Souvenir is also available on www.aedsi.org

9th International Conference
On
Current Approaches in Agricultural, Biological & Applied Sciences for Sustainable Development (CAABASSD-2024)

Venue:

Kumaun University, Nainital, Uttarakhand, India

March 01-03, 2024

Souvenir

Organized by

Faculty of Agriculture & Agroforestry
Kumaun University, Nainital
Uttarakhand, India
(www.kunainital.ac.in)

AEDS

Agro Environmental Development Society (AEDS)
Majhra Ghat, Rampur, U.P., India
(www.aedsi.org)

Editors

Jeet Ram
Chhatarpal Singh
Sanjay Kumar Jha
Md. Nadeem Akhtar

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Editors

Prof. Jeet Ram
Dean, Faculty of Agriculture & Agroforestry, Kumaun University, Nainital, UK, India

Dr. Chhatarpal Singh
President, AEDS, Rampur, U.P., India

Dr. Sanjay Kumar Jha
Associate Professor, Central Dept. of Botany, Tribhuvan University, Kathmandu, Nepal

Md. Nadeem Akhtar
Scientist, BAU, Sabour, Bhagalpur, Bihar, India

कुमाऊँ विश्वविद्यालय नैनीताल

स्लीपी हॉलो, नैनीताल–263001, उत्तराखण्ड, भारत

Kumaun University, Nainital

Sleepy Hollow, Nainital-263001, Uttarakhand, India
(Accredited "A" Grade by NAAC)

प्रो० दीवान एस. रावत
एफ एन ए एससी, एफ आर एस सी, सी केम (लन्दन)
कुलपति

Prof. Diwan S. Rawat
FNASc, FRSC, CChem (London)
Vice-Chancellor

Message

It gives me great pleasure to learn that the faculty of Agriculture and Agroforestry, Department of Forestry, Kumaun University Nainital and Agro Environmental Development Society (AEDS) are organizing 9th international conference on "*Current approaches in Agricultural, Biological and Applied Sciences for Sustainable Development* (CAABASSD-2024)" on March 1-3, 2024. The present conference provides a ground to discuss the current issues and advances in the areas of agriculture, biological and applied science to promote the sustainable development of our society. This international conference will be a best amalgamation of eminent scientist, researchers, scholars and students to share the latest research and technologies in the relevant field to promote the sustainable development.

It is my aspiration that this conference will be a foundation for the growth of new ideas towards a better tomorrow

Prof. Diwan S. Rawat
Vice Chancellor

दूरभाष (कार्यालय) 05942–235068, मो. 9411101144, 9810232301 फैक्स (कार्यालय) 05942–235576
E-mail : vc@kunainital.ac.in

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कृषि भवन, नई दिल्ली

सत्यमेव जयते

Government of India
Ministry of Agriculture and Farmers Welfare
Department of Agriculture and Farmers Welfare
Krishi Bhavan, New Delhi

Dr. Sudhir Singh Bhadauria
Deputy Commissioner
(Crops)

Message

It is a matter of great pleasure that Faculty of Agriculture & Agroforestry, Kumaun University, Nainital, Uttarakhand & Agro Environmental Development Society (AEDS) Rampur, U.P., at Kumaun University, Nainital, Uttarakhand, Indiaare going to organize **9th International Conference on Current Approaches in Agricultural, Biological & Applied Sciences for Sustainable Development(CAABASSD-2024)** at Kumaun University, Nainital, Uttarakhand, India from March 01-03, 2024. The quest for knowledge has been from beginning of time but inherent knowledge provides the valuable inputs which disseminated to the different beneficiary. It is hoped that CAABASSD-2024will provide the platform to collect and disseminate the latest knowledge in recent emerging areas of agriculture. Through this platform, researcher will able to discuss and share the new findings which may applicable practically and encouraging entrepreneurship in the agriculture and allied sectors. It is also expected that they will understand the current scenario of the market and able to face challenges raising at the different level of business. New start-ups have great potential to succeed either in term of contributing in GDP and generating the employment. Agri-entrepreneurs are able to grab the opportunities due to conductive environment provided by the Government through various schemes.

I convey my best wishesfor the successful completion of this international conference and I wish the participants and organising committee all the best and hope the event concludes with grand success.

(Dr. Sudhir Singh Bhadauria)

KUMAUN UNIVERSITY

Faculty of Agriculture and Agroforestry

Professor Jeet Ram
Dean

D.S.B. Campus
Krishnapur, Nainital-263001
Mob. : 9411184571
E-mail : agridsb@gmail.com
jeetram2001@yahoo.com

Message

It is really heartening to learn that Faculty of Agriculture and Agroforestry, Department of Forestry, Kumaun University, Nainital and AEDS Uttar Pradesh are organizing 3 days International conference on **"Current approaches in agricultural, Biological and Applied Sciences for Sustainable Development (CAABASSD-2024)"** from March 1-3, 2024 and a souvenir is also being brought out.

Agriculture is a comprehensive science with research that covers a wide range of field. Some of the research is conducted in scientific areas, such as studies on restoring natural environments; analyzing the behaviour of wild animals; conservation and usage of forests; the scientific aspects involved with housing and shelter; usage of water resources; soil sciences; the development of medicinal resources; sciences concerned with the security and safety of food; techniques for processing and preserving food products; research on the functionality of food items; and putting microorganisms to use in foods and the envoronment. In recent yeas, the fields of agriculture is becoming highly specialized and also equip the researchers with the basic knowledge of agriculture and foster within them a global perspective that enables them to flourish in any environment.

I am sure that it will be a very interactive and high quality where a considerable number of delagates including senior academicians, experts and subject specialists from state, other parts of the country as well as international level are expected to participate. The Scientists, Students and Researchers of our state also need to take advantage of this conference and policies so to create, share and use knowledge for inclusive sustainable development.

I do hope that the deliberations in the conference will be fruitful and wish for the grand success of the event.

Date : 21/02/2024

Prof. Jeet Ram
(Dean)

एग्रो एनवायर्नमेंट्ल डेवलपमेंट सोसाइटी (ए.ई.डी.एस.)
Agro Environmental Development Society (AEDS)
Majhra Ghat, Rampur-244922, Uttar Pradesh, India
(Registered under the Society Registration Act XXI, 1860)
(Registered Under the Niti Aayog, Reg. No: UP/2020/0263654)

डॉ. छत्रपाल सिंह
Dr. Chhatarpal Singh
President, AEDS
Organizing Secretary, CAABASSD-2024

Phone: 91-6394082801
E-Mail: cpsingh.2012@gmail.com
Website : www.aedsi.org

Message

As organizing secretary, I warmly welcome to all the dignitaries, delegates and participants in the 9th International Conference on **"Current Approaches in Agricultural, Biological & Applied Sciences for Sustainable Development (CAABASSD-2024)"**. The conference is going to be organized byFaculty of Agriculture & Agroforestry, Kumaun University, Nainital, Uttarakhand&Agro Environmental Development Society (AEDS) Rampur, U.P., atKumaun University, Nainital, Uttarakhand, India, from March 01-03, 2024.The AEDSis continuously working in the agriculture field and organizing various training/international conference to keep the students, researchers and scientists encourage. The main focus of the society and conference is how to overcome the problems that are arising for the sustainable development and how to increasesentrepreneurship with the low expenditure in agriculture and allied sectors. I am very much thankful to our Chief Patron, Prof. Diwan Singh Rawat, Hon'ble Vice Chancellor, Kumaun University, Nainital, UK.Organizing Chairman,Prof. Jeet Ram, Dean, Faculty of Agriculture & Agroforestry, Kumaun University, Nainital, UK for conducting this conference in joint collaboration. I am also thankful to all the respective committee members of this conference for their valuable support and guidance during this conference.

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, animal husbandry, fisheries and allied fields for the grand success of this conference.

(Dr. Chhatarpal Singh)

Central Department of Botany
TRIBHUVAN UNIVERSITY
Kritipur, Kathmandu, Nepal

Dr. Sanjay Kumar Jha, PhD
Associate Professor
Head of International Advisory Committee, (CAABASSD-2024)
Email:sanjay.jha@cdbtu.edu.np
Website:*www.cdbtu.edu.np*
Mobile: +977-9843051710

Message

It is immense pleasure that "Agro Environmental Development Society (AEDS)" is going to organize 9th International Conference on **"Current Approaches in Agricultural, Biological & Applied Sciences for Sustainable Development (CAABASSD-2024)"** at Kumaun University, Nainital, Uttarakhand, India during March 1-3, 2024 in collaboration with Faculty of Agriculture & Agroforestry, Kumaun University, Nainital, Uttarakhand, India. I warmly welcome to all the delegates at Nainital, Uttarakhand,a rich treasure of biodiversity with different natural resources. The state has spiritual harmony with beautiful temples.

This typesof seminar and symposia are an important platform which helps in harnessing the research and communication skills of scientists, researchers, students and farmers. Such scientific gathering is the important part of knowledge shearing among the scientists. The topic of conference is very relevant because multi-disciplinary interactions are more useful to take a holistic view of a problem. After industrialization, Environment and climate changing has been the main causality, thus forcing all the countries to build a consensus to combat the same.

I am pleased to welcome all the delegates and participants in the 9th international conference and I wish all the members of organizing committee for their great efforts and suggestion to make this conference a grand success.

Sanjay

(Dr. Sanjay Kumar Jha)

CONTENTS

Button Mushroom cultivation in Biodegradation of Water Hyacinth compost with Lignocellulolytic Fungi

***Sanjay Kumar Jha and Anita Kharbuja**
Central Department of Botany Tribhuvan University, Kirtipur, Kathmandu, Nepal

Corresponding author email: sk.jha@cdbtu.edu.np

Abstract

Agaricus bisporus, an edible mushroom and cultivated in lignocellulolytic materials. Water hyacinth isworst weed lignocellulolytic material which rich in cellulose and lignin. The objective of this study wasto cultivate button mushroom from degradation of water hyacinth compost with lignocellulolytic fungi.The experiment was performed in triplicate of five different samples i.e. control, before fungal treatedcompost, three fungal treated compost and straw compost during button mushroom cultivation. The datawas analyzed on various aspects like completion of mycelium in different media, cereals grain, andduring cultivation spawn run, appearance of pinheads, fruit bodies and number of fruit bodies.Ganoderma sp. (1.29±0cm/day) and Pleurotus sp. (1.29±0cm/day) was fastest grown in water hyacinththan PDA media. Lentinus sp. was slowest grown in PDA and water hyacinth media. The growth rate ofmycelium in wheat seed (2.69±0.12 mm/day) was faster than corn seed (2.22±0.14 mm per day) duringspawn preparation. During composting preparation, the lignocellulolytic fungi was treated for 45 daysafter 30 days of composting of substrate. The nutrient analysis was done between fungal strain treatedcompost, straw and control sample compost. The percentage of carbon was present high in paddy straw(2.17±0.65%), and low in control sample compost (0.9±0%). In nitrogen content, high percent was foundin Lentinus sp. treated compost (2.08±0.01%), low in paddy straw compost (0.4 ±0.6%). In phosphoruscontent, high percentage found in before fungal treated compost (0.43±0.03%), low in paddy straw(0.09±0.6%). In potassium content, high in Lentinus sp. treated compost (1.88±0.08%), low in strawcompost (0.5±0.6%). During the cultivation, paddy straw compost took short duration for fruiting which gave high production (11.35%) and Lentinus sp. treated compost took long duration and gave low production (5.73). Significant production was obtained in control compost as compared to paddy strawcompost and fungal treated compost. Water hyacinth is the alternative substrate for mushroomproduction instead of paddy straw. This study has successfully demonstrated the possibility of waterhyacinth as substrate in mushroom production and management of water hyacinth.

Keywords: *Agaricus bisporus, Water hyacinth, mycelium growth, total N, P, K, Production.*

Plant doctors in the Hungarian and Nepalese plant health and plant protection systems

Gabor Tarcali
University of Debrecen, Faculty of Agricultural and Food Sciences and Environmental Management, Institute of Plant Protection, Debrecen, Hungary
Hungarian Chamber of Professionals and Doctors of Plant Protection, Budapest, Hungary
Corresponding author e-mail:tarcali@agr.unideb.hu

Abstract

The plant doctor as a profession is as old as agricultural production, but its name is new and may still be

unusual for many people. However, it is at the same root as the professions of human doctors and veterinarians. The practitioners of all three professions deal with living organisms, prevent, diagnose and cure diseases, and damages. The plant doctor protects plant health, is responsible for food safety, thereby protecting human health, and does so in a way that respects the environment and nature.

In Hungary, higher education of agricultural specialists has a history of more than two hundred years. Higher education of plant protection specialists (plant protection engineers) has been going on since 1960.In 2007, the higher education in Plant Doctor MSc has started at 4 Hungarian universities.Act XLVI of 2008 on the Food Chain and its Official Supervision (the act of plant protection in Hungary) codified the name of the profession as plant doctor.In 2011, the statistical number ofplant doctorswas officially introduced in Hungary, third next to human doctors and veterinariansin the State Register of Occupations.Soil andagricultural products originating from soil are of extremely great value. Food safety of the agricultural products that get to the markets and people's tables as well as plant health are extremely important. In Hungary, the motto of the plant doctorate profession is: "Safe food to the table from the farm to the fork". In order to achieve this, very strict legislation defines the framework for plant protection work. In Hungary, end-users are only entitled to purchase plant production products with marketing category I if they have a prescription. It is a very special official document. Only plant doctors who are members of the Plant Protection Chamber are entitled to issue and sign plant protection prescriptions. This is very important, and it helps the expert use of plant production products with category I. A written contract between the plant doctor and the end-user of the plant protection product is also obligatory to issueplant protection prescriptions. By issuing the prescription, the plant doctor gives the farmer the right to buy the plant protection product with category I, but professional management of the application of the pesticide is also a very strict obligation of the plant doctor and he is also responsible for this work process.The application of IPM is very important and mandatory in agricultural production in Hungary.Hungarian plant doctors are responsible for the plant health safety of domestic plant production and for the production of safe food for markets, guaranteeing a plant product free of residues of active substances harmful to human health. All this is done in accordance with today's requirements, maximally ensuring the principles of Integrated Pest Management (IPM), striving to ensure that chemical pesticides that pose a potentially high risk to consumers and have the potential to cause very serious damage to our environment and living nature are used only at the minimum level necessary.

In Hungary, we are the first in the world to introduce plant doctor private practice in plant protection, the university level education of plant doctor (MSc), and the plant protection prescription.The Hungarian plant protection system is unique in the world, and there are only a few countries in the world where there are similar innovative solutions. One of these countries is Nepal, the beautiful Himalayan country. In Nepal, agriculture is also a strategic sector of the liveability and competitiveness of rural life. Nepal's agriculture is developing. A novel approach of agricultural extension services in Nepal is the plant clinic. The plant clinic approach of the agriculture extension system conceived by CABI started in Nepal in 2008, followed by a formal engagement in 2013 between CABI and the Government of Nepal. The plant clinics play an important role in supporting farmers in growing healthy crops and achieving higher productivity in Nepal. In Nepal, the operators of the plant clinic system are also called plant doctors. They are primarily agricultural technicians with plant protection expertise, as well as IPM farmer facilitators and community business facilitators after attending an intensive plant doctor's training.

Currently, the national plant protection program in Nepal incorporates plant clinics as part of its accepted approaches. However, plant clinic services and Nepal's plant health system should be strengthened. At the same time, the path that Nepal has embarked on in plant health is exemplary and should be followed.Following the Hungarian example, higher education in plant medicine may one day be introduced in Nepal, which could be a major step in the development of the plant health system and can be exemplary in this geographical region. The author of this work was the national president of the Hungarian Plant Protection Chamber between 2013 and 2021, which, in addition to the government, is an important organizer and responsible for the plant protection and plant health system in Hungary. The joint analysis of the Hungarian and Nepalese plant protection systems is part of a recent TÉT project: 2019-2.1.11-TÉT-2020-00201.This report is an overview of the unique practice of the Hungarian plant protection system in the world and the possibilities of extending it to other countries. Let us never forget what our great ancient Greek physician, Hippocrates (c. 460-377 BC) said: "Let your food be your first remedy."

