states of Jharkhand, Chhattisgarh, Orissa, Maharashtra, West Bengal and Andhra Pradesh. Tasar culture is the main stay for many tribal communities in India. Eri silk is the product of the domesticated silkworm, *Samia cynthia ricini* that feeds mainly on castor leaves. Eri silk is produced in Assam, Bihar, Manipur, Meghalaya, Nagaland and West Bengal. Unlike other kind of silk, this cannot be reeled and hence it is only spun. Muga Silk is produced only in Assam and it is peculiarly characterized with rich golden colour. Considering overall production of silk irrespective of varieties, Karnataka is highest producer of silk in India which is closely followed by Andhra Pradesh. However, the states like Tamil Nadu, West Bengal, Jharkhand, Assam and Meghalaya also produce considerable quantities of different silks. Total silk production during the year 2018-19 was 35,468 MT.

Table 3: Overall production of raw silk by different states during the Years 2015-16 to 2018-19 (in MT)

Sl.	State	2015-16	2016-17	2017-18	2018-19
1	Karnataka	9823	9571	9322	11592
2	Andhra Pradesh	5086	5970	6778	7481
3	Telangana	116	119	163	224

4	Tamil Nadu	1898	1914	1984	2072
5	Kerala	11	11	15	16
6	Maharashtra	274	259	373	519
7	Uttar Pradesh	256	269	292	289
8	Madhya Pradesh	257	111	103	100
9	Chhattisgarh	263	361	532	349
10	West Bengal	2391	2565	2577	2394
11	Bihar	67	77	63	55
12	Jharkhand	2284	2631	2220	2375
13	Odisha	117	125	116	131
14	Jammu & Kashmir	127	145	132	118
15	Himachal Pradesh	32	32	32	34
16	Uttarakhand	30	34	35	36
17	Haryana	0.6	1	0.7	1
18	Punjab	0.8	3	3	3
19	Assam	3325	3811	4861	5026
20	Arunachal Pradesh	37	45	54	59
21	Manipur	519	529	388	464
22	Meghalaya	857	927	1076	1187
23	Mizoram	64	76	83.6	92
24	Nagaland	631	678	615	620
25	Sikkim	6	9	0.001	0
26	Tripura	52	75	87	230
	Total	**28,523**	**30,348**	**31,906**	**35468**

Production of raw silk of all varieties increased steadily since last 10 years (Table 4). Among the four varieties of silk produced in 2018-19, mulberry accounts for 71.45% (25,344 MT) followed by eri 19.48% (6,910 MT), tasar 8.40% (2,981 MT) and muga 0.0.65 % (233 MT) of the total raw silk production of 35,468 MT. Tasar silk is produced utilizing natural trees of Asan and Arjun in hill tracks mainly in Jharkhand. But promotion of economic plantations of these trees in some states helped to increase its production. Eri silk confined to North East zone was introduced in to nontraditional states like Andhra Pradesh, Uttar Pradesh, Tamil Nadu etc where its food plants like castor and tapioca are cultivated largely as agriculture crop. Hence, eri silk production was increased considerably since last 10 years and currently its production is higher among non mulberry silks.

Table 4: Indian Mulberry and vanya raw silk production statistics (MT)

Years	Mulberry	Tasar	Eri	Muga	Total
2000-01	14,432	237	1,089	99	15,857
2001-02	15,842	249	1,160	100	17,351
2002-03	14,617	284	1,316	102	16,319
2003-04	13,970	315	1,352	105	15,742
2004-05	14,620	322	1,448	110	16,500

2005-06	15,445	308	1,442	110	17,305
2006-07	16,525	350	1,485	115	18,475
2007-08	16,245	428	1,530	117	18,320
2008-09	15,610	603	2,038	119	18,370
2009-10	16,322	803	2,460	105	19,690
2010-11	16,360	1,166	2,760	124	20,410
2011-12	18,272	1,590	3,072	126	23,060
2012-13	18,715	1,729	3,116	119	23,679
2013-14	19,476	2,619	4,237	148	26,480
2014-15	21,390	2,434	4,726	158	28,708
2015-16	20,478	2,819	5,060	166	28,523
2016-17	21,273	3,268	5,637	170	30,348
2017-18	22,066	2,988	6,661	192	31,906
2018-19	25,344	2,981	6,910	233	35,468

Currently, the industry provides employment to more than 9.1 million people across 82,562 villages, who operate 328,627 handlooms and 45,867 power looms with 8,14,616 weavers. Its exports of silk are worth about US$ 360 Million of which 70 per cent comprises natural silk yarn and fabrics, 13 per cent made-ups and 26 per cent garments. Aggressive promotion of the silk industry in India has attracted a large number of organized players to set up modern units for both apparel as well as home textile production.

Raw Silk Imports

India is biggest consumer of silk and country's raw silk production is lesser than the demand. During the year 2018-19, domestic demand of raw silk stands at 38,046 MT compared to production of 35,468 MT. In order to meet out the demand certain quantity of silk is imported every year. The quantity and value of raw silk imported during 2015-16 to 2018-19 are given below:

Year	Quantity(MT)	Value (Rs. in Crores)
2015-16	3529	1006.16
2016-17	3795	1092.26
2017-18	3712	1218.14
2018-19	2785	1041.40

Export of silk goods

India exports silk products rather than raw silk to some countries. The silk goods export earnings have decreased over the years due to global recession and reduction in demand for silk goods in western countries (Western Europe and the USA, which are the major consumers of silk goods). However, the silk exports are picking up to the non-traditional/new markets such as the UAE, Nigeria, Sudan, Thailand etc., which is an encouraging sign. The export earnings during 2017-18 were Rs. 1,649.48 crores. Export values of silk goods during 2015-16 to 2018-19 are given below:

(Rs. in Crores)

Items	2015-16	2016-17	2017-18	2018-19
Natural Silk Yarn	30.31	15.33	15.67	9.04
Silk Fabrics	1280.60	1051.65	864.81	396.39
Readymade Garments	1078.39	864.33	650.48	1184.54
Silk Carpet	16.88	63.78	17.34	113.09
Silk Waste	89.80	98.33	101.19	129.39
Total	**2495.98**	**2093.42**	**1649.48**	**1832.45**

Source: Compiled from the Statistics of DGCIS, Kolkata;

The Indian sericulture market was worth INR 241.1 billion in 2018. The market is further projected to reach a value of INR 637.7 billion by 2024, growing at a CAGR of 17.6% during 2019-2024.The market for silk in India is driven by both exports and a very strong domestic demand.

Employment Generation

Silk has been intermingled with the life and culture of the people. Sericulture industry stands for livelihood opportunity for millions. Of these, a sizeable number of workers belong to the economically weaker sections of society, including women. High employment potential, low capital requirement and remunerative nature of its production has attracted the attention of the planners and policy makers to recognize the industry among one of the most appropriate avenues for socio-economic development of a largely agrarian economy of India. The employment generation in the country is raised to 9.12 million persons in 2018-19 compared to 8.60 million persons in 2017-18, indicating a growth of 6%. India's traditional and culture bound domestic market and an amazing diversity of silk garments that reflect geographic specificity has helped the country to achieve a leading position in silk industry.

Research priorities in sericulture

Central Silk Board, Government of India is an organization for development of sericulture in the country and functions in association with state sericulture departments. It has several research institutes for R & D in the field of sericulture for sustainable production of silk. The current research priorities are:

- ✓ Development of mulberry varieties and silkworm races for resilience to climate changes.
- ✓ Development of effective organic farming strategies for production of "Organic silk"
- ✓ Mechanization in sericulture
- ✓ Microclimate management in silkworm rearing houses.
- ✓ Production of colour cocoons to avoid dying process and its related pollution issues.

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Section (D)
Oral/Poster Presentation

Optimization of gel formation process parameters for improvement of physical properties of tapioca based fish cracker using response surface methodology

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Abstract

The present study was to develop standard gelatinization conditions for tapioca based fish cracker production by optimization of gel formation process parameters using response surface methodology (RSM). The gelatinization conditions of the fish crackers were optimized in order to improve the linear expansion, bulk density, hardness and oil absorption. Response surface methodology (RSM) was adopted by following central composite design to determine the optimal conditions of three independent variables namely steaming time, gel setting time and drying temperature whereas the responses taken were linear expansion, bulk density, hardness and oil absorption. Quadratic models expressed the relationship between the dependent and independent variables. The result showed that the best interaction found was 88.58 % for linear expansion, 0.0827 g/cm³ for bulk density, 1216.90 N/cm2 for hardness and 25.75 % for oil absorption of the fried cracker. Regression analysis indicated that the quadratic term was significant in many of the models derived except bulk density. Regression models were used to generate contour plots for the physical quality attributes of the crackers and these were superimposed to obtain an optimal region, from where an optimum gelation condition was chosen. The optimum condition predicted by RSM to have high linear expansion, lower oil absorption and improved crispness of tapioca based fish cracker was achieved at steaming time of 50 min, a gel setting time of 18 hrs. and drying temperature of 55 ^{0}C.
Keywords: Fish cracker, optimization, gelation, liner expansion, oil absorption