Keywords : *plant protection system, plant doctor, plant protection prescription, healthy food, Hungary, Nepal*

Control options against the fungus Cryphonectria parasitica causing chestnut bark canker, focusing on biological control by using hypovirulent strains of the pathogen

László Radócz*and Gábor Tarcali

University of Debrecen, Faculty of Agricultural and Food Sciences and Environmental Management, Instituteof Plant Protection, Böszörményi street 138, H- 4032 Debrecen, Hungary

Corresponding author e-mail:radocz@agr.unideb.hu

Abstract

Sweet chestnut or European chestnut (Castanea sativa) is a very important tree species in Europe and also in the north-west part of India.The most important disease of this tree species isthe chestnut blight caused by the fungus Cryphonectria parasitica (Murrill) Barr.The pathogen is also able to infect other tree species from Fagaceaeplant family (e.g. beech, oak species). The fungus originates from Eastern Asia. In Europe, the pathogen was first discoveredon sweet chestnut stands in Italy, in 1938.Later, almost all chestnut-growing areas of Europe were affected by the pathogen, including Central-European countries. The presence of the pathogen was identified first in Hungary in 1969.Then, the fungus caused very serious damage to chestnut plantations in Hungary as well.The infection of the fungus was also observed in some places in Hungary on oaks (mostly on Quercus petraea), however, the extent of the infection was not so severe and usually did not cause fatal destruction.

Protection against the fungus is very difficult. Chemical control is difficult to implement. Theoretically, there are some effective fungicide active ingredients that can control the fungus under in vitro conditions, but this is not feasible in nature, in forest stands due to the large size of trees.There have been attempts to use resistant hybrids(Castanea sativa x C. crenata), but even this has not been able to give adequate results in Europe.There are ongoing biological experiments with antagonist microorganisms (e.g. Trichoderma spp.) and biopreparations (e.g. essential oils), but these technologies have not yet been

developed.The only effective control method on a large scale in Europe so far is the biological control with hypovirulent fungal strains. This is a special fungal strainwith reduced virulence caused by a mycovirus encoded in the RNA of their cytoplasm. In 1959, a "transmissible disease" was discovered which was caused by the dsRNA in the cytoplasm of the mycelium of Helminthosporium victoriae fungus. This virus-like particle (VLP) causes significant changes in the virulence of the fungus, and in vitro, abnormal morphological fungal bodies are being formed.This RNA is transmitted by hyphanastomosis, but only if the virulent and hypovirulent fungi belong to the same Vegetative Compatibility Group (VCG).The discovery of mycoviruses and their subsequent studies opened up a new field of experimental mycology. These mycoviruses have often been used in biological plant protection as an effective control against their host fungus. The recognition of the characteristics of these mycoviruses containing dsRNA resulted in the creation of the Hypoviridae family, and Cryphonectria hypovirus (CHV) is one of this mycovirus group.

In 1964, abnormal morphological fungi were isolated from cankers caused by C. parasitica on European chestnut. It was a reduced sporulated, less pigmented white strain. Its infection capacity was significantly lower than the infection capacity of the other fungal strains. The name of this phenomenon is hypovirulence. Hypovirulent strains of C. parasitica have spread in the Southern European region. Once the pathogen has appeared in an area, its hypovirulent strains will also appear naturally. However, that will happen only after a long time. The artificial spreading of hypovirulent fungal strains can be used for biological control actions.

In Hungary, we have been researching the topic for several decades with the research group of the Plant Protection Institute, University of Debrecen. We assessed the prevalence of the disease in the country and identified its prevalent VCGs. We have developed and established the practical biological control of C. parasiticausing hypovirulent fungal strains. This method was applied on many occasions on sweet chestnuts in Hungary, Slovakia, and, based on recent results, also in Romania as a successful biological control against the pathogen.

Keywords: *sweet chestnut, Cryphonectria parasitica, biological control, mycovirus, hipovirulent strain*

Influence of broodstock nutrition on the reproductive outputs of endangered golden mahseer, Tor putitora

A. Ciji*, M.S. Akhtar., B.S. Kamalam., M. Rajesh, P. Sharma

ICAR-Directorate of Coldwater Fisheries Research, Anusandhan Bhawan, Bhimtal-263136, Uttarakhand, India

****Corresponding author: cijialex83@gmail.com; ciji.alexander@icar.gov.in***

Abstract

Endangered golden mahseer, a flagship species in Indian coldwater fisheries, needs rehabilitation and conservation measures for its sustainability. For this, mass-scale seed production using captive broodstock is imperative. However, the breeding performance and hatchery output of captive-raised brooders were relatively lower. It is well known that broodstock nutrition is crucial for ensuring successful reproduction and healthy offspring production in fish. In this milieu, a mahseer brooder feed has developed and

validated for captive maturation and higher reproductive performance through repeated trials over a period of three years. The said brooder feed facilitates year-round multiple breeding of golden mahseer with a higher spawning response, fecundity (by 10 -15%), fertilization (by 12 -18%) and hatching (by 4-5%) rates. The immunity of brooders was also enhanced. The broodstock diet improved egg quality (egg size 2.54 Vs 2.73 mm, carotenoid content, etc.), sperm quality and quantity (spermatocrit and sperm count by 5 -10% and sperm viability by 10%) while reducing abnormalities in the sperm by 3%. Further, significantly higher growth (by 20-22%), survival (7- 10%) and fitness were noticed in offspring/ fry obtained from brooders fed on the broodstock diet. The brooder feed enables the production of robust and healthy mahseer stocking material (seed) for replenishing its population in the natural water bodies through ranching and rehabilitation/conservation.

Keywords: *Broodstock nutrition; gamete quality, reproduction; fertilization, survival; mahseer*

Estimation of Variability in Major Pulses of Rajasthan

A V. Mhaskey[1], G. L. Meena[2], L. Sharma[3], H. Singh[4], B. Upadhyay[5], L. N. Mahawer[6] and D. Jain[7]
Rajasthan College of Agriculture, MPUAT, Udaipur, Rajasthan
[1]Ph.D. Research Scholar, Department of Agricultural Economics and Management, [2]Associate Professor,Department of Agricultural Economics and Management, [3]Associate Professor & Head, Department of Agricultural Economics and Management, [4]Associate Professor, Department of Agricultural Economics and Management, [5]Professor, Department of Statistics, 6Professor, Department of Horticulture,7Assistant Professor,Department of Molecular Biology & Biotechnology
Corresponding Author's Email: akashmhaskey@gmail.com

Abstract

In this research, the focus was on examining the instability in the production of gram and green gram in Rajasthan, India, from 2000-01 to 2021-22, spanning a period of 22 years. To analyze the historical data,Coppock's Instability Index was utilized to evaluate the fluctuations in the cultivation area, overall production, and yield of these major pulse crops.The results of the study indicated that there was a higher degree of variability in the production of gram and green gram throughout the entire period when compared to Period-I and Period-II. Specifically, for gram, the CII values ranged from 49.56% to 54.38% for the cultivation area, 54.83% to 65.97% for overall production, and 42.66% to 48.28% for yield. On the other hand, for green gram, the CII values ranged from 47.93% to 62.44% for the cultivation area, 64.59% to 106.02% for production, and 44.74% to 86.11% for yield. These findings highlighted the significant variation experienced in the production of both the gram and green gram over the studied period.The research underlined the significance of adopting improved risk management strategies, encouraging diversification, investing in research and technology, and enhancing infrastructure to establish sustainable agricultural practices to minimize the impacts of variability. By implementing these measures, farmers can better prepare themselves to tackle the challenges posed by instability in gram and green gram production and work towards a more resilient agricultural sector.The research also emphasized the importance of addressing variability in agricultural production to safeguard food security and promote sustainable development in Rajasthan. The research delves into key policy implications and proposed strategies to enhance pulse production and strengthen agricultural resilience.

By focusing on these aspects, the government can strive towards a more stable and sustainable agricultural sector that can meet the growing demands for food while ensuring the long-term well-being of the community.

Keywords: *Variability, Gram, Green gram, Coppock's Instability Index and sustainability.*

Greater Wax Moth (*Galleria mellonella*) and its potential use as a Bio-agent for Plastic Degradation

Aarzoo Gupta[1]*, Arvind Kumar[2]

[1]Forest Research Institute, deemed to be University, PO. I.P.E. 248195, Dehradun, Uttarakhand, India.

[2]Forest Entomology Discipline, Forest Protection Division, Forest Research Institute, PO-New Forest, Dehradun 248006, India.

Corresponding Author's E-Mail: Aarzoogupta20018901@Gmail.Com

Abstract

With the invention of cheaper and efficient material, to solve the issues of mankind, we have come a long way and lead to the overproduction and accumulation of plastic waste.Recycling the waste is an effective way, but not a far reached feat, as only 5% of the total plastic waste is being recycled. So, the development of sustainable ways to degrade the plastic waste is indeed required. One such way is biodegradation of waste. Recent research has revealed an amazing ability of greater wax moth, Galleria mellonella larvae in effective degradation of plastic. Galleria mellonella is well known insect pest of the beehives. The larvae of greater wax moth (Gm) have the ability to dissolve the long chain aliphatic carbon chain present in the plastics, as they are in the beeswax, which is the natural diet for them. Certain enzymes in the saliva of Gm helps in oxidizing the plastics and facilitate in ingestion, and further the gut biome of the insect helps in digestion. Studies have shown that insect can complete its complete life cycle feeding on these plastics. Therefore, the foregone review discusses the biology and distribution of Galleria mellonella. It also focusses aboutvarious diets natural/artificial, plastic as a diet source, and rate and mechanism of biodegradation of plastics by Galleria mellonella. This study will help in understanding full potential of Galleria mellonella for its use as a bio- agent in the degradation of plastic wastes.

Keywords: *Biodegradation, Waste management, Sustainable development, Landfill, Pollution Management*

Dharti-ka-Doctor (DKD): Rapid and affordable soil testing solutions for assessing soil nutrient profile for sustainable agriculture.

Acharya Balkrishna[1,2], Kushi Yadav[1], Brijesh Kumar[1], Vedpriya Arya[1,2,3]*

[1]Patanjali Herbal Research Department, Patanjali Research Institute, Haridwar 249405, Uttarakhand, India

[2]University of Patanjali, Haridwar 249405, Uttarakhand, INDIA

[3]Centre of Excellence, Patanjali Ayurved Hospital, Haridwar 249405, Uttarakhand, INDIA

Corresponding author: vedpriya.arya@patanjali.res.in

Abstract

The persistent and excessive application of chemical fertilizers and pesticides has been identified as a significant factor contributing to the degradation of soil quality. Moreover, accumulating specific chemical components inherent in fertilizers can exacerbate soil salinity, diminishing its fertility and suitability for sustaining optimal plant growth. Soil testing is crucial for optimal plant growth, but conventional lab testing is costly and time-consuming. In response to these challenges, the Patanjali Organic Research Institute has developed a pragmatic solution in the form of the "Dharti ka Doctor" (DKD) kit, designed to swiftly assess five major soil parameters on-site, alongside a semi-automated DKD machine capable of analysing twelve parameters. This innovative solution not only addresses the practical constraints associated with conventional soil testing methodologies but also ensures affordability and accessibility for farmers. Furthermore, to augment the accuracy of soil sampling, GPS-enabled device enables precise identification of sample sites. The collected soil samples are then encapsulated within bar-coded pouches, denoted as "Mrida Sangrah Thalley" (Soil Collection Bags), ensuring proper sample identification and traceability. The DKD kits and machines seamlessly integrate with the DKD application, allowing real-time access to soil testing reports and fertilizer recommendations. Insights of their soil nutrient profile empower the farmers to make informed decisions regarding fertilizer application practices. Hence, the DKD helps to optimize agricultural productivity andminimize environmental impact.

Assessment of Water Quality and Identification of Pollution Hot Spots in the Arpa River Watershed, Bilaspur, Chhattisgarh

Alok Kumar Chandrakar*, Ajay Kumar Singh, S. S. Dhuria
Department of Forestry, Wildlife & Environmental Sciences,
Guru Ghasidas Vishwavidyalaya, Bilaspur, Chhattisgarh, India.

E-mail: alokanand1234@gmail.com

Abstract

Rivers are a vital source of fresh water for life but are deteriorating due to the release of industrial and domestic wastewaters, agricultural runoff, etc. Most Indian rivers are contaminated due to discharges of organic and inorganic contaminants, viruses and bacteria, etc. Urbanized parts of India generate large volumes of sewage which are often discharged into water bodies without proper treatment, while agriculture practices in watersheds are also major sources of river pollution. Arpa riveris a major tributary of the river Seonath that meets with river Mahanadi in central India. Arpa riveris regarded as the very core of the socio-economic sustenance of Bilaspur district of Chhattisgarh. The economy, culture, tradition, and livelihood are all inextricably linked to the river and surrounding forests.Water quality assessment requires not only an investigation of water pollution and the recognition of main pollution factors, but also the identification of pollution hot spots in the river watershed. To realize this objective, water samples were collected from 30 sampling points from the Arpa River watershed of Chhattisgarh, to analyze various quality parameters and calculate the water quality index (WQI), followed by statistical evaluation. The results indicated that water quality in the Arpa watershedvaried from poor to unsuitable for utilization.Geographical Information System (GIS) were used to visualize the spatial pollution

characteristics and identifying potential polluted risky regions. The results indicated that the general water quality in the watershed has been exposed to various pollutants. These conclusions may provide useful and effective information for watershed water pollution control and management.

***Key words**: Arpa river, Watershed, Water quality Index, Pollution hotspot, GIS.*

Assessment of Antidiabetic and Antibacterial activity of Silver and Zinc oxide nanoparticles from medicinal plants

Amrita Raj[1]*, Reena lawerence[2]

[1]*Departmentof Applied Sciences, United University, Rawatpur, Jalwa, Prayagraj,Uttar Pradesh, India - 211012

[2]Departmentof Basic Sciences,Sam Higginbottom University of Agriculture, Technology & Science, Naini, Prayagraj, Uttar Pradesh, India- 211007.

Corresponding author email:rajamrita334@gmail.com

Abstracts

The present study is focused on the extraction of ZnO and Ag NPs from medicinal plant to evaluate their antibacterial and antidiabetic activity in the Vitro and Vivo case respectively. We synthesized ZnO and AgNPsfrom medicinal plant and their characterization are carried out using SEM, DLS, XRD,UV-Vis spectroscopy. The antidiabetic activity was measured in (STZ) streptozotocin-induced mice. Mice were treated with silver nanoparticles (10mg/kg) for 21 days. The synthesized Ag NPs as potential anti-bacterial agents have been studied on Bacillus subtilis (MTCC 121) and Pseudomonas aeruginosa(MTCC 1688). A significant reduction in blood sugar levels was noted in mice treated with ZnO and Ag NPs NPs and such NPs have the potential to prevent the growth of bacteria.Ag NPs deliver efficient antidiabetic activity in diabeticmice. Therefore, we speculated ZnO and Ag NPs would be a suitable candidate to form antidiabetic medicines.

***Keywords:** ZnO, Ag NPs, Medicinal plant, antibacterialand antidiabetic activity*

Impact of physico-chemical parameter on growth performance of Gulsha Tengra (*Mystus cavasius*)

Anand Basumatary[1]* and Anuck Islary[2]

[1, 2]Department of Food Engineering and Technology, Central Institue of Technology Kokrajhar, Kokrajhar 783370, Assam, India

Corresponding author e-mail: ph20fet1004@cit.ac.in

Abstract

The objectives of this research were to evaluate the effects of various physico-chemical parameters, including temperature, pH, total dissolved solids (TDS), dissolved oxygen (DO), nitrite, nitrate, TAN on the specific growth rate, survival rate, and overall health of Mystus cavasius over a five-months period. The study employed a controlled experimental design, with the treated Biofloc technology

system (BFT) tanks. Water quality was monitored and adjusted to maintain the desired level of each parameter, while fish growth performance was assessed bi-weekly through measurements of weight gain, length gain, specific growth rate and survival rate. Additionally, water samples were analyzed periodically to ensure the maintenance of targeted environmental conditions. Results indicated that the treated BFT tank T8 was found the maximum length gain (1.43±0.318), body weight gain (1.48±0.120) and specific growth rate (0.10±0.006) and treated BFT tank T5 was found the maximum survival rate of (74.62±0.370), within the specific ranges of temperature (27-31℃), pH (7-8.4), and dissolved oxygen (6.5-8.5 mg/L). Deviations beyond these ranges, particularly in terms of nitrite, nitrate and TAN concentrations, were correlated with reduced growth rates and increased mortality, highlighting the importance of maintaining optimal water quality for the cultivation of this species. The study concludes that careful management of physico-chemical parameters is essential for the sustainable aquaculture of Gulsha Tengra (mystus cavasius).

Keywords: *Gulsha Tengra, Biofloc, Temperature, pH, DO, Specific growth rate, Survival rate.*

Approaches To Identify Candidate Genes for Wilt Resistant Genes Using Forest Biotechnology

[1]Annie Biju, [2]Dr. Ajay Thakur, [3]Dr. Shambhavi

[1,2,3]Genetics and Tree Improvement Division,Forest Research Institute, Dehradun

Corresponding author: anniebiju124@gmail.com

Abstract

In the present scenario, resilient forest ecosystems to both climate and pathogens are of necessity. Pests and pathogens are the cause for destruction of vast areas of the forest ecosystem. The most common disease in forest tree species is the vascular wilt disease which is caused by both bacteria and fungi pathogens. Vascular wilt disease is the primary reason for devastation of agricultural crops as well as commercially important forest tree species such as Pine, Dalbergia, Shorea etc. Vascular wilt is caused by various causal organisms; both bacterial and fungal. Bacterial wilt is caused byRalstoniaspp.Whereas fungal wilt is caused by Fusarium spp., Verticillium spp., Ophiostomaspp. and Ceratocystis spp. There is a need to identify the genes resistance to wilt diseases in order to improve resistance of the plants. Hence, we also identified the genes resistant to wilt from scientific literature and have proposed biotechnological techniques such as transcriptomics, proteomics and metagenomics for incorporation of these genes for resistant plants. The need for resistant trees has increased prompting the integration of breeding, genetic engineering, and genomic technologies to accelerate the identification of candidate genes for testing and enhancing tree immunity. This comprehensive viewpoint is crucial for developing effective strategies to enhance tree resistance against pests and pathogens.

Keywords: *Vascular Wilt, Plant immunity, Pathogen resistance, Candidate genes, Forest Biotechnology*

Synthesis of biodegradable composite film prepare from sodium alginate and sago starch embedded with zinc oxide nanoparticles

Anuj Kumar Singh, Vishal, Harish Kumar,* M. S. Karuna

[1]Department of Chemical Engineering, M J P Rohilkhand University, Uttar Pradesh, Bareilly-243006 India

e-mail: harishkumar@mnnit.ac.in

Abstract

The current work focuses on the synthesis of the biodegradable composite film prepared from Sodium alginate (SA) and sago starch afterward the addition of zinc oxide nanoparticles (ZnO-NPs) was synthesized by sol-gel technique. Glycerol plasticizer is used to enhance film expansion due to a decrease in intermolecular forces in the polymer chain. With the addition of olive oil (OE), the functional properties of control films were improved, which resulted in a lowering of water solubility, and moisture content. The opacity, moisture absorption, solubility, and ultraviolet-vis spectroscopy, were used to characterize sodium alginate and sago starch composite film with the addition of ZnO-NPs (SA/SS1), without the addition of ZnO-NPs (SA/SS2), and without olive oil (SA/SS3). The resulting films were described and evaluated for antibacterial testing against two strains of bacteria, one Gram-positive (Staphylococcus aureus) and the other Gram-negative (Escherichia coli). The opacity was enhanced by ZnO-NPs addition, while moisture content (WVP), and solubility decrease.

Keywords: *Sodium alginate (SA), Sago Starch (SS), Zinc oxide nanoparticle (ZnO-NPs), Water vapor permeability, With nanoparticles (SA/SS1), Without nanoparticles (SA/SS2), Without olive oil (SA/SS3)*

Strengthening nutritional and livelihood security through technological interventions in soybean and Bhat (*Glycine max*) cultivation in Uttarakhand Himalayas

Anuradha Bhartiya*, J.P. Aditya, Hemlata Joshi and L. Kant

ICAR-Vivekananda Parvatiya Krishi AnusandhanSansthan, Almora-263601, Uttarakhand, India

Corresponding author e-mail:anuradha.bhartiya@icar.gov.in;anuradhagpb@gmail.com

Abstract

Soybean and black soybean are important legumes which play a vital role in nutritional and livelihood security in Uttarakhand hills. Considering importance of this legume in hill agriculture and prevalent food system of the region, efforts have been made for the improvement of productivity through technological interventions (improved varieties, recommended production technologies, farm mechanization and value addition) by ICAR-VPKAS, Almora during Kharif 2015- 2023. The present study revealed that the improved production technologies produced on an average 24.27% and 33.57% more yield of soybean and black soybean, respectively as compared to local cultivars and existing traditional practicesunder front line demonstrationswhich indicates that the positive effects of improved varieties and cultivation practices over the existingpractices in hills. Results revealed extension gap for soybean (460 kg/ha) and black soybean (422 kg/ha) exhibiting the potential of improving productivity by understanding the causes of yield gap and abridging them with proper interventions. In terms of

economic impact based on benefit cost ratio, the cultivation of black soybean (0.90) was found more profitable than soybean (0.88) besides, better feasibility of improved technological interventions in black soybean at farmer's field revealed by lower technology index of black soybean (17.93%) than soybean (24.13%). The front line demonstrations approach has generated awareness about the importance of improved varieties and matcing production technology for increasing the productivity of soybean and black soybean in hills.

Key words: *Black soybean [Glycine max (L.) Merrill], constraint analysis, economic impact, yield gap*

Effect of INM and Intercropping Under Normal Density Apple Orchard

Arun Kishor, Rashmi E. R. and Chandni

ICAR-Central Institute of Temperate Horticulture Regional Station, Mukteshwar-263138, District Nainital (Uttarakhand), India

E-mail id:aruniari@gmail.com

Abstract

An experiment was conducted in ICAR-CITH RS, Mukteshwar, Uttarakhandon effect of INM and vegetable as intercrop on the fruit quality of apple.The results obtained from investigation revealedthat treatment comprising FYM + Vermi-compost + Bio-fertilizer + Inorganic was found best in terms of highest fruit length (63.06 mm and 63.90 mm), fruit diameter (71.13 mm and 71.59 mm), fruit weight (151.94g and 156.35g), fruit firmness (12.43 lb/ inch2and 13.35lb/ inch2) fruit TSS (13.46 ?Band 12.39 ?B) and yield (32.83 kg/tree and 29.38 kg/tree) of apple per tree as compared to other treatments intercrop with pea and cauliflower respectively. Highest (77.07 cm) height, number of branches/plant (13.34), pod length (9.30 cm) and yield (51.37 q/h) of pea intercrop were recorded in treatment comprising of FYM + Vermi-compost + Biofertilizer + inorganics in pea intercrop in apple orchard. Maximum (44.90 cm) height, leaves per plant (17.51), curd diameter (19.41 cm), curd weight (427.41) and yield (163.09 q/ha) recorded in cauliflower intercroptreated with FYM + Vermi-compost + Biofertilizer + inorganics in apple orchard. Conclusively, treatment FYM + Vermi-compost + Biofertilizer + inorganics with intercrops pea and cauliflower was found best for improving the apple quality andtreatment FYM + Vermi-compost + Biofertilizer + inorganics also found effective to improve the growth parameters and yield of pea and cauliflower.

Key words: *INM, Pea, Cauliflower, Intercrop and Apple orchard*

Dissipation kinetics and risk assessment of spiromesifen residue in green chilli and the soil

Arvind Kumar [1,2], Pritha Ghosh[3], Manoj Dhouni[2] and Sujan Majumder[1]*

[1]Indian Institute of Vegetable Research, Varanasi, India

[2]Department of Chemistry, D.S.B Campus Kumaun University Nainital, India

[3]Department of Entomology, Lovely Professional University, Phagwara, Punjab, India

Corresponding author e-mail: sujaniari@gmail.com

Abstract

This study outcome indicated the risk involved in indiscriminate use of spiromesifen, 3-mesityl-2-oxo-1-oxaspiro[4.4]non-3-en-4-yl 3,3 and its harmful impact on harvested chilli as well as on it's microclimate for soil microbiota. The green chilli and the soils were collected in different time intervals and spiromesifen residue were analyzed using modified QuEChERS based gas chromatographic method. The estimation method was validated according to international standard. A comparison study of the different doses (recommended dose & double dose) of chemical was obtained from the dissipation rate constant. Results of residues on crop and in the soil revealed that spiromesifendissipitate readily at initial stage after application. The residue level was observed below detection level after the 10th day of last spray in green chilli, whereas in the soils it takes 7 days to become below detection level (BDL). Initially, persistence of the spiromesifen residue imparted a negative impact on the earthworms and arthropods present in soil microclimate but after 5 days risk quotient (RQ) values were found below 1 i.e. safe to the soil earthworm and arthropods. Different precautionary measures which could be amenable is to decontaminate the residual impact by blanching (26.96%) followed by washing the chillies with 1% NaCl (30.16%), followed by vinegar solution(34.88%). Least decontamination was recorded by washing the samples with running tap water (42.82%) which consists of the major quantity of insecticide remains.

Key words: *Spiromesifen residue, Persistence, Risk assessment, Decontamination, Sustainable crop protection*

Effect of Replacing Skimmed milk powder with Fish meal on Linear Body Measurements in Early Weaned Growing Piglets

Asem Ameeta Devi

KVK Chandel,MonsangPantha,Chandel

Abstract

The effect of replacing skimmed milk powder (SMP) with' fish meal and age of weaning on body length, chest girth and height at withers was studied on 108 piglets belonging to 12farrowings of crossbreed Hampshire pigs maintained at Farmers field at Chandel district . Age at weaning and dietary composition had no significant influence on body length and chest girth at birth and 12th week of age, whereas it had significant effect on body length and chest girth at 8th week of age. However, height at wither, was significantly influenced at 8th week as well as 12th week of age. At 8th week of age, the linear body measurements. were significantly higher in piglets reared on ration I (100 % SMP replaced by fish meal) and weaned at 56 days which did not differ significantly from ration I (with 4 % SMP) and weaned at 56 days and ration-II weaned at 35 days. Lowest measurement was found in ration I weaned at 35 days.It is realized that maximum survivability upto weaning besides higher live time pig production can only be archived by weaning the piglets at early ages by providing special `nutritionally balanced cheap diets for early weaned piglets. Cheaper weaned diet can be formulated by replacing skimmed milk powder which is expensive feed ingredient of weaner diet by fish meal. Very limited systematic studies have been made in this direction so far. An attempt was therefore made to develop cheap and well balanced weaner diet for early weaned piglets.

Comparative performances of Graded Hampshire pigs and Large Black in Chandel district of Manipur

Asem Ameeta Devi

KVK Chandel, Monsang Pantha

Abstract

Background: The present study was carried out at farmer's door with an objective to compare the performances of two genetic groups of pig in their agro-climatic conditions. Methods: A total of 36 (18 no each of Graded Hampshire and Graded Large Black)piglets of approximately 2 months old were distributed among 6 farmersreciving 6 piglets of 3 no each of two different pigs. Pigs were maintained by farmers under intensive system with the provision of approximately 70% locally available feed(kitchen waste 40 percent with 30 percent colocassia) and 30% supplemented ration in the form of concentrate mixture. Weaning of piglets was done at the age of 8 weeks. Body weight was recorded at monthly interval. Age at sexual maturity, age a first farrowing, litter size and weight at birth and at weaning were also recorded. Result: Genetic group had significant effect on age at first farrowing (AFF) and litter weight at weaning. Significantly higher litter weight at weaning was recorded in graded Hampshire (83.60±2.77 kg) than graded Large Black (75.40±3.96 kg). Similarly, significantly lower AFF was found in graded Hampshire (376.80±4.87 days) than graded Large Black(395.60±6.12 days). The rest of other economic traits had nonsignificant influence but higher value was recorded in graded Hampshire. On the basis of above findings, it can be concluded that graded Hampshire pigs performed better than graded Large Black under village managemental conditions. Hence, Hampshire boar should be preferred over Large Black for upgrading the non-descript desi stock of the state

Marketing of Kasuri Methi (*Trigonella corniculata* L.) In Rajasthan State

Ashish Kumar[1] and Monika Sharma[2]

[1]Ph.D. Research Scholar, Department of Agricultural Economics and Management Rajasthan College of Agriculture, MPUAT, Udaipur, Rajasthan

[2]Ph.D. Research Scholar, Department OF Agricultural Economics, ICAR/NDRI, Karnal, Haryana

E-mail:Ashish127sharma@gmail.com

Abstract

This study examines marketing channels for Kasuri Methi (dried fenugreek leaves) in Nagaur district, Rajasthan. In the study area, two marketing channels were identified for Kasuri Methi: Channel-I (Producers ? Village traders ? Processing unit ? Retailer ? Consumer). Channel-I was the preferred channel, with 64.67 per cent of the produce marketed through it. In Channel-I, the net price received by the producer was ?13,384.21, with a gross marketing margin of 29.96 per cent. This channel had more intermediaries than Channel-II, leading to higher margins. However, Channel-II had a higher producer's share in the consumer rupee, with 81.32 per cent compared to Channel-I's 70.04 per cent. In terms of marketing efficiency, Channel-II was most efficient (4.34), followed by Channel-I (2.34). Despite Channel-II's efficiency, it handled only 35.33% of the produce due to storage challenges. Farmers had

to sell quickly, allowing village traders to collect produce from village to village. Channel-II's efficiency stemmed from its fewer intermediaries, resulting in a higher net marketing margin.

Keywords: *Kasuri Methi, marketing channels, intermediaries, marketing efficiency.*

Roots of Conservation: Tracing the Historical Evolution of Environmental Sustainability in Uttarakhand

***Avni Arya[1], Deep Pandey[2], Prem Prakash[3]**

Department of Botany, M.B.Govt.P.G College, Haldwani, Nainital, Uttarakhand

Abstract

Uttarakhand, nestled in the Himalayan region, boasts a rich variety of biodiversity and ecosystems that have been crucial to the survival and well-being of its inhabitants for centuries. Against the backdrop of rapid urbanization, population growth, and anthropogenic activities understanding the historical evolution of environmental sustainability becomes imperative for formulating effective conservation strategies.Thestudy employs an interdisciplinary approach, combining historical analysis, archival research, and ecological studies to chronicle the development of conservation efforts in Uttarakhand.Beginning with ancient indigenous practices that harmonized human life with nature, the study passes through historical milestones such as establishing protected areas, formulating environmental policies, and implementing community-based initiatives.Thefindings provide an understanding of the roots of conservation in Uttarakhand, shedding light on the successes, challenges, and lessons learned over time. Insights collected from this historical exploration can serve as a valuable foundation for contemporary conservation strategies, aiding policymakers, environmentalists, and communities to balance development and preserving the state's ecological heritage. Ultimately, this study contributes to the broader discourse on sustainable development by offering a historical lens to comprehend the complex relationship between society and the environment in Uttarakhand.