Farm Loan Waivers: Solution for farmers and Agricultural upliftment in India

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Abstract

India is a developing country from which 60% of its population are belongs to the rural area and their main occupation is agriculture and livestock production. Generally, Indian farmers are

small and marginal with poor money source and lack in modern technology also 20% out of them are landless and they used to take the land as a rent basis and money from village Money lenders with a large interest rate for doing agricultural practices to run their day to day life. Indian government provides various crop loans and subsidies to farmers for good and dynamic agriculture practices, agriculture sector rising to full fill the food scarcity. Indian Govt provides loan waiver through schemes, Pradhan Mantri Kisan Samman Nidhi (PM-KISAN). Assistance for cultivation, assistance for livelihood, assistance for vulnerable agricultural household, life insurance for cultivators & landless agricultural worker, interest-free crop loan. Farm loan waiver is an effective credit culture, it impacts credit discipline, it blunts incentives for future borrowers to repay, in other words, waivers engender moral hazard and it will help farmer to increase their income and improve economy with sustainable enhanced production in this COVID-19 Scenario.

Keywords: Assistance, credit, farmer, loan, waiver

Digital Technologies: A New Horizon in Sustainable Agriculture Development for Food Security

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Abstract

Agriculture is a source of livelihood for more than 70 % of people in India and contributes to the growth of GDP much more as compared to other sectors. In the current era digital world, the Indian Agricultural sector and the farmers are backward for modernization & industrialization of its agricultural land. Global warming and Climate change are one of the most important environmental issues facing the world today. The impact of climate change is a reality and it cuts across all climates sensitive sectors including the Agriculture sector. Climate change could affect agriculture in several ways such as the quality and quantity of crops in terms of productivity. The climate changes affect the existing cultivating areas due to unscheduled rainfall, high temperature, and high tensed cyclones and so on. The traditional approaches of farming have numerous issues in terms of production, management of agricultural products, marketing, choice of suitable seeds and optimization of inputs that need attention in order to enhance the production and sustainable development. These challenges of traditional farming are addressed significantly by using information and communication technologies (ICT). Digital farming technology will be key to increasing agriculture productivity by delivering tailored recommendations to farmers based on crop, planting date, variety sown; real-time localized observed weather and projected market prices. Smart phones also enable farmers to integrate into structured markets based on approved grades and standards. The greatest impact of digital agriculture will have is on the democratization of market pricing and compressing transaction costs. Digital technologies will also leverage social media platforms to build human capacity. We need to put our concrete efforts to place an effective framework, in terms of appropriate policies and programs that will harness the already well-known potentials of digital technologies

to put India on the higher pedestal of the' Second Green Revolution' by making Indian rural and agricultural sector self-sufficient.

Key words: Global warming, Climate change, Digital technologies, Sustainable agriculture, Food security

Assessment on Potential of Bacterial Biocontrol Agents on Plant Parasitic Nematodes in Banana

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Abstract

Field experiments on management of nematodes in banana was conducted to assess the efficacy of plant growth promoting rhizobacteria, single and combined application of Pseudomonas fluorescens and Bacillus subtilis. All the treatments were significantly increased the yield parameters viz., stem girth, plant height and number of leaves per plant and observed that the reduction of nematode population in root system. Eighty-six per cent of nematode population was reduced from the initial nematode population recorded in combined application of P. fluorescens (Pfbv 22) + B. subtilis (Bbv57) each 12.5 g/plant respectively compared to untreated control followed by single soil application of P. fluorescens (Pf1) @ 25/ plant recorded lowest nematode population compared to untreated control.