Keywords: *Conservation, Environmental sustainability, biodiversity, sustainable development*

Molecular Characterization of Cucumber mosaic virus Isolate and Study of Virus-Vector Relationship along with Host Range.

Ayan Das[1]* , Swati Chakraborty[2], Jayanta Tarafdar[3], Sudarshan Chakraborti[4], Arup Chattopadhyay[5]

[1]*Research Scholar & [4]Professor, Department of Agricultural Entomology, Bidhan Chandra Krishi Viswavidyalaya

[2]Assistant Professor, Seacom Skills University

[3]Professor, Department of Plant Pathology, Bidhan Chandra Krishi Viswavidyalaya

[5]Professor, Department of Vegetable Science, Bidhan Chandra Krishi Viswavidyalaya

Email:ayandasvb@gmail.com*

Abstract

A field as well as lab experiment was conducted on cucumber mosaic virus isolate, from cucumber plants prevailing under the new gangetic alluvial plain of West Bengal to identify both of its molecular as well as biological characteristics. The amplified PCR products were subjected to electrophoresis on 1% agarose gel and~657 bp size band was amplified. Further the cDNA from another leaf sampleshowing CV like symptom was tested using RT-PCR. The amplification of ~657 bp band inagarose gel of PCR product of degenerative primers (CMV1F and CMV1R) confirmed thepresence of cucumber mosaic virus (CMV) infection in the cucumber plants gave positivereaction. The gene index confirmed that CMV infecting cucumber plants at Kalyani belongs to Sub-group-II and the Coat Protein (CP) gene sequence located in RNA3 subgenomic RNA. Further the phylogram analysis have revealed that CMV isolate KLY-1 has a closer association with theChinese, USA, Brazil and German isolate, whereas it is interesting to observe that CMV- KLY-1 wasdistantly related with the Middle East, other European and Australian isolates. The correlation analysis and further regression models have indicated that the aphid population along with prevailing temperature have a greater contribution over disease development. The virus-vector analysisstudy revealed Myzuspesicae as an efficient vector in term of dispersal of viral particle (CMV) to thehealthy plants incomparison to Aphis gossypii, while from sequential transmission study it was observed that upto third plant was mostly favorable for single acquisition. The host range study via serological detection revealed the viral particle has a greater host range but not significantly cause any symptom on grass family.

Keywords: *CMV, characterization, virus-vector relation, host range.*

Optimization of Anthocyanin Extraction from Rose Petals

Babita Singh, Keerthana Sanapala, Ritu Jain, Markandey Singh, Ajai Tiwari, Alka Joshi and Ruchi Bansal

ICAR-Indian Agricultural Research Institute

Corresponding Author:bflori17feb@gmail.com

Abstract

India has a rich biodiversity and harbours a wealth of useful germplasm resources and there is no doubt that the plant kingdom is a treasure-house of diverse natural products. One such product from the nature is dye. Dyes are one of the most important uses of the plants. The application of natural dye in the textile industry is gaining popularity because of the increasing awareness of environmental effects, ecological effects, and the pollution caused by synthetic dyes. Rose flowers, which are one of the best sources of natural dye, have been selected for fabric dyeing due to the presence of anthocyanin pigment. Like other natural dyes, anthocyanins have limitations due to the lack of standardized extraction protocols and reduced stability. An experiment was conducted for the process optimization of anthocyanin extraction from rose petals. Total Anthocyanin Content (TAC) and Redness Index (RI) are the two responses used in the experiment. Box Behnken Design of Response Surface Methodology (RSM) optimized that at 25°C temp, 1:5 solid to solvent ratio using 0% HCl most desirable anthocyanin content could be extracted with desirable Redness Index.

Key words: *Rose, Natural Dye, Anthocyanin, Box Behnken Design, Response Surface Methodology*

Seasonal study on the gut content, digestive enzyme activities and body composition of two Himalayan cyprinid fishes, *Schizothorax richardsonii* and *Nazirit orchelynoides*

Bhawna Gehlot[1],[2]*, Manchi Rajesh[1], Rini Joshi[1], Mukul Arya[1], Biju Sam Kamalam[1], Suresh Chandra[1] and Rina Chakrabarti[2]

[1]ICAR-Directorate of Coldwater Fisheries Research, Bhimtal 263136, Uttarakhand, India

[2]Department of Zoology, Delhi University, New Delhi 110007, Delhi, India

Corresponding author email: bhawnagehlot19@gmail.com

Abstract

In natural stream ecosystems, seasonal variations in gut content composition, digestive enzyme activities, tissue indices and body composition of fish species are good indicators of their ecological adaptation and nutritional status. Therefore, in this study, we comparatively investigated the seasonal changes of the above-mentioned indices in two important Himalayan stream dwelling cyprinid fish,*Schizothoraxrichards* onii (snow trout) and *Nazirit orchelynoides* (dark mahseer), which inhabit the Shipra riverine stretch of Kosi River near Kainchidham, Uttarakhand, India. Live specimens of snow trout (9.9 - 56 g) and dark mahseer (8 - 75 g) were collected during summer, winter and monsoon seasons using cast net and brought to ICAR-Directorate of Coldwater Fisheries Research experimental facility at Bhimtal for further biometric and biochemical investigations. Changes in body condition factor, relative gut length, and intestine-somatic index, suggested potential shifts in nutritional status across seasons, in a species-specific manner. Plankton communities predominantly made up the gut content of snow trout, whereas dark mahseer showed seasonal dietary preferences consisting of planktons, insects, detritus and algal matter. Body composition showed significant seasonal alterations, with high protein content in summer and high lipid content during monsoon in both species, reflecting changes in food availability and bioenergetics. Digestive enzyme activities showed seasonal patterns, with total proteaseand alkaline phosphatase activity peaks in summer in both species. Whereas, trypsin, chymotrypsin, leucine aminopeptidase, amylase and lipase activities showed species-specific seasonal variations, which could be associated with their food and feeding habits. Collectively, these findings shed light on the specific ecological adaptations of Schizothoraxrichardsonii and Naziritorchelynoides to the food availability in their natural habitats, and provides valuable insights for their conservation and culture strategies.

Keywords: *Snow trout, Dark mahseer, Gut content, Digestive enzymes, Body composition, Tissue indices*

Infectious bacterial gill disease in farmed rainbow trout (*Oncorhynchus mykiss*) of northern Himalayan region of India: A case study

Bhupendra Singh[1]*, Neetu Shahi[1], and Sumanta Kumar Mallik[1]

[1]ICAR- Directorate of Coldwater Fisheries Research,AnushandhanBhawan,Bhimtal, Bhimtal 263136, Nainital, Uttarakhand

Corresponding Author: bhupendras308@gmail.com

Abstract

In between February 2022 - April 2022 occurrence of chronic gill disease was observed in farmed (average body weight: 220 g) rainbow trout (Oncorhynchus mykiss). The disease was chronic, and the rainbow trout with clinical signs were dead within few weeks of manifestationof clinical signs. The gross clinical sign of gill disease was respiratory distress in fish, piping, lack of appetite, weight loss, melanosis, opening of operculum of both the gills, redness of gills, necrosis of gill filaments and rapid gill movement. Six moribund rainbow troutwith gill disease were sampled for bacterial and histological examination. Altogether 9 bacteria were isolated from gill and liver of infected fish and the bacteria were identified by partial amplification of 16S rRNA gene. All the isolated bacterial strains were Gram-negative rods. The bacteria identified by molecular methods were Chryseobacteriumaquaticum strain 10-46 (99.46%), Rossellomoreamarisflavi strain TF-11 (99.20%), Pararheinheinerachironomi strain K19414 (99.15%), Aeromonasallosaccharophila strain CECT 4199 (99.39%), A. hydrophila AU 1D12 (99.54%), A.rivipollensis strain P2G1 (99.47%), and Exiguabacteriumundae strain DSM14481 (99.10%). The bacterial isolates were confirmed for in vitro virulence (haemolytic, lipase, protease, and DNase activity) and also susceptibility to five antibiotics (E15, TE30, C30, CIP5 and COT25) commonly used in aquaculture. Majority of the isolated bacterial strain exhibited hemolytic activity and DNase activity. All the bacterial isolates were sensitive to antibiotic TE30, however showed intermediate resistant to E15. Histopathological examination of gill exhibited extensive hyperplasia of lamellar cells, partial or complete fusion of secondary lamellae, lifting of the epithelium of secondary lamellae and congestion of blood vessels. Liver and kidney had very minimal histopathological changes. Our study suggests that in farmed rainbow trout of India, gill disease can be a major health issue in coming years, and may cause major economic losses.

Keywords: *Fish pathogen, Histopathology, 16S rRNA, Antibiotic susceptibility test, Bacteria*

Isolation and characterization of pathogenic bacteria from farmed rainbow trout (*Oncorhynchus mykiss*) of India, showing severe lenticular opacity and focally extensive hemorrhagic corneal ulcer

Bitun Bhowmik[1],[2]* Bhupendra Singh[1] Sumanta Kumar Mallik[1] and Neetu Shahi[1]

[1]ICAR-Directorate of Coldwater Fisheries Research, Anusandhan Bhavan, Industrial Area, Bhimtal-263136 Uttarakhand

[2]Maulana Abul Kalam Azad University of Technology, Haringhata, Simhat, Nadia-741249 West Bengal

Corresponding author e-mail: sonubhowmik123@gmail.com

Abstract

Hemorrhagic eye infection poses a significant threat to rainbow trout (Oncorhynchusmykiss) aquaculture, necessitating comprehensive investigation into the microbial pathogens involved. This study aimed to isolate and characterize pathogenic bacteria from hemorrhagic eye lesions of adult rainbow trout (average body weight: 326±79.2 g), with additional sampling from the liver, to assess potential systemic dissemination of pathogens. A total of 11 bacterial isolates were obtained, comprising 6 isolates from

eye samples and 5 from liver tissues. To identify these isolates, a series of 28 biochemical tests were employed, providing insights into their metabolic profiles and potential taxonomic classification. Moreover, antibiotic susceptibility testing (AST) was conducted to evaluate the susceptibility of the isolates to commonly used antimicrobial agent, while antimicrobial resistance profiles were assessed to elucidate any emerging patterns of resistance. Preliminary analysis revealed a diverse range of bacterial species associated with hemorrhagic eye infections in rainbow trout, including members of the genera Aeromonas, Flavobacterium, Lactococcus, and Pseudomonas. Among the 11 bacterial isolates 64% were Gram-negative and remaining were Gram-positive.Notably, variations in biochemical characteristics and antimicrobial susceptibility profiles were observed among the isolates, suggesting potential differences in pathogenicity and adaptive strategies. All the bacterial isolates were hemolytic and 35% isolates degraded protease. Lipase, lecithinase and DNase activity was not observed in any of the isolates. In AST, 100% sensitivity was shown by all the 11 isolates againsttetracycline 30 (TE30), Amikacin (AK30), Imipenem (IPM10), Kanamycin (K30), Doxycycline hydrochloride(DO30), Ciprofloxacin (CIP5), and Gentamicin (GEN10). However, the isolates were resistant to Oxacillin (OX1). Histopathological examination of eye, kidney and liver shows extensive infiltration of RBC and necrosis in these three organs. This comprehensive characterization of pathogenic bacteria from hemorrhagic eye lesions provides valuable insights into the etiology and epidemiology of ocular infections in rainbow trout.

Keywords: *Fish disease, hemorrhagic eye, antimicrobial resistance, rainbow trout, virulence*

Synthesis and characterization of sodium alginate-gum karaya crosslinked antibacterial film for prospects in fruit packaging

Brijesh Kumar, Pramendra Kumar*

Department of Applied Chemistry, M. J.P. Rohilkhand University, Bareilly-243006 (U.P.), India

Corresponding author e-mail: pramendra2002@gmail.com

Abstract

The antimicrobial crosslinked sodium alginate-gum karaya film was prepared by citric acid crosslinker between sodium alginate and gum karaya blended via microwave-initiated graft copolymerization. The cross-linking between sodium alginate and gum karaya was confirmed by FTIR, XRD, SEM, and TGA analytical techniques. The cross-linked film was used to investigate antimicrobial activity efficiency against three tested strains, i.e., Escherichia coli, Staphylococcus aureus, and Pseudomonas aeruginosa. The biodegradability study of the cross-linked film was conducted under different conditions. The prepared crosslinked film was tested for fruits packaging.

Keyword: *Sodium alginate, Gum karaya, Cross-linked film, Fruits packaging, Antimicrobial activity.*

Biotechnological Approaches in Crop Improvement for Sustainable Agricultural Production

Chandragiri Cheralu[1]* and Neelam Venkateshwar Rao[2]

[1]Dean of Agriculture, Chaitanya Deemed to be University Telangana State, India 506001

[2]Senior Scientist & Head, KVK Jammikunta, Karimnagar, Telangana State, India 505122

Corresponding author e-mail: cheralu4@gmai.com

Abstract

Biotechnological approaches used in modern plant breeding for genetic improvement of crop varieties with less time and and desirable traits includes plant tissue culture, molecular breeding and transgenics. Global population by 2050 is anticipated to attain 9.7 billion, to ensure food security there is a need to increase food crop production by 60 % under constraint conditions of climate change and decrease in all natural resources. Alarming situation demands additional integration of all developed relevant methods such as Genomics, Genome editing, Artificial Intelligence and Deep learning to sustainably boost food grain production with high yield, enhanced nutrition of resilient crop varieties.More than 17 million farmers in 29 countries cultivate bio-tech crop varieties in over 190 million hectares. Major countries include USA, Brazil, Argentina, Canada, India and crops are Soyabean, Maize, Cotton and Canola. Biotech crop varieties not only increases productivity but also conserves biodiversity, provides safer environment,decreases CO2emission and helps to alleviate poverty through uplifting the economic situation of millions of small farmers.Efforts in this direction at Professor Jayashanker Telangana State Agricultural University (PJTSAU) resulted in development and release of multiple gall midge biotype (biotype 1, 3 and 4M)and neck blast resistant variety Warangal 1119 through Marker Assisted Back cross Breeding(MABB). Another variety WGL 1487, with puf gene introgression was released in collaboration with IIRR. In addition, genetic stocks for resistance to blast (pi54 + pil), blast+ bacterial blight (Xa 13+ Xa 21+ Pi54+Pil) and bacterial blight+ gall midge (xa13+ Gm4) and others were developed through MABB. In cotton, efforts are in progress to develop varieties having resistance toHelicoverpa by incorporating Cry 1 gene through pedigree breeding and few lines are in advanced testing. Indian Institute of Rice Research, successfully introgressed several traits in to rice using Market Assisted Back cross breeding supplemented with genomic tools, Improved Samba Mahasuri was released for bacterial blight resistance (Xa 21, xa 13 and xa 5), blast (pi 2, pi 54), gall midge (Gm 4, Gm 3), BPH (BPH 33), low soil P (Puf 1), salinity (saltal), submergence (.sub 1), drought (qDTy2.1, qDTy3.1), yield(Gn1a, scM2, OsSPL34) were successfully demonstrated. Several climate resilient varieties and hybrids DRRH 4 (Aerobic hybrid), DRR Dhan 64 (early, high NUE), DRR Dhan 65 and 66 (low soil P tolerant) were released. Progress of research in other crops in through Molecular breeding, Genome editing and transgenics have been discussed in this paper.

Keywords: *Biotechnological approaches, Resilient crop varieties, Sustainable agricultural production*

Weed Management In Direct-seeded Rice (*Orayza Sativa* L.)

D.K. Patel[1] and K.P. Patel[2]

[1]Cotton Wilt Breeding Station, Navsari Agricultural University, Hansot, Gujarat

[2]Department of Agronomy, N.M. College of Agriculture, Navsari Agricultural University, Navsari, Gujarat

Corresponding author e-mail: dkpatelagro@nau.in

Abstract

A field experiment was conducted to investigate the weed management in direct-seeded rice under South Gujarat conditions at College Farm, N. M. College of Agriculture, Navsari Agricultural University, Navsari during summer season. The experiment comprised of twelve treatments combinations, viz., butachlor @ 1.25 kg/ha as pre-emergence (T1), pendimethalin @ 1.00 kg/ha as pre-emergence (T2), pretilachlor @ 0.75 kg/ha as pre-emergence (T3), aniloguard @ 0.5 kg/ha as pre-emergence (T4), 2,4-D (Ethyl ester) @ 1.00 kg/ha as post-emergence at 20 to 25 DAS (T5), T1 + Hand weeding at 40 DAS (T6), T2 + Hand weeding at 40 DAS (T7), T3 + Hand weeding at 40 DAS (T8), T4 + Hand weeding at 40 DAS (T9), T5 + Hand weeding at 40 DAS (T10), Un weeded control (T11), Weed free condition by hand weeding at 20, 40 and 60 DAS (T12) were evaluated in randomized block design with three replications. The field was infested by number of weed species comprising of monocot weeds viz., Echinochloa colunum, Cynodon dactylon, Echinochloa crusgalli, Eichhornia crassipes and Bracharia spp. major dicot weeds viz., Physalis minima, Euphorbia hirta, Alternanthera sessilis and Digera arvensis were predominantly present during the experimentation. The maximum and minimum nutrient removal by grain and straw were recorded under treatments of weed free condition by hand weeding at 20, 40 and 60 DAS (T12) and unweeded control (T11), respectively. Significantly highest nutrient content and uptake of NPK was found with treatment weed free condition by hand weeding at 20, 40 and 60 DAS because crop provide weed free condition throughout growth period as well as minimize the competition with weed for nutrient ultimately increased the content and uptake by crop. The highest net profit was obtained from treatment of two hand weedings + hoeing at 20 and 40 DAS followed by treatments of two hand weedings at 20 and 40 DAS and Pendimethalin @ 0.75 kg/ha + hand weeding and hoeing at 40 DAS. while the highest cost benefit ratio was obtained under treatment of two hand weedings and hoeings at 20 and 40 DAS followed by treatments two hand weeding at 20 and 40 DAS and Pendimethalin @ 0.75 kg/ha + hand weeding and hoeing at 40 DAS. On the basis of experimentation, it can be concluded that higher profitable yield of direct-seeded rice variety Jaya can be obtained by keeping the crop weed free either by hand weeding coupled with hoeing or only two hand weedings at 20 and 40 days after sowing. In scarcity of laboures, pendimethalin @ 0.75 kg/ha may be applied coupled with hand weeding at hoeing at 40 days after sowing.

Performance evaluation of tractor operated hydro-mechanical offset rotavator for intra row weeding in orchards

D.M. Kadam[1]*, A.K. Shrivastava[2], Manish Patel[3] and Prabhat Guru[4]

[1].Department of Farm Machinery and Power Engineering, College of Agricultural Engineering, JNKVV, Jabalpur-482004, M.P., India.

[2].Department of Farm Machinery and Power Engineering, College of Agricultural Engineering, JNKVV, Jabalpur-482004, M.P., India.

[3].Department of Farm Machinery and Power Engineering, College of Agricultural Engineering, JNKVV, Jabalpur-482004, M.P., India.

[4].Department of Farm Machinery and Power Engineering, College of Agricultural Engineering, JNKVV, Jabalpur-482004, M.P., India.

Corresponding author's e-mail: dmkadam.jnkvv@gmail.com

Abstract

India is one of the most important country in the world which is growing the fruit crops which needs to be mechanized. In order meet the requirement of intra row weeding in orchard, Tractor drawn hydro mechanical rotavator need to be developed and evaluated scientifically in orchard field to check its performance of intra row weeding and improve its suitability for orchard. In this research work the feasibility testing trial of tractor drawn offset rotavator was conducted in 13.10 ha area of JNKVV horticultural farm. The trails were conducted at JNKVV farms and at farmer's field for orchards(Pomegranate, Mango, Guava and Sapota) during the year 2020. The average values of the soil bulk density, cone index and moisture content were determined as 1722 kg/m3, 898 kN/m2 and 13.44% respectively. Actual field capacity was found as 0.20 ha/h with field efficiency 62.5%. The fuel consumption was found 4.60 lit/h for offset rotavator. Weeding efficiency calculated was found 85 %. Plant damage was found as 3.0 %. The overall performance of hydro mechanical offset rotavator was found satisfactory for intra row weeding in orchard.

Keywords: *Offset rotavator, side shift rotavator, hydro mechanical rotavator, intra row weeding, weeding in orchard, orchard weeder.*

Assessing Fish Diversity and Habitat Ecology in Mining-Impacted Regions of the Upper Ravi River Basin, Himachal Pradesh

***Danish Mahajan[1], Amit Kumar Sharma[1], Kushal Thakur[1], Hishani Kumari and Dr. Rakesh Kumar[1]**

[1]Department of Animal Sciences, Central University of Himachal Pradesh, Kangra (H.P.) 176206

****Email: danisharushi@gmail.com***

Abstract

The presence of a diversified fish community helps to maintain the ecosystem's equilibrium and contributes to its overall stability. The purpose of this research was to evaluate the diversity of fish in a particular section of the Ravi River in India, in connection to the environmental conditions that exist there. Kharamukh, Sultanpur, Saru village, and Samleu were chosen as the locations for the intended study. These four zones were designated as Zones A,B, C, and D respectively. Zone A was an area that was not mined and was therefore referred to as the reference zone. The remaining zones were places that had river bed mining carried out in them. The environmental parameters were sampled once a month, while the fish species were sampled twice a month. In total, sixteen different aspects of the environment were investigated. Both the Shannon-Wiener diversity index and the total number of individuals were used in the analysis of the data, which consisted of a total of 524 individuals connected to 8 families and collected in total. In addition, the results of a canonical correspondence analysis demonstrated that a number of environmental factors, including water velocity, water temperature, water depth, boulders, sand, gravel, turbidity, and dissolved oxygen, had significant correlations with the fish assemblage. The findings indicated that there were a greater number of fish in the areas that had not been touched by mining in comparison to those areas that had been impacted by mining. On the other hand, it was discovered that mining river bed materials messed with the environmental factors, which in turn had an effect on the fish population.

Keywords: *River bed mining, Environmental parameter,CCA,Ravi River Diversity index*

Synthesis, characterization and structure of ruthenium complexes derived from adipoyldihydrazone

Debajani Basumatary[1]*, Ram Ashray Lal[2]

[1]Department of Applied Sciences, Chemical Science Division, Gauhati University, Guwahati-781014, Assam, India

[2](Retired)Department of Chemistry, North-Eastern Hill University, Shillong 793022, Meghalaya, India

Corresponding author e-mail: debbasumatary@gmail.com

Abstract

The importance of coordination compounds in nature can be exemplified by vital role played by macromolecule such as chlorophyll. Schiff bases are important in Coordination chemistry. Ruthenium Chemistry with variable oxidation states has opened new promising avenues. A continuous research is being carried out to develop new organic moieties and their corresponding ruthenium complexes. For the present work, ruthenium was selected to study the complex chemistry of the ligand, Bis(2-hydroxy-1-naphthaldehyde) adipoyldihydrazone (naphH4). Literature reviews has failed to locate any study on ruthenium complexes of the Bis(2-hydroxy-1-naphthaldehyde) adipoyldihydrazone. Ruthenium complexes derived of Bis(2-hydroxy-1-naphthaldehyde) adipoyldihydrazone were characterized by various physico-chemical and spectral techniques that revealed the stoichiometry of the complexes. The structure of the complexes was supported by data obtained from conductivity, magnetic moment, electronic, IR and 1H NMR spectral studies. In addition, the electron transfer properties of the monometallic ruthenium complexes were verified using cyclic voltammetric technique. Bis(2-hydroxy-1-naphthaldehyde) adipoyldihydrazone in methanol was treated with solution of RuCl3.3H2O in methanol in absence and presence of different pyridine bases (pyridine, 2-picoline, 3-picoline, 4-picoline, 1, 10-phenanthroline and 2,2' bipyridine). The complexes are monomeric in nature. The dihydrazone encapsulates the metal center by tetradentate chelation. Keto form of the dihydrazones coordinates to the metal. Cooordination to the metal centre occurs through naphtholic oxygen and azomethine nitrogen atoms. It was suggested that the chloride groups present outside the coordination sphere are H-bonded form involving naphtholic-OH group. The dihydrazone ligands on being bonded to the same metal centre in the anti-cis configuration introduces steric crowding in the molecules and as a result, one hydrazone arm is in the equatorial plane while the other is in axial positions. The electron transfer process suggest that redox activity is metal centered and is associated with RuII/RuI redox couple. It was suggested that all the complexes have distorted octahedral stereochemistry around the metal centre.

Keywords: *Ruthenium, Bis (2-hydroxy-1-naphthaldehyde) adipoyldihydrazone, Synthesis, Characterization, Physico-chemical, Spectral techniques*

Impact of Land Uses on quality of water sources in Bilaspur district of Himachal Pradesh

Deeksha Sharma[1]* and MK Brahmi[2]

[1]Department of Environmental Science, Dr. Yashwant Singh Parmar University of Horticulture and Forestry, Nauni (Solan) -173230, Himachal Pradesh, India.

[2]Department of Forest Products and Utilization, College of Horticulture and Forestry, Neri, Hamirpur, Dr. Yashwant Singh Parmar University of Horticulture and Forestry, Nauni (Solan)-173230, Himachal Pradesh, India

Corresponding author e-mail: deeksha.sharma9215@gmail.com

Abstract

The present investigation was carried out to study the impact of dominant land uses on water quality.Surface and groundwater samples were collected during winter and monsoon seasons under different land uses (Urban/Peri-urban, Agriculture and Forest). Water Quality Index (WQI) was calculated using weighted arithmetic water quality index method using 10 water quality parameters viz. pH, EC,turbidity, TDS, BOD, COD, Calcium, Magnesium, Chloride and Nitrate.Maximum pH (8.34), EC (702 µS cm-1), TDS (455.67 mg l-1), Turbidity (3.83 NTU), BOD (3.04 mg l-1), COD (202 mg l-1) and Chloride (128.17 mg l-1) were recorded maximum under urban/peri-urban land use while Ca2+(123.83 mg l-1), Mg2+(51.07mg l-1) and NO3-(23.65 mg l-1)were recorded maximum under agriculture land use. WQI under urban/peri-urban (61.65) and agriculture (53.39) showed poor water quality. While the minimum WQI (18.65) under forest land use showed excellent water quality. Seasonally, maximum pH (8.06), EC (µS cm-1), TDS (320.60 mg l-1), Turbidity (3.11 NTU), BOD (2.80 mg l-1), COD (129.11 mg l-1), Nitrate (13.94 mg l-1)and Chloride (81.89 mg l-1) and WQI (52.54) were found during monsoon season whereas Ca2+(93.44 mg l-1) and Mg2+(45.94 mg l-1) were recorded maximum in winter season. Results indicate that the urban/peri-urban and agriculture land use have started impacting the quality of water sources in the district. Attention on effective land use planning for improving quality of natural water in hills is of paramount importance as it directly affects the health of the people.Therefore, there is urgent need to regulate urbanization and agricultural practices in the district by promoting environment friendly development for healthy ecosystem.

Keywords: *Water Quality Index, Land Use, Agriculture, Seasonal Variation, groundwater quality, Urban/ Peri-urban.*

Understanding directional ecological filtering based on a comparative analysis of invasive plants in "Tehri" and "Pauri" Garhwal, Uttarakhand, India

Deep Pandey[1], Avni Arya[1], Prem Prakash[1]*

[1]Department of Botany, M.B. Govt. P.G. College, Haldwani - 263139 Uttarakhand, India

Corresponding author e-mail:drppbot@gmail.com

Abstract

The establishment of invasive plants in a particular area leads to significant ecological changes on the native species of that area, alters ecosystem services and is one of the major drivers of biodiversity loss.

In recent years, invasion by alien plants in the hilly regions has posed a severe threat to the ecosystem of these areas. A review was made in this context to study the Invasive Alien Plant Species (IAPS) of "Tehri" and "Pauri" districts. Large number of invasive alien plants was identified under different genera and families from both the study areas. Based on the growth form of invasive plants, herbs contributed the maximum percentage. Asteraceae was found to be dominating over other families followed by Solanaceae. The native range indicated differences in nativity of invasive flora found in Tehri and Pauri with a large percentage of invasive plants coming from Asia (23%) and Tropical America (26%) and respectively. It was observed that invasive plants are invading higher elevation zones which parallels with the directional filtering theory. Due to higher proliferation rates outside their native range and absence of natural predators, it is quite difficult to control this increasing expansion of invasive plants which is a call for concern and needs immediate attention.This review paper primarily focuses on the analysis of invasive plants distribution, their growth forms, families, native ranges and species diversity patterns.

Keywords: *Invasive alien plant species (IAPS), Ecosystem services, Native species, Biodiversity, Asteraceae*

Effect of trisodium citrate and Vitamin E supplementation during transition period on quality and quantity of milk produced by Phule Triveni cow

Deokar D. K.[1]*, Patil A.M.[2], Lokhande A.T.[3], Kamble D.K.[4] and Parade A. K.[5]
Department of Animal Husbandry and Dairy Science,
Mahatma Phule Krishi Vidyapeeth, Rahuri- 413722
Dist. Ahmednagar, Maharashtra,India

Correspomding author e-mail: deokardk68@gmail.com

ABSTRACT

Study was conducted to evaluate the "Effect of trisodium citrate and Vitamin E supplementation during transition period on production parameters in Phule Triveni cows". Twenty Phule Triveni cows were randomly selected from RCDP on cattle, MPKV Rahuri, and further divided into two groups of ten animals each. It was ensured that the selected animals for study are free from any anatomical, physiological and infectious disorders. Cows were randomly divided into two group viz. T(Treatment) and C (Control). T: In addition to the usual ration of the RCDP on cattle farm the animal of this group were supplemented with a mixture of trisodium citrate (25gm) and vitamin E (1000 I.U.) per animal per day, during the transition period i.e. 3 weeks before calving to 3 weeks after calving at morning time. C: Animal of this group were offered usual as per ICAR feeding standard, 2013. Institute grown seasonal green fodderslike oat, maize, jowar and berseem depending on their availability, along with dry fodder was fed ad lib to the animals. The animals had free access to clean drinkingwater throughout the day and night. Observations were recorded at day 1, 3, 7 and then weekly interval upto56th day post parturition. Milk sample was checked by using lactoscan. The average milk yield was lowest during first week of lactation in both treatment and control groups (6.52 kgand6.38 kg/day/cow). Afterwards milk yield started increasing gradually with the progress of lactation. It was noticed, that milk yield of treatment group was always higher than the control group, but statistically significant (P ? 0.05) difference

was noticed only at day 42, 49 and 56. The EC was lower in treatment group as compare to control group but statistically significant (P ? 0.05) difference found during colostrums period i.e. day 1, day 3, day 7 and peak lactation period i.e. day 42, day49 and day 56. The milk fat,protein and lactose percentage was significantly (P<0.05) high in treatment group compare to control group. The Solid not Fat per cent were declined significantly (P<0.05) on day 7 postpartum and remained almost constant up to day 56. Result indicate that effect of supplementing combination of trisodium citrate (25gm) and vitamin E (1000IU) during the transition period had significant effect on milk yield and milk composition of Phule Triveni cows.