Studies on Impact of Pre-Sowing Treatments on Seedling Growth, Vigour and Field Establishment of Karonda Cultivars

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Abstract

The experiment entitled "studies on seed germination in karonda cultivars" was carried out at College of Horticulture, Dr.Y.S.R. Horticultural University, Venkataramannagudem, Tadepalligudem, West Godavari District. The seeds of karonda cultivars *viz.,* pink-fruited plants and green-fruited plants were treated with different pre-sowing treatments (IBA, KNO_3, Thiourea) along with control and the experiment was carried out in Factorial Randomised Block Design with 3 replications comprising 14 treatment combinations. The experiment results indicate that the height of stem (5.29 cm, 9.11 cm, 13.58 cm and 17.65 cm at 30, 60, 90, 120 DAP respectively), root length (20.72 cm), root : shoot ratio (0.62), seedling vigour index–I (2,018.46 cm), seedling vigour index–II (205.56 g) and percentage of establishment in main field (98.57 %) were significantly superior in green fruited cultivar when compared to pink-fruited cultivar. Among different pre-sowing seed treatments KNO_3 @ 2% was found to be superior for height of stem (5.47 cm, 9.74 cm, 14.51 cm and 18.86 cm at 30, 60, 90, 120 DAP respectively), root length (22.36 cm), root : shoot ratio (1.04), seedling vigour index–I (2690.70 cm), seedling vigour index–II (351.28 g) and percentage of establishment in main field (100 %) when compared to other treatments. The interaction of different pre-sowing seed treatments and cultivar's combinations showed significant effect, green fruited seeds treated with KNO_3 @ 2 % recorded better result for above said parameters.

Key words: karonda cultivars, pre-sowing treatments, IBA, KNO_3, Thiourea

Fall army worm is one of emerging pest in Maize: Review article

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Abstract

Fall armyworm, *Spodoptera frugiperda*, is a lepidopteran pest that feeds in large numbers on the leaves, stems and reproductive parts of more than 350 plant species, causing major damage to economically important cultivated grasses such as maize, rice, sorghum, sugarcane and wheat but also other vegetable crops and cotton. Native to the Americas, it has been repeatedly intercepted at quarantine in Europe and was first reported from Africa in 2016 where it

caused significant damage to maize crops. In 2018, S. frugiperda was first reported from the Indian subcontinent. It has since invaded Bangladesh, Thailand, Myanmar, China and Sri Lanka). The ideal climatic conditions for fall armyworm present in many parts of Africa and Asia, and the abundance of suitable host plants suggests the pest can produce several generations in a single season, and is likely to lead to the pest becoming endemic.

Keywords: Fall army worm, Cultural control,Biopesticide, Larvae,Moth.

Evaluation of LA hybrids and Oriental lilies under protected and open conditions

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Abstract

An experiment was carried out to evaluate LA hybrids and Oriental lilies under protected and open conditions. The fresh bulbs of 9 cultivars (4 cultivars of LA hybrid *viz*. Salmon Classic, Bright Diamond, Red Alert, Pavia and 5 cultivars of Oriental lily *viz.* Mero Star, Medusa, Canberra, Rialto and Avocado) of *Lilium* were used as experimental material. The results showed that number of leaves, leaf area, plant height, total number of buds, bud diameter, total number of flowers, duration of flowering, vase life, weight of bulblets and diameter of bulblets found superior under protected condition in both LA hybrids and Oriental lilies, while days to visible bud formation and and weight of bulb recorded superior under open condition in both LA hybrids and Oriental lilies. Among the cultivars of LA hybrid, total number of buds, flower bud length, total number of flowers, diameter of flowers, weight of bulblets and diameter of bulb recorded maximum in Bright Diamond, whereas bud diameter, duration of flowering and weight of bulb registered maximum in Pavia. Among the cultivars of Oriental lily, number of buds and flowers, flower bud length and diameter recorded maximum in Rialto, whereas duration of flowering, weight and diameter of bulb and bulblets recorded maximum in Avocado.