Keywords: *Transition period, Trisodium citrate and Vitamin E, milk production, Phule Triveni cows.*

Adoption Level of Beneficiary and Non- Beneficiary Dairy Farmers About Milk Production Techniques

Devendra Singh[1], S.S. Sisodia[2], R.S. Rathore[3]

[1]Ph.D. Research Scholar, Department of Extension Education, Rajasthan Collage of Agriculture, MPUAT, Rajasthan, India
[2]Professor and Head, Department of Extension Education, Rajasthan Collage of Agriculture, MPUAT, Rajasthan, India
[3]ICAR-Emeritus Professor, Department of Extension Education, Rajasthan Collage of Agriculture, MPUAT, Rajasthan, India

Abstract

India is the highest milk producer and ranks first position in the world contributing 24.64% of global milk production in the year 2021-22.In the current year 2021-22, the milk production has registered an annual growth rate of 5.29%. Top five major milk producing States are Rajasthan (15.05%). Hence, Rajasthan is the highest milk producing state in India. The present study was conducted in Udaipur district of Southern Rajasthan. There are 22 Panchayat Samiti, out of which two Panchayat Samiti namely Bhinder, and Sakumber were selected on the basis of maximum milk collection centers. From each selected Panchayat Samiti, Three milk collection centers were selected on the basis of maximum milk collection and 20 respondents (10 beneficiary and 10 non-beneficiary) from each milk collection center were randomly selected with the help of MCC incharge. Thus, total 120 respondents were selected for the study. Data were collected from the respondents by using interview schedule. The collected data was categorized, analysed by using appropriate statistical measures in computer and tabulated for the convenience.The study indicated that 53.33 percent of beneficiary respondents and 26.67 per cent of non-beneficiary respondents belong to high level of adoption category and 31.67 per cent of beneficiary respondents and 35.00 per cent of non-beneficiary respondents belong to medium level of adoption category of improved milk production practices. On the other hand, 15.00 percent of beneficiary respondents and 38.33 per cent of non-beneficiary respondents belong to low level of adoption category of improved milk production practices.It was observed that majority of non-beneficiary farmers had low level of adoption about improved milk production practices so capacity building training program should be organized to enhance the adoption level of non-beneficiary farmers.

Key words: *MCC, Adoption, Breeding, Saras dairy, Feeding, Management practices.*

Assessing stinging nettle leaves as a potential source of cellulose for nanocellulose production

Dharna Bhardwaj[1], Vimal Chandra Srivastava[1], [2]*

[1]Centre for Nanotechnology, Indian Institute of Technology Roorkee, Roorkee, Uttarakhand 247667, India

[2]Department of Chemical Engineering, Indian Institute of Technology Roorkee, Roorkee, Uttarakhand 247667, India

Corresponding author emails: dharna_b@nt.iitr.ac.in (D. Bhardwaj), vimal.srivastava@ch.iitr.ac.in (V.C. Srivastava).

Abstract

With its leaves having a cellulose content of around 85%, the stinging nettle plant (Urtica dioica) has drawn interest for its potential as a cellulose source. The study investigates the viability of obtaining nanocellulose from stinging nettle leaves and considers its potential use in treating wastewater. Stinging nettle, which has long been used medicinally, appears to be a promising option for cellulose extraction, providing an environmentally friendly alternative to traditional sources. Stinging nettle, with its considerable cellulose content, offers an exciting path for the sustainable manufacturing of cellulose-derived goods. The study focuses on nanocellulose, a cellulose derivative with nanoscale dimensions. The study describes the technique of obtaining nanocellulose from stinging nettle leaves, emphasising its versatility as a material with several uses. Because of its superior adsorption properties, nanocellulose is widely used in wastewater treatment. By taking use of nanocellulose's intrinsic qualities, such as large surface area and reactivity, it may efficiently adsorb impurities and pollutants from wastewater streams, therefore aiding purification. Furthermore, the applicability of nanocellulose goes beyond wastewater treatment. It has potential for the production of nanocomposites, with applications in a variety of sectors. Nanocellulose-based nanocomposites have improved mechanical characteristics, biodegradability, and sustainability, making them suitable for a variety of applications ranging from packaging materials to biomedical devices. Finally, the study emphasises the untapped potential of stinging nettle leaves as a source of cellulose for nanocellulose manufacturing. By using this natural resource, tremendous progress may be achieved towards sustainable industrial methods and new wastewater treatment systems and beyond.

Keywords: *Stinging nettle; cellulose; nanocellulose*

Entomophagy in Transition: Unveiling the Scientific Foundations for Edible Insects in Global Food Security

[1]Dilip Kumar Chaurasiya, [2]Smita Gorai, [1]Biplov Chandra Sarkar [3]Siddharth Singh, and [4]Hemadri Bag

[1]Faculty of Agricultural sciences, GLA University, Mathura, Uttar Pradesh-281 406(IN)
[2]Department of Agriculture, Invertis University, Bareilly Uttar Pradesh- 243 123 (IN)
[3]Department of Plant Pathology, C. S. Azad University of Agriculture and Technology, Kanpur-208002, Uttar Pradesh (IN)
[4]Krishi Vigyan Kendra, OUAT, Rayagada, -765022, Odisha (IN)

**Corresponding Author: dilip.chaurasiya@gla.ac.in*

Abstract

This study critically assesses the emerging interest in edible insects as a sustainable food source, leveraging insights from academic research, the business sector, and the local insect trade in Southeast Asia. While entomophagy has long been practiced in tropical regions, Western societies are progressively embracing insect consumption due to heightened global demand for alternative protein sources, driven by escalating meat consumption and dwindling agricultural land. Edible insects, characterized by their substantial protein, fat, mineral, vitamin, and fiber content, emerge as pivotal contributors to alleviating hunger and advancing ecologically sustainable food security. The abstract underscores the imperative of consumer acceptance and their willingness to pay a premium for insect-derived products to ensure the economic viability of the insect farming chain. Additionally, the study delves into the environmental incentives influencing consumer adoption of edible insects, presenting them as a pragmatic solution to the intricate challenges of global food and feed security amidst population growth and agricultural yield decline.

Keywords: *Edible Insects, Entomophagy, Environmental Incentives, Global Protein Sources, and Sustainable Food Security.*

Evaluation of Antidiabetic and Antihyperglycemic Effects of Foxtail Millet (*Setaria italica* L. beauv) Extract in Type II Wistar albino Diabetic Rats: A Histopathological and Phytochemical Analysis

Divya Singh[ab]*, Alok Mukherjee[c], and Kapil Lawrence[a]

[a]Department of Biochemistry and Biochemical Engineering, Jacob Institute of Biotechnology and Bioengineering, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

[b]Prof. Rajendra Singh (Rajju Bhaiya) University, Prayagraj, Uttar Pradesh, India

[c]United Institute of Pharmacy, U.C.E.R., Prayagraj,Uttar Pradesh, India

email id-divyamaltisingh@gmail.com a*, kapil.lawrence@shiats.edu.ina

Abstract

Type II diabetes mellitus poses a significant global public health challenge. This condition exerts serious adverse effects on human health, often necessitating the use of conventional medications. In contrast, herbal remedies, such as those derived from the Setaria italica crop, commonly known as foxtail millet, have gained attention for their potential therapeutic benefits. Foxtail millet, utilized in various culinary applications, including sweet and savory dishes, is particularly promising for individuals with diabetes in India due to its low gluten content. This study aimed to assess the antidiabetic and antihyperglycemic effects of foxtail millet (Setaria italica L. beauv) in type II diabetic rats, along with histopathological changes. Additionally, it sought to quantify kaempferol and quercetin in foxtail millet using validated high-performance thin layer chromatography (HPTLC). Five superior genotypes of foxtail millet (FM), designated as K-1, K-4, K-5, K-6, K-7, and K-10, were selected for investigation from a pool of 10 genotypes. Initial antidiabetic activity was assessed through various parameters including DPPH

scavenging activity, glycogen content, and histological examination of rat organs, namely liver, muscle, and blood. Subsequently, experiments involving oral administration of Setaria italica seed aqueous extract (SISAE) in streptozotocin-induced diabetic rats were conducted and compared with glibenclamide, a standard oral hypoglycemic agent. Long-term treatment effects of 300 mg of S.I.S.A.E./ kg body weight/day on blood glucose and glycemic control were evaluated in normal and diabetic rats. Significant reductions in fasting blood glucose levels and improvements in glycemic control, evidenced by lower HbA1c levels, were observed in diabetic rats treated with foxtail millet extract compared to untreated diabetic rats. Variations in glycemic index were noted among the five foxtail millet genotypes studied. Minor histopathological changes, including cholesterol hemorrhage and lymphocytic infiltrations, were observed in the liver of treated rats, though no significant alterations in liver gross were detected. Experimental findings suggest that the aqueous extract of foxtail millet seeds possesses notable antihyperglycemic properties and holds promise as a natural health product source.

Keywords: *Type II diabetes mellitus, streptozotocin, antidiabetic activity, phytochemicals, glycogen, histopathology, HPTLC, kaempferol, quercetin.*

Development of Plant-Based Functional Edible Coating for Enhancing the Quality and Safety of Perishables via the Zero Plastic Waste Models

Suman Singh

Department of Food Engineering, Institute of Food Science & Technology, VCSG Uttarakhand University of Horticulture and Forestry, Majri Grant, Dehradun, 248140, Uttarakhand, India

Abstract

The urgent need for sustainable packaging solutions in the food industry has led to the exploration of plant-based functional edible coatings as a method to extend the shelf life of perishables while adhering to the zero plastic waste models. This review focuses on the advancements in edible coatings derived from natural sources, emphasizing their potential in improving food quality and safety through the incorporation of antimicrobial and antioxidant agents. It highlights the benefits of these coatings in reducing environmental impact by offering a biodegradable alternative to conventional plastic packaging. Challenges related to production scalability, regulatory issues, and consumer acceptance is discussed. The paper concludes by underlining the significance of edible coatings in achieving sustainability goals, suggesting future research directions for enhancing their applicability and market readiness. This synthesis advocates for a multidisciplinary approach to innovate in the realm of edible coatings, contributing to a more sustainable food packaging paradigm.

Keyword- *Sustainable Packaging, Plant-Based Edible Coatings, Perishables, Food Quality, Food Safety,*

Impact of Weed Control Strategies and Planting Techniques on Summer Rice Production

A. M. Rathod[1], V. P. Parmar[2], T. U. Patel[3]

[1]Department of Agronomy, College of Agriculture, Parul University,Vadodara-391760 (Gujarat)
[2]Department of soil science and Agri. chemistry, College of Agriculture, Parul University,Vadodara-

391760 (Gujarat)

Corresponding Author E-mail: apexa.rathod395@gmail.com

Abstract

A field experiment was conducted during summer season of 2019-20 and 2020-21 at the College Farm, N. M. College of Agriculture, Navsari Agricultural University, Navsari to study the "Weed management in summer rice under different establishment methods". The experiment was laid out in split-plot design and replicated four time. Three crop establishment methods were assigned to main plots viz. S1: Direct Seeded Rice, S2: Conventional Transplanted Rice, S3: Sprouted Seed (line sowing) whereas five weed management practices in sub-plots within each main plot viz. W1: Weedy check (control), W2: 2 HW at 20-25 and 40-45 DAS/T, W3: Pretilachlor 50 % EC 1000 g ai/ha (Pre) fbBispyribac sodium 10 % SC 25 g ai/ha at 30 DAS/T, W4: Pyrazosulfuron-ethyl 10 % WP 15 g ai/ha (Pre) fbBispyribac sodium 10 % SC 25 g ai/ha at 30 DAS/T and W5: Pretilachlor 50 % EC 1000 g ai/ha (Pre) fb Chlorimuron ethyl + Metsulfuron methyl 20 % WP 4 g ai/ha at 30 DAS/T were evaluated on rice cv. NAUR 1. The soil of the experimental field was clayey in texture, medium in available nitrogen (223.4 and 219.6 kg/ha), phosphorus (39.4 and 37.6 kg/ha) and fairly rich in available potassium (391 and 383 kg/ha), slightly alkaline in reaction (pH 7.9 and 7.8) with normal electrical conductivity (0.37 and 0.35 dS/m). Transplanted rice (S2) among establishment methods and 2 HW at 20-25 and 40-45 DAS/T (W2) recorded highest weed control efficiency, rice grain and straw yield, gross return and lowest weed seed bank. Among weed management treatments, Pretilachlor 50 % EC 1000 g ai/ha (Pre) fb Chlorimuron-ethyl + Metsulfuron-methyl 20% WP 4 g ai/ha at 30 DAS/T (W5) and among methods of sowing recorded the lowest weed index. and S2W5 recorded highest net returns. Further, benefit cost ratio was highest in S3W5.

Key words: *Herbicide, Transplanting, Weed, Weed Index, Weed Seed Bank*

Agricultural Extension Approaches for Sustainable Development Goals in India: A case study of the Farmer FIRST Programme

Dr. Arpita Sharma Kandpal and Dr. S. K. Kashyap

Assistant Professor, Dept. of Agricultural Communication, College of Ag, GBPUA&T, Pantnagar
Dean, College of Agriculture, GBPUA&T, Pantnagar

Abstract

A pivotal focus of India's development goals revolves around agricultural advancement and the well-being of farmers. Over the years, diverse strategies have been employed to stimulate agricultural growth, transitioning from a primary emphasis on food self-sufficiency to sustainable income generation and inclusive progress. Introduced in 2016, the Farmer FIRST Programme (FFP), an innovative extension initiative by the Indian Council of Agricultural Research (ICAR), has played a crucial role in expanding the reach and efficacy of agricultural research through a collaborative approach involving multiple stakeholders.This paper assesses the impact of the FFP within ICAR institutions, specifically examining its role in upscaling promising technologies that have significantly benefited the farming community. The evaluation criteria encompass farm income, cropping intensity, the usage of chemical fertilizers,

pesticides, organic manure, and nutritional security. The findings indicate a noteworthy increase in income, cropping intensity, nutritional security, and a reduction in pesticide usage as a direct result of the FFP. FFP interventions have markedly enhanced farm income and nutritional security. These positive outcomes advocate for the broader implementation and institutionalization of the FFP approach on a national scale.

Key words: *Farmer First Project, Extension Approaches, Sustainable development goal*

Effect of Changing Weather on Incidence of Leaf Crinkle Virus in Three Popular Varieties of Blackgram

M. Johnson[1]*, P. Srivalli[1], V. Madhuri[2], K. Sunil Kumar[1], V. Chandrika[3] and M. Sreenivasa Chari[1]

[1]Agricultural Research Station, Utukur, [2]Polytechnic of Agriculture,
[3]S.V. Agricultural College, Tirupati

Corresponding author email: m.johnson@angrau.ac.in

Abstract

Blackgram is the most important short duration pulse crop grown throughout the year in various states of our countrydue to its suitability to fit into various cropping systems and most importantly because of its commercial value.Among the various viral diseases,Leaf crinkle virus in Blackgram designated as Urdbean leaf crinkle disease (ULCD) is an economically significant, widespread and devastating disease having potential in causing heavy yield losses upto 35 to 81% depending on cultivated varieties and their cropping seasons. The susceptible genotypes and favourable climatic conditions further can aggravate the outbreak of viral disease.Among the different management factors, sowing time is known to influence yield and optimum date of sowing could be an important strategy to avoid the outbreak of economically important diseases and to get higher yields with better quality.Keeping this in view,an experiment was taken up to study the influence of changing weather on incidence of ULCD on popular varieties in Blackgram i.e., PU-31, TBG-104 and LBG-752 and to find out the most favourable sowing window of Blackgram during Rabi season in southern zone of Andhra Pradesh. Study conducted at Agricultural Research Station, Utukur, Kadapa during 5 dates of sowing (October I FN (D1), October II FN (D2), November I FN (D3), November II FN (D4) and December I FN (D5)) in rabi 2021 and rabi 2022 to know the influence of weather parameters like maximum temperature (Tmax), minimum temperature (Tmin), diurnal temperature (Tmax - Tmin), relative humidity at morning hours (Rh1), relative humidity at evening hours (Rh2) and rainfallon spread and outbreak of this viral disease. PDI (Percent Disease Index) of ULCD was Recorded on weekly interval and data on yield and yield attributes was collected during 2022.Results of correlation studies indicates that PDI of ULCD during D2,D3, D4and D5showed positive correlation with Tmaxand Tminwhile, negative correlation with Rh1, Rh2 and rainfallduring both rabi seasons of 2021 and 2022 and in all the three varieties studied.Correlation analysis pooled over all the 10 dates of sowing indicated thatTminhas recorded highly significant positive correlation with PDI of ULCD in all the three varieties tested. Hence, it is concluded thatTminhas played a crucial role in initiation and further spread of the leaf crinkle disease in Blackgram during rabi season.A regression analysis of the data inferred that the weather parameters as a whole contribute about 99.8 %, 80.4 % and 93.1 % to the incidence of ULCD in three varieties i.e. PU-31, TBG-104 and

LBG-752, respectively. From this study it is evident that, during the months with low rainfall during rabi season, a range of Tmaxof 29 to 33 ? while a range of Tminof 22? and above and a diurnal temperature variation of 9? or below can create the most favourable microclimate for vector transmission of ULCD. The PDI of ULCD was less in all the dates of sowings during 2022 compared to 2021 as Tminrecorded was below 20 ?. Highest average per cent disease incidence (PDI) of 23.0 and 22.4% was recorded during December I and November II fortnights respectively with lower seed yields in all the three varieties. Highest seed yield of 1194kg/ha was recorded during October II fortnight sowing in all the three varieties and hence concluded as optimum sowing window for Blackgram for rabi season in Southern zone of Andhra Pradesh.