Key words: *Lilium*, LA hybrid, Oriental, Protected, Open

Conjoint use of *Rhizobium* and PGPR biofertilizers in mungbean improved productivity and soil health in mungbean-wheat sequence

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Abstract

Biofertilizers have emerged as an important component in agriculture sector for their potential role in productivity and sustainability of soil. However, information on the contribution of biofertilizer application in legumes on residual effect in terms of productivity of succeeding crop

and soil health is scanty. A study was conducted for two consecutive years to examine the effect of biofertilizers (*Rhizobium* sp. and PGPR) inoculation in mungbean (*Vigna radiata* L.) on productivity and soil properties mungbean-wheat (*Triticum aestivum* L.) sequence during 2017-18 and 2018-19. Experimental soil was Sandy loam of pH 7.4 and EC 0.46 dS m^{-1} having 0.79% organic C and 228.3, 23.4 and 218.1 kg ha^{-1} available N, P and K, respectively. Treatments in mungbean (PM 5) comprising seed inoculation with *Rhizobium* sp. (MR-14), PGPR (*Bacillus cereus*, NE-10), *Rhizobium* sp.+ PGPR, RDF (20 kg N+40 kg P_2O_5 ha^{-1}) and uninoculated control were replicated thrice in main plots. The succeeding wheat crop (cv. PBW 550) was taken by superimposing the three N levels of 50, 75 and 100% levels of recommended N (120 kg ha^{-1}) in sub plots. Conjoint use of *Rhizobium* sp. and PGPR resulted in significant increases in nodulation and yield in mungbean during both the years. The combined inoculation in mungbean, regardless of N levels in wheat, further increased the wheat grain yield, by 9.1 and 10.2%, and straw yields, by 9.1 and 9.7%, over the uninoculated mungbean during 2017-18 and 2018-19, respectively. Combined inoculation of *Rhizobium* sp. and PGPR in mungbean also significantly increased soil available N, by 23.7%, soil available P, by 62.3% and soil available K, by 10.5% at harvest of wheat during 2017-18 over the uninoculated mungbean, respectively. Increasing levels of N significantly increased the wheat yield and soil properties at different intervals.

Key words: Biofertilizers, legumes, residual effect, yield, soil health, sustainability

Apitherapy-A Valuable Gift from Honey Bee

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Abstract

Apitherapy is the use of bee products such as honey, pollen, propolis, bee wax, royal jelly and venom to prevent or to treat illness and promote healing. Apitherapy dates back to 460 BC, where hippocrates utilized bee stings on his patients for the treatment of diseases. Its importance was highlighted with the publication of the First scientific paper by desjardins, a French physician on the successful treatment and curative properties of bee venom for rheumatic disease. filip terc, who treated many of his patients with bee venom was considered as the "Father of Apitherapy". Christopher kim, patented the first standardized and federal regulated injectable form of honey bee venom known as Apitoxin. Bee products have been used for treatment of varieties of ailments. Honey is used for wound management, pediatric care, gastrointestinal disorder, pharyngitis, cough etc. Pollen that results from agglutination of nectar or honey is widely used for burn wounds, allergies and cosmetics. Propolis a resinous product is used for gastrointestinal disorder and oncological treatment (Algerian propolis ethanolic extract

– melanoma tumor & Turkish propolis – Human lung cancer). Royal jelly a white and viscous jelly like substance is used for enhancing reproductive health and treating neurodegenerative disorders. Bee wax is effectively used as coating for its slow drug releasing function. Venom is used for treatment of parkinson's disease, neuralgia and even cancer. "APILARNIL" (Product From Seven - Day Old Drone Larval Comb Cell) and Bee Hive Air are also used for their beneficial effects on humans.

Keywords: Bee products – as medicines and cosmetics.

Effect of Integrated Nitrogen Management on yield and quality of Niger (*Guizotia abyssinica*)

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Abstract

A field experiment was conducted during *kharif* season of 2017 at Experiment Farm, Department of Agronomy, College of Agriculture, Latur, to study "Effect of Integrated Nitrogen Management on yield and quality of Niger (*Guizotia abyssinica*)". The experimental plot soil was clayey in texture, low in available nitrogen (135.31 kg ha^{-1}), medium in phosphorus (19.42 kg ha^{-1}), high in potassium (444 kg ha^{-1}) and slightly alkaline in reaction (pH 8.1). The experiment was laid out in a randomized block design with nine treatments and three replications. The treatments were T_1 - Control, T_2 – RDF (40:20:00 kg/ha NPK), T_3 – 75% N (Urea) + 25% N(FYM), T_4 – 75% N (Urea) + 25% N (Vermicompost), T_5 – 75% N (Urea) + 25% N (Cotton cake), T_6 – 75% N (Urea) + 25% N (Neem cake), T_7– 75% N (Urea) + 25% N (Karanj cake), T_8 – 75% N (Urea) + 25% N (Castor cake), T_9 – 75% N (Urea) + 25% N (Groundnut cake).The recommended cultural practices and plant protection measures were taken. The recommended dose of fertilizer (40:20:00NPK kg ha^{-1}) was considered and applied at the time of sowing through Urea and SSP. The results indicated that yield attributing characters of niger viz. total dry matter, seed yield per plant, number of filled and unfilled seed, number of mature and immature seed, weight of mature flower head, straw yield, biological yield, harvest index and test weight were appreciably improved with the different organic manures. Application of 75% N (Urea) + 25% N (Karanj cake) (T_7) to Niger crop recorded significantly higher values in growth and yield attributes. Application of 75% N (Urea) + 25% N (Karanj cake) (T_7) was found to be significantly effective in producing higher seed yield (278 kg ha^{-1}), oil yield (107.54 kg ha^{-1}), GMR (` 36140), NMR (` 11549), and B: C (1.47) ratio. which was closely followed by the application of 75% N (Urea) + 25% N (Vermicompost) (T_4).

"Fruits Harvesting Robot" a New Horizon in Smart Agriculture: A Review

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Abstract

The harvesting of fruits is laborious method and increases the cost of production so, the robotic harvester is one of the solution for it. The challenges in developing a fruit harvesting robot are recognizing the fruit in the foliage and detaching the fruit from the tree without damaging both the fruit and the tree. In large-scale greenhouse production, technological developments can reduce production costs; mechanization of crop maintenance and harvesting is one desirable way to accomplish this. Based on the sonar-camera sensor, an autonomous navigation system of the harvesting robot was built to move along the trough lines independently. The mature fruits were recognized according to the H (Hue) and S (Saturation) color feature and the picking-point were located by the binocular-vision unit. A nondestructive end-effector, used to suck the fruit, hold and cut the fruit-stem, was designed to prevent pericarp damage and disease infection. This paper deals with fruit recognition and it presents the development of a various techniques for the harvesting of Strawberry.

Effect chitosan and salicylic acid on defense induced physio-biochemical characteristics of mango malformation

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Abstract

Mangifera indica L. (2n=2x=40) is a world wild-grown tropical fruit crop belongs to family Anacardiaceae. The global production of mangoes (the report includes mangosteens and guavas) was 50.6 million tonnes. India is the largest producer with 39% (19.5 million tonnes) of the world total **(FAOSTAT, 2017)**. Mango malformation imposes a serious threat on the production of mango in India and other mango cultivating provinces of the world bringing in heavy economic losses. The etiology of mango malformation is not well understood. However, convincing evidence suggested that either *Fusarium* species particularly *Fusarium moniliforme* or low temperature-induced stress ethylene production is associated with mango malformation. Therefore, the study was conducted to identify the effect of a foliar application of chitosan and salicylic acid on 7-year-old mango trees of Amrapali and Dashehari. Foliar application of eight treatments at different concentrations of chitosan (CT) and salicylic (SA) acid was treated at three unlike stages i.e. panicle emergence, pre-bloom and full blooming along with three replications. The results showed that the various defence induced physio-biochemical characteristics such as total chlorophyll content, chlorophyll fluorescence, total proline content, total phenol and antioxidant enzymes such as guaiacol peroxidase and superoxide dismutase increases significantly in comparison to control. In both, the cultivars moderately resistant Dashehari showed higher resistance than moderately susceptible Amrapali. Chitosan 0.50 % and

0.40 % SA in both varieties, help in inducing defense response by increase chlorophyll content, osmolyte accumulation, lipid peroxidation and scavenging reactive oxygen species and enhancing resistance and pave the way to minimize the deleterious effects of mango malformation.

Key words: Chitosan, Salicylic acid, Mango malformation, Chlorophyll fluorescence, Defense and Resistance.