Key words: *Weather, Leaf crinkle virus, Blackgram varieties-PU-31, TBG-104 and LBG-752*

Mass multiplication of Pipali (*Piper longum* L.) via adventitious shoot regeneration from leaf petioles

Era Vaidya Malhotra*[1], Shreya Sharma[1], Sangita Bansal[2], K. Pradheep[3]

[1]Division of Germplasm Conservation, ICAR - National Bureau of Plant Genetic Resources, New Delhi

[2]Division of Genetic Resources, ICAR - National Bureau of Plant Genetic Resources, New Delhi

[3]ICAR - National Bureau of Plant Genetic Resources Regional Station Thrissur, Kerala

Corresponding author: Era V. Malhotra, Scientist, Division of Germplasm Conservation,

ICAR - National Bureau of Plant Genetic Resources (NBPGR), New Delhi

Email: Era.Vaidya@icar.gov.in

Abstract

Genus Piper comprises of large number of species growing as aromatic herbs in the hot and humid regions of the Indian subcontinent. Among these,Piper longumcommonly known as Indian long pepper or pipli, is an economically important species of this genus. It is found in the Western Ghats as well as the North Eastern regions of the country and is abundantly used in the traditional medicine system of Ayurveda. This plant has also gained importance in pharmaceutical as well as food industry for its essential oils and oleoresins. Pipali is not commercially cultivated but is mainly collected from the wild, leading to its over exploitation and hence posing a threat to its survival. Therefore, there is an urgent need to develop practices for the large-scale multiplication and conservation of this vital genetic resource. Naturally this plant is a poor seed setter and is propagated vegetatively, however, this mode of propagation is slow. A protocol for large scale multiplication via induction and regeneration of adventitious buds on petiole explants is presented. Shoot buds were induced on petiole explants on high cytokinin supplemented Murashige and Skoog (MS) medium without an intervening callus phase. Direct organogenesis was observed on MS medium supplemented with 3 mg/l BAP, leading to the formation of rosette like structures with clusters of shoot buds within 40 days of culture. Further, shoots were induced from the buds on separating them and transferring onto low cytokinin (0.1 g/l) supplemented medium. Shoots elongated to form plantlets within two months and in vitro rooting was induced on the same medium. Thus, a method for large scale multiplication of disease free Pipali plants using petiolar

explants is presented. The multiplied plants can be used for commercial cultivation, germplasm conservation and genetic improvement.

Role of kn1 gene in enhancing cob length of tropical field corn (*Zea mays* L.) and their utilization in hybrid breeding

Ganapati Mukri[1]*, Chandra Prabha[1], Shilpa[1], Jayant S Bhat[1], RN Gadag[1], and Navin C Gupta[2]

[1]ICAR-Indian Agricultural Research Institute, New Delhi
[2]ICAR-National Institute for Plant Biotechnology

Corresponding author: ganapati4121@gmaill.com

Abstract

Systematic genetic studieson the cob length (CL) of maize led to the identification of several genes and few of them are cloned and characterized. The knotted 1 (kn1) is one such gene, which belongs to the KNOX homeobox gene family, and has a significant association with the cob length of temperate maize germplasm. The cob length (CL),kernel number per row (KPR), and kernel row number (KRN) are highly correlated with the number of kernels per cob in maize. Eventually, the length of the cob facilitates the variability in KPR, hence it determines the final cob weight and grain yield. Using a next-generation sequencing-based approach (Illumina_2500 platform), the amplicon sequence (7477bp) of the kn1 gene (GRMZM2G017087) generated from the total eight stable inbred lines (four with high CL, 15-23 cm, and four with low CL,6-10 cm) was aligned along with the reference kn1 gene sequence (B73).A totalof 64 SNPswas observed between reference and test genotypes. A totalof 13 SNPs was causing non-synonymous mutation at 114, 147, 160, 175, 631, 670, 687, 697, 931, 933, 934, 946, and 2943 nucleotide positions which led to the change in respective amino acids evident in the allelic variation present in the tested inbred lines. In addition, the inbred lines with high CL, AI 538 and AI 541, showed 75 bp deletion in their mRNA (length:1326 bp) sequence compared to low CL, AI 542 (length of mRNA:1401 bp) which leads to a reduction of 25 amino acids. Three different structure prediction toolsviz., SAS, Alpha Fold, and SWISS model were used to see the difference between the protein structure of high and low CL inbred lines which indicated thathomeobox protein knotted-1-like 6 proteinspecifically present in the AI 541 (high CL) may be theprobable reason for increased CL in field corn. Further RNA expression analysis also clearly differentiated the high CL inbred lines from the low. The generated hybrid between AI 541 and AI 542 showed high CL and productivity.

Keywords*: *Cob length, field corn, NGS, SNPs, protein structure, expression analysis

Deciphering the morpho-phenological diversity of a panel of tropical field corn (*Zea mays* L.) inbred lines

Shilpa[1], Ganapati Mukri[1]*, SB Tripathi[2], Jayant S Bhat[1], RN Gadag[1], Chandra Prabha[1] and KV Gowtham[1]

[1]ICAR-Indian Agricultural Research Institute, New Delhi
[2]TERI school of advanced studies, New Delhi

Corresponding author:ganapati4121@gmaill.com

Abstract

Genetic diversity is the prerequisite for any crop improvement program. Maize is a versatile crop that has high genetic variability but framing the required variability in to development of hybrids/varieties is the successful implication of notable variability. In this connection, the available active collections of inbred lines (514) from the field corn improvement program of ICAR-IARI were studied for their genetic versatility, considering the parameters of Growers Distance (Corehunter 3.0), and a total of 206 were found distinct/variable among them. These selected 206 inbred lines were evaluated in two seasons (kharif 2022, and kharif 2023) at ICAR-IARI, New Delhi, and one season (rabi 2023) at IARI-RRC-Dharwad, Karnataka and they were characterized for a total of 31 morpho-phenological traits as per maize-DUS descriptor. The hierarchical cluster analysis indicated that the given inbred lines were genetically highly diverse. As it does not form any structural population within the available population, this can be a candidate population for genome-wide association studies. The maturity of inbred lines ranged from early to late and grain yield ranged from134 to634Kg/ha. The other important yield component traits viz., Cob Length (CL) (5.50-20.40 cm), Cob Girth (20.00-53.00 mm), Kernel Row Number (KRN) (6.00-26.00) and Kernels per Row (KPR) (7.00-37.00), Test Weight (TW) (10.79-35.24 g), etc. showed high variability indicating their possible effectiveness of the selection of target traits. There was a highly significant correction between KRN and CG (0.43), CL and KPR (0.72), and KRN and Grain Yield (0.43), suggesting that further genetic enhancement of yield in maize is possible by selecting these diverse and intercorrelated traits. However, understanding possible genetic gain through the careful utilization of this variability is a prerequisite for designing effective breeding pipelines. Hence, the yield component traits were subjected to Best Linear Unbiased Prediction (BLUP) analysis, and understood that PML 17, AI 537, C11, CML 565, and AI 511 may be the best-inbred lines that can be targeted for futuristic genetic gain in field corn.

Keywords: *field corn, DUS, growers distance, hierarchical cluster, BLUP, genetic gain*

Comparative Assessment of Foliar Damage by Fall Armyworm (*Spodoptera frugiperda* (J.E. Smith)) in Elite Field Corn (*Zea mays* L.) Inbred Lines Using Field and Molecular Marker-based Screening

Ganapati Mukri*, KV Gowtham, MK Dhillon, Jayant S Bhat, RN Gadag, Shilpa, Chandra Prabha and Monika Sahu

[1]ICAR-Indian Agricultural Research Institute, New Delhi

Corresponding author: ganapati4121@gmaill.com

Abstract

Field corn is an important crop worldwide, but its productivity is threatened by the invasive pest fall armyworm (FAW). While FAW's impact on corn is widely studied, comprehensive field screening for foliage damage remains limited. To assess the reaction or incidence of FAW and investigate the relationship between damage scores and traits like anthocyanin content, seedling vigor, glossiness, leaf chlorophyll content, and trichome density/cm2 in thirty elite inbred lines across two distinct locations (ICAR-IARI, New Delhi and IARI-RRC, Dharwad). Significant genotype-environment interactions

were found to influence foliage damage and genotypes with consistently lower damage scores (AI 542, AI 125, AI 155, PDM 24-1, C 11) emerged as promising candidate inbred lines for developing FAW-resistant hybrids. The correlations between damage scores and characters like anthocyanin content, seedling vigor, glossiness, and leaf chlorophyll content may be good indicators for plant health and resilience. GGE [Genotype main effect (G) plus genotype by environment interaction (GE)] biplot analysis and BLUP (Best Linear Unbiased Prediction) estimation aided genotype evaluation, and predictionwas followed to selectresistant inbred lines. Inbreds with damage scores and BLUP values below the mean predicted damage were found promising for their yield-attributing traits as well. Characterization of a total of 26 (candidate gene-based) SSR markers across the test material indicated that the material under study was genetically significantly different from each other. These markers differentiated the tolerant genotypes from the susceptible. Multiple-choice and no-choice methods of evaluation of genotypes at controlled conditions indicated that the possible role of antibiosis may be the reason for the tolerance mechanism offered by the inbred lines against FAW.

Keywords: *field corn, FAW, inbreds, SSR, BLUP, antibiosis*

Isolation of novel mutants using electron beam irradiation for kernel attributes in field corn (*Zea mays* L)

Ganapati Mukri*[1], Chandra Prabha[1], Shilpa[1], Jayant S Bhat[1], RN Gadag[1] and Suvendu Mondal[2]

[1]ICAR-Indian Agricultural Research Institute, New Delhi
[2]Nuclear agriculture and Biotechnology Division, Bhabha Atomic Research Centre, Mumbai, India

Corresponding author:ganapati4121@gmaill.com

Abstract

Though natural variability does exist in maize, the application of mutagen will give an additional opportunity for the creation of geneticvariability.In the present investigation a field corn inbred line, AI 544, a medium maturing inbred line having good general combining ability was irradiated with a 200 Gy Electron beam. The M1 generation was raised during kharif 2021 at ICAR-IARI, New Delhi. Individual plants were self-pollinated and the M2 population was planted at the IARI-RRC, Dharwad during rabi 2021-22. Out of 1600 individuals, a total of 42 distinct mutants were isolated along with 128 variable plant types. Various morphological traits viz., leaf angle, leaf width, flowering date, and tassel density were the prime considerations for the identification and selection. These selected plant types were advanced to the next generation and planted at ICAR-IARI during kharif 2022. However, plants showed segregation, and a total of 286 mutant plants were observed in the M3 generation. These mutants were individually characterized and they distributed among a total of 17 distinct classes and the mutants showed increased kernel attributes and leaf parameters (gigas leaf).In addition, to understand the molecular basis of this mutation, a total of 50 SSR markers (five from each chromosome) were characterized against 37 mutants selected for seed size. The clusters generated through neighbor-joining distributed all the mutants into eight clusters. A total of three mutants showed molecular similarity with the wild-type inbred lines (AI 544) having kernel test weight (TW) 21.2 g. On the other hand, the mutants distinct from the original inbred lines showed improved kernel TW range from 31.7-42.8 g.

After stabilizing these mutants, novel variations can be used for the trait-specific improvement of field corn.

Keywords*: field corn, electron beam, kernel attributes, mutants, SSR markers, inbred lines*

Pulses Production Performance in India: Significance and Sustenance in 21st Century

I. Sekar[1]* and Shiv Kumar[2]

[1]&[2] ICAR-National Institute of Agricultural Economics and Policy Research, DPS Marg, Pusa, New Delhi 110012, India

Corresponding author email: sekar_i@yahoo.com

Abstract

The study assessedthe performance of pulses production at the turn of the 21st century in India. By segregating two decadal periods, the secondary data sourced for the first period (2001-02 to 2010-11) and the second period (2011-12 to 2021-22). Using the exponential form of the function, compound annual growth rates were estimated for the two periods and the overall performance was also assessed. Total pulses have registered a pronounced growth performance particularly during period II (4.78 per cent). Individual commodity wise analysis revealed that tur (arhar) production growth has been higher (5 per cent) in period IIthan period I (2.07 percent), owing greatly to the schemes implemented specifically for improving the production of pulses in the country through provision of good quality seeds and inputs and setting up of seed banks across the country. It was also found that gram production growth has been consistently positive and significant (more than 5 percent) in both the periods. Despite lentil witnessed a dismal negative growth rate (-0.12 per cent) during period I, it revived during period II (2.87 per cent) which more than offset the negative rate and achieve an overall CAGR of 2.03 per cent. This provides an insight needing sustained efforts in order to maintain self-sufficiency and further to achieve surplus and net exporting status of pulses in the country.

Keywords: *Compound annual growth rate, Pulses, Production, Gram, Tur, Sustenance*

Study on impact of brick kiln emissions on Apple leaves (*Malus pumila* L. var. Red Delicious) in orchards of Budgam District of Kashmir Himalaya

Javeed I. A. Bhat[1]* and Humayun Azad[2]

[1],[2]Division of Environmental Sciences, Faculty of Horticulture, SKUAST Kashmir-190025

Corresponding author email: javeediqbbal123@gmail.com

Abstract

The study was conducted during 2020 and aimed at to study the impact of brick kiln emissions on quality and heavy metal accumulation in apple foliage of Malus pumila L. var. Red Delicious. Two orchards of same age group were selected, one at brick kiln site and another five Km away from brick kiln emission as control. The results revealed the decrease in photosynthetic pigments (chlorophyll a, chlorophyll b, total chlorophyll and carotenoids) in the leaves of apple tree at brick kiln site as compared

to control. While determining the pH it was noticed that pH of the leaves around brick kiln was acidic as compared to control. Macronutrients (Na, K, Ca, Mg, P) also showed decreasing trend at the impact site. Total phenolics, ascorbic acid, relative water content and APTI while estimated showed an increased proportion in the leaves under the exposure to brick kiln emissions. The higher levels of heavy metal accumulation in the leaves at experimental site as compared to control follows the trend as Cd>Fe>Zn>Cu>Ni>Pb>Mn.

***Key Words**: Brick kiln, Apple Orchard and Heavy Metals.*

Stream stories : Unravelling the Ichthyological diversity and threats of Tissa river basin in Arunachal Pradesh, eastern Himalaya.