Comparative bio-evaluation and protein phenolic interaction of bark of *Prosopis cineraria* (L.) Druce

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Plants play a vital role in the field of pharmaceutics. *Prosopis*species have been a valuable source of fuel, timber, wood, shelter, medicines and food for peoples and animals. Methanolic extract of bar*k of Prosopis cineraria* showed total phenolic content maximum in methanol fraction i.e. 842.71±1.43 mgGAEg^{-1} of dry extract while total flavonoids content maximum in acetone fraction i.e. 371.28±0.99 mg CEg^{-1} of dry extract. Comparative analysis of various fractions of bark extract showed that nutritional value of nitrogen in methanol fraction is maximum i.e. 2700±0.06 mg/100g and minimum in copper of hexane fraction i.e. 00.10±0.01 mg/100g. Mineral content of various fractions of bark of *Prosopis cineraria* revealed in order of Nitrogen > Phosphorous > Potassium > Iron > Zinc > Manganese > Copper. The obtained fractions and methanolic extract were then evaluated for phenolic interaction with protein and it was found that maximum protein binding efficiency was shown by ethyl acetate i.e. 4.8±0.04% at 10µg/µl concentration, followed by minimum in chloroform fraction i.e. 2.44±0.05% at 10µg/µl activity concentrations.

Keywords: *Prosopis cineraria*, total phenolic, total flavonoids, mineral contents, phenolic interaction, concentraction.

Impact of Withania somnifera (Ashwagandha) as an exogenous growth promoter in the diet of fingerlings of Labeo rohita in Tarai region

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Abstract

The present investigation was conducted to assess the effect of different doses of Ashwagandha supplemented feed in Labeo rohita on growth rate, feed conversion ratio, condition factor, protein efficiency ratio and gross protein retention. Experiment comprised of 3 treatments viz. Diet containing Ashwagandha @1%, 3% and control diet with no supplementation. Results revealed that diet containing 3% Ashwagandha resulted in better FCR, growth rate, condition factor and higher protein retention. The results obtained with this diet were superior to other treatments and significantly different (P<0.05), however the diet containing 1% Ashwagandha also yielded better results than the control diet but not as good as diet containing 3% Ashwagandha. All the physicochemical parameters were within the optimum range as desired for fish culture practices. Any kind of adverse effects due to Ashwagandha on the water quality parameters, behavioral and feeding response of fish were not encountered during the period of investigation.

Keywords: Ashwagandha, Labeo rohita, Growth rate

Spray dried carotenoid and omega-3 rich emulsion from carrot pomace

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Abstract

Carrot is one of the popular root vegetables having rich source of dietary carotenoids. During commercial juice processing, 30–50% of carrot remains as pomace and up to 50% of the carotene is lost with this pomace. Carotenoids have been linked with the enhancement of immune system and decreased risk of degenerative diseases such as cancer, cardiovascular disease, age related mascular degeneration and cataract formation. The carotenoid present in carrot is bounded by proteins and cellulosic material so decreases the bio-accessibility, thus extracting these carotenoids using green bio-refinery technology increases its bioavailability by facilitating easier micellization of carotenoids with oil. Therefore, in the present work, the carotenoids were extracted in vegetable oil from carrot pomace followed by preparation of emulsion of these using natural ingredients, including milk protein. The emulsion prepared was spray dried (185/85 ±5°C). The percent fat, protein, moisture and ash contents of carotenoid rich powder were 65.59±0.45%, 18.02±0.12%, 4.72±0.24 %, 0.3242 ± 0.001%, respectively. Further, the developed powder contained 54.598g alpha linolenic acid/100g of total fats and 41 µg total carotenoid content/ g of sample. The developed powder holds tremendous potential to be used as a source of both omega-3 fatty acid and carotenoid (also as natural colourant) in products like dahi, yoghurt, frozen desserts, etc.

Multi storied cropping system in horticulture - an approach for more crops per unit area of land

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Abstract

Monoculture is exceptional, while mixture of species is the rule of nature. Intensive horticultural systems are often based on optimizing the productivity of monoculture. In these system, crop diversity is reduced to one or few species that are generally genetically homogeneous, the planting layout is uniform and symmetrical, external inputs are often supplied in large quantities and monoculture system are widely criticized today for their negative environment impacts. In multi storied cropping system two or more crops of different heights are grown simultaneously on a piece of land in a certain period. A multi storey cropping system accommodates crops of different heights, canopy patterns and root system to maximize use of sunlight, nutrient, sustainable land use and maintain an ecological balance. In this system of cropping, the possibility of more efficient use of resources like sunlight, water, soil and nutrient is leading to increased biological diversity, more crops per unit area and sustainability of production.

Keywords: Multi storey cropping, canopy pattern, ecological balance and biodiversity

Different approaches for Heat Stress Tolerance in Bread Wheat (*Triticum aestivum* L.)

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Abstract

Climate change may cause hindrance in progress toward a vision of world without hunger. The most remarkable driver of climate change affecting agriculture is the increase of global temperature. Significant influence of increased global temperature on agricultural productivity along with other consequences related to severity of drought. Exposure to higher temperature results in reduced yield and production of cereals. Wheat is a major food crop that is likely to be impacted by climate change. In wheat, every degree Celsius rise from a seasonal mean minimum crop temperature of 15^0C has been found to cost yield losses of up to 5%; although this threshold may vary based on other environmental factors, genotypes, and the developmental stage of the plant. In wheat all the growth stages are sensitive to high temperatures, while the reproductive phase is the most sensitive one as it affects both grain setting and grain filling. High temperature can alter physiological, biochemical, and morphological behaviour in bread wheat, which affects its growth and development causing a reduction in pollen viability, duration of grain filling, and starch synthesis in the grains. At flowering, temperature above optimum results in seed sterility, while post-anthesis heat stress (HS) causes a reduction in starch biosynthesis and alters its composition. Wheat crop has evolved appropriate mechanisms such as escape, avoidance, and/or stay green to cope with heat stress. In addition, plants hasten the production of HS-related

proteins such as heat shock proteins (HSPs) as their defence approach. An overview of wheat responses and tolerance to heat stress (HS) at physiological, biochemical, and morphological behaviour may help in formulating appropriate breeding strategies for wheat crop improvement.
Keywords- climate, temperature, heat-stress and grain filling.

Action of insecticides on the architecture of ovaries in curbing the incidence of myiasis inflicted by *Chrysomya megacephala*

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Abstract

Chrysomya megacephala commonly known as Oriental blow fly, classified under the important family Calliphoridae. It is a synanthropic fly which lives in the vicinity of humans and its habitat and thus transmits various diseases. It is of forensic significance as it is the foremost species to inhabit the corpse and thus assists in determining the post mortem interval (PMI) and is also medically important as it is the source of accidental myiasis. Present work has been focussed on the analysis and correlation of the ultrastructural changes in the morphology of the ovaries with that of the histopathological changes in *C. megacephala* treated with the sub lethal doses of the insecticides i.e. Chlorpyrifos (0.0008%, 0.002%, 0.008%) and Imidacloprid (0.002%, 0.004%, 0.02%) belonging to the groups Organophosphates and Neonicotinoids respectively. Remarkable contrariety changes were envisaged on treatment with these insecticides. The prominent characters of an ovary i.e. the well-developed epithelium and the smooth surface of an untreated ovary were totally distorted and gave an altogether a new architecture imparting distinct morphological characters i.e. the cuticular folding, disrupted and ruptured epithelium, shrinkage in overall structure and ruffled membrane which were further compared with the histopathology of the ovary depicting thinning in epithelium, vacuolar formation, necrosis of cells and disintegration of the yolk, these discernible characters till date has not been reported in the context of application of insecticides on the ovaries of *C. megacephala*.
Keywords: *Chrysomya megacephala*, Chlorpyrifos, Imidacloprid, Myiasis, Ovariole, Scanning Electron Microscopy, Histopathology, Necrosis, Shrinkage

Mitochondrial DNA as A Phylogenetic Tool in Tracing Evolutionary History in Pentatomid Bugs

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Mitochondria possess their own DNA molecules, which is much shorter than the nuclear DNA. Cells from the thorax region contain ample copies of the mtDNA molecule, which makes its extraction easier in comparison to nuclear DNA. Mitochondrial DNA particularly is fascinating to study, as unlike nuclear DNA, mtDNA is inherited only from the mother. The mutational changes are mostly preserved and carried on to succeeding generations along any particular line of descent. Mitochondrial DNA accumulates mutations at a constant rate. The mutations in the mitochondrial DNA act as the molecular clock that equip us to estimate, the time elapsed since

the earlier ancestors lived. Changing environment brings about mutations leading to new variations. Some of these variants will survive emerging into new species, specifically adapted to new niches and be identified as distinct lineages. At the same time few species end up, when the last family in a distinct branch has no daughters. This plays a key role in establishing the phylogeny of these organisms. Pentatomid bugs are important biological environmental cleaners, thus they act as the perfect group under study as tracing their phylogeny may present clear image of the changing environment of North India. Good extraction results were found from thorax region in comparison to leg and other parts.