Junngam Khiham[1]* J.A. Johnson[2] and Prasanta Nanda[3]

[1]Department of Habitat ecology, Wildlife Institute of India, Chandrabani, Dehradun 248001, Uttrakhand, India, junngamk@wii.gov.in

[2]Department of Habitat ecology, Wildlife Institute of India, Chandrabani, Dehradun 248001, Uttrakhand, India, jaj@wii.gov.in

[3]Department of Zoology, Dera Natung Government College, Itanagar 791110, Arunachal Pradesh, nandapz71@gmail.com

Corresponding author e-mail: jkhiham@gmail.com

Abstract

Global extinction rate of fishes are in excess due to their heightened sensitivity to changes in both the quantity and quality of aquatic habitats. Understanding intricacies of species diversity influenced by changing environmental factors that shape the species assemblage of a region is crucial for comprehending and conserving riverscapes. This objective becomes especially crucial in the lessexplored eastern Himalayan state of Arunachal Pradesh, where ichthyological information is sporadic for most river systems. This study delves into the ichthyofaunal diversity of Tissa River basin, offering insights into the rich but often overlooked aquatic life of this unique region paving way for effective conservation measures. The study was carried out during February to April in pre-monsoon period of the state along the altitudinal gradients varying from 100 m - 1500 m. A total of 48 fish species belonging to 12 families were recorded with highest number of species (18) belonging to familyCyprinidae followed by Nemacheilidae (7 species) and least species under Psilorhynchidae, Cobitidae, Bagridae, Amblycipitidae and Mastacembelidae with one species each. The species richness varied from 0 to 23 with highest species diversity recorded in Chettum river (H'=3.153, site 13). All the 19 sites were also surveyed to note the presence of any prevailing threats along the river channel. Habitat fragmentation, destructive fishing , over fishing and excessive removal of river bed rocks leading to habitat destruction were amongst the most prominent threats witnessed. The above discoveries emphasize the pressing need for immediate action to enhance conservation efforts in response to escalating anthropogenic activities and environmental shifts.

***Keywords**: Ichthyological diversity, fish, Tissa river, north-eastern Himalaya, anthropogenic threats, conservation*

Evaluation of Novel primers for *Ralstonia pseudosolanacearum* detection

Jyotsana Maura[1]* Merwyn P. Raj[1] Vineeta Bhatt[1]*, Ankur Agarwal[1] Devkanta P. Singh [1]Veena Pande*.

[1]Defence Institute of Bioenergy Research (DIBER), DRDO P.O Arjunpur, Haldwani 263139 Uttarakhand, *Kumaun University Nainital 263001

Corresponding author mail id; jyotsana.maura7@gmail.com

Abstract

Ralstoniapseudosolanacearum (R. pseudosolanacearum) is a Gram-negative, soil- borne, vascular phytopathogen that damages host plants by infecting through their roots, causing wilting disease in numerous crops worldwide causing significant economic losses. Accurate and rapid detection methods are crucial for effective disease management.This study aimed to detect the Ralstoniapseudosolanacearum through the utilization of two newly designed primer sets targeting the gene precorrin methyl transferase and helix-turn -helix transcriptional regulator. The primer sets were designed and optimised by the insilco analyses and further tested by Polymerase chain reaction (PCR). Furthermore the specificity of the primer was tested against non- target bacterial strains. Results of the study demonstrated that the utilization of these primer sets gave positive results with all the strains of R. pseudosolaneacearumtested. Moreover, the primers through rigorous testing and validation can further be utilised for detection of R. pseudosolaneacearum in heterogeneous environment.

Keywords: *Phytopathogen, Ralstoniapseudosolanacearum, Molecular diagnostic, Polymerase chain reaction, Novel primer.*

Moisture sensor based irrigation to increase fresh pod yield of pea

K Arunadevi[1]*, Singh M[2], Khanna M[2]., Mishra AK[2]., Prajapati VK[2], Denny F[3], Ramachandran J[4], Maruthi Sankar GR[5]

[1]Dept. of Soil & Water Conservation Engineering, Agricultural Engineering College and Research Institute, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India
[2]Water Technology Centre, Indian Agricultural Research Institute, ICAR, New Delhi-110012, India.
[3]Regional Agricultural Research Station, Kerala Agricultural University, Wayanad, 673593, Kerala, India
[4]Agricultural Engineering College &Research Institute, TNAU, Coimbatore, 641003, Tamil Nadu, India.
[5]Central Research Institute for Dryland Agriculture, ICAR, Santoshnagar, Hyderabad-500059, India.

****Corresponding Author: arunadeviswce@gmail.com***

Abstract

Pea is the delicious vegetable consumed in India. Conventional irrigation is being practiced to cultivate pea crop, which consumes lot of water and uneven distribution of soil moisture. Drip irrigation plays a major role for uniform distribution of water. Further water saving and maximum water use efficiency can be achieved through innovative technologies like soil moisture sensor based irrigation scheduling

for pea. Moisture presence in soil can be detected by soil moisture sensors or Tensiometers. When irrigation is scheduled based on soil moisture measurement using tensiometers or soil moisture sensors, it would increase fresh pod yield of pea and improve water productivity.A research was conducted on pulse crop of pea (Pisum Sativum L.) to decide irrigation quantity and frequency according to the presence of soil moisture with different irrigation and fertigation treatments. The research findings indicated irrigation at the soil moisture tension of ?30 kPa with 1.2 times more fertilizer application would bring maximum yield and water productivity of pea.

Keywords: *Irrigation scheduling, Pea crop, Soil matric potential, Tensiometer, Water productivity*

In vitro propagation of *Crepidium acuminatum* (D.Don) Szlach., an endangered medicinal plant of Uttarakhand, India

Kalpana Rautela[1],[2], Arun K. Jugran*[1], Prem Prakash[2]

[1]G. B. Pant National Institute of Himalayan Environment, Garhwal Regional Centre, Upper Bhaktiyana, Srinagar Garhwal - 246174, Uttarakhand, India
[2]Department of Botany, M. B. Govt. P. G. College Haldwani (Nainital), Uttarakhand - 263139

E-mail presenter author: kalpnarautela@gmail.com

****E-mail corresponding author: arunjugran@gmail.com***

Abstract

Crepidium acuminatum (D.Don) Szlach. is an herbaceous medicinal plant of the family Orchidaceae, utilized in several Ayurvedic and modern medicines. As C. acuminatum is harvested from nature to meet the demands, it is facing threats in its natural habitats. Hence, the present study attempted to standardize the propagation protocol for the target species followed by acclimatization under various conditions. The vegetative propagules of C. acuminatum were grown on MS media supplemented with sucrose, vitamins, and varying concentrations of cytokinins and auxins to produce adventitious shoot buds. The explants over 0.5 cm in length showed positive responses to regeneration. Induction of shoot buds in explants was observed in the treatment of BAP/NAA (6µM each) either alone or in a combination [BAP (3µM) + NAA (1.5µM)]. The medium supplemented with NAA and BAP in 1:1, NAA, and TDZ in 1:2 ratios exhibited the highest shoot induction while the average plant height and the number of leaves were 3.5 cm and 3.0, respectively. The micro-shoots were then placed in a rooting medium containing auxin, specifically IAA/IBA, 2,4-D. The addition of activated charcoal did not impact the development of plantlets in nutrient media. Regardless of the type and concentration of cytokinin, all responding explants produced only one adventitious shoot. The regenerated plantlets were acclimatized and transferred in clay pots with a potting mixture of soil, sand, and composted leaves (1:1:1) and recorded a survival rate of 70-80% of plantlets. Thus, in vitro propagation protocol developed through the study can be used as a model for management, and domestication practices of this species along with the conservation of genetic resources of the species in near future. Additionally, proper legislation, including the collection and marketing is recommended for the sustainable use and conservation of such medicinal plants.

Keywords*: Crepidium acuminatum, Medicinal Plants, Micropropagation, Conservation strategy*

Progressive thoughts and relevance of using nano-enabled chitosan fertilizer for environmental rehabilitation

Kinjal Monda[l]* Pooja and Mala Ram

Department of Molecular Biology and Biotechnology, Maharana Pratap University of Agriculture and Technology, Udaipur-313001 (Raj.), India

Corresponding author: kinjal.mondal1234@gmail.com

Abstract

Agriculture is an essential sector for ensuring regional food security as well as national wealth. Therefore, upholding agriculture output is becoming crucial day by dayto feed the expanding population under ever-changing environment. Eventually, the growth of global crop yields has largely depended on heavy investments in chemical fertilizers. And unfortunately, improper application of commercially available chemical fertilizers has created strong barriers to the health of soil as well as entire ecosystem. Long-term chemical use can alter the pH balance of topsoil and cause a toxic build-up of certain nutrients which may attributes severe environmental issues in marine, freshwater and terrestrial ecosystems. Conventional chemical fertilizers are therefore realized to be modified and redesigned to overcome the negative consequences. In this context, nano enabled slow-release fertilizers may be the best option for nutritional security as well as environmental sustainability. Since few years back, the use of nanomaterials (NMs) in terms of next-generation fertilizers especially the biopolymer-based formulations at optimal dose have been appreciated to increase the nutrient utilization efficiency through a more controlled, and slower nutrient release phenomenon that could better match the sustained nutrient needs of crops across the time. In this regard, chitosan being biocompatible and biodegradable in nature has mostly been studied for crop protection and growth in agriculture since the last decade. Chitosan is a linear biopolymer of randomly distributed ?-(1?4)-linked D-glucosamine (deacetylated unit) and N-acetyl-D-glucosamine (acetylated unit), derived from the biowaste of seafood industry. In addition, chitosan possesses enough functional groups which can be used to functionalize with active ingredients (AIs). Chitosan-based functional fertilizer has piqued the invention of next-generation agrochemicals to ennoble modern agriculture.

Keywords: *Environment, slow-release fertilizer, nanomaterials, chitosan, active ingredient*

Phytochemical analysis and comparative in-vitro bioevaluation of encapsulated and unencapsulated Thymus linearis essential oil using chitosan polymer

[a]Kirti Nagarkoti#, [a]Om Prakash, [a]Ravendra Kumar, [b]R.M. Srivastava, [c]Satya Kumar, [d]D.S.Rawat

[a]Department of Chemistry, College of Basic Sciences and Humanities, G. B. Pant University of Agriculture and Technology, Pantnagar-263145, U.S. Nagar, Uttarakhand, India
[b] Department of Entomology, College of Agriculture, G. B. Pant University of Agriculture and Technology, Pantnagar-263145, U.S. Nagar, Uttarakhand, India

[c]Department of Plant Pathology, College of Agriculture, G. B. Pant University of Agriculture and Technology, Pantnagar-263145, U.S. Nagar, Uttarakhand, India
[d]Department of Biological Sciences, College of Basic Sciences and Humanities, G. B. Pant University of Agriculture and Technology, Pantnagar-263145, U.S. Nagar, Uttarakhand, India.

#Presenting author email: kirti.nagarkoti121@gmail.com

Abstract

The essential oils (EOs) derived from Thymus linearis Benth. (Lamiaceae), collected during the rainy and winter seasons in Nainital, Uttarakhand, India, were extracted using the hydrodistillation method. GC and GC/MS techniques identified over 91.5% and 95.7% of the rainy and winter EOs, respectively. The chemical composition of T. linearis rainy EO (TLREO) revealed significant amounts of thymol (48.2%), p-cymene (9.8%), ?-bisabolene (8.3%), borneol (8.2%), and trans-?-caryophyllene (6.1%). T. linearis winter EO (TLWEO) revealed the presence of carvacrol (28.8%), p-cymene (11.3%), ?-terpinene (5.1%), borneol (5.1%), trans-?-caryophyllene (4.8%), and ?-bisabolene (4.1%). TLREO and TLWEO, both encapsulated with chitosan biopolymer, were synthesized using the precipitation technique, followed by subsequent characterization through FTIR and SEM analyses. The pure EOs (TLREO and TLWEO), unencapsulated chitosan polymer (UCP) and encapsulated T. linearis rainy and winter EOs using chitosan polymer (ETRCP and ETWCP) exhibited good to moderate pesticidal activities, including nematicidal, insecticidal, and antimicrobial activity. The particle size varied based on the morphology of UCP (1.6 µm), ETRCP (3.9 µm) and ETWCP (4.4 µm). ETRCP and ETWCP exhibited better nematicidal activity against Meloidogyne incognita compared to pure EOs. Similarly, ETRCP and ETWCP showed increased antifungal activity against Curvularia lunata and antibacterial activity against Staphylococcus aureus when compared to pure EOs. However, ETRCP and ETWCP showed comparable insecticidal activity to that of pure EOs against Lipaphis erysimi. The in silico molecular docking was also performed using Auto dock software. The findings suggest that T. linearis is a rich source of phytochemicals and may be utilized for the development of herbal-based pesticidal formulations through encapsulation, after undergoing clinical trials.

Keywords- *Thymus linearis, nematicidal, insecticidal, antimicrobial, encapsulation, molecular docking*

Inclusion of microbial fermented canola meal in poultry diet as a partial substitute for soybean meal

Kirti Taneja[1]*, Sanjula Sharma[2], Pratibha Vyas[3], Prem Prakash Dubey[4]

[1]Department of Biochemistry, College of Basic Sciences and Humanities, Punjab Agricultural University, Ludhiana, Punjab, India
[2]Department of Plant Breeding and Genetics, Punjab Agricultural University, Ludhiana, Punjab, India
[3]Department of Microbiology, College of Basic Sciences and Humanities, Punjab Agricultural

University, Ludhiana, Punjab, India
[4]Department of Animal Genetics and Breeding, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, Punjab, India

Corresponding author: kirti-1842003@pau.edu

Abstract

Poultry products are among the most popular food items in ensuring global food security. Soybean meal is widely used in poultry diets; however, its availability and price volatility have prompted nutritionists to look for otherfeed alternatives. Canola meal has the potential to be a partial substitute for soybean meal in poultry feed; however, its use is restricteddue to the presence of phytates, an antinutrient that negatively impacts the production and performance of poultry. In the current study, Candida tropicalis (OR647639) yeast strain, isolated from curd sample, was used to ferment canola meal by solid-state fermentation, aiming to efficiently decrease phytate content and enhancing the overall nutritional profileof the meal. Under the optimized fermentation conditions of 20% inoculant level, 1:1.25 feed: water ratio at 32°C for 48h, phytate content in canola meal was decreased by 45.43%. Different ratios of fermented canola meal: soybean meal (25:75, 50:50, 75:25) evaluated for quality traits suggests 25:75 as the most promising ratio. This ratio was then used in poultry feed to determine its impact on the growth performance and tibial bone characteristicsof broilers(Indian Broilers Ludhiana-80). The results revealed that the inclusion of fermented canola meal in the poultry feed diet has improved the overall growth performance and tibial bone characteristics. The outcome of this study indicates the potential use of fermented canola meal as an alternative to soybean meal in poultry feed.

Keywords*: broilers, canola meal, fermentation, phytate, soybean meal*

Enhancement of crop response of Chickpea (*Cicer arietinum* L.) with hormonal and nutritional interventions to mitigate pre-harvest rainfall in West Bengal conditions

Kousik Atta[1]*, Tuhina Ghosh[2], Subhasis Mondal[3] and Rajib Nath[4]

[1]*Assistant Professor, Faculty of Agricultural Sciences, GLA University, Mathura, Uttar Pradesh, India
[2]Senior Research Fellow, Division of Seed Science & Technology, ICAR-Indian Agricultural Research Institute, Pusa, New Delhi, India
[3]Associate Professor, Department of Plant Physiology, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal, India
[4]Professor, Department of Agronomy, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal, India

Corresponding author Email: kousikatta1995@gmail.com

Abstract

The third most important protein-rich pulse crop is chickpea (Cicer arietinum L.), also known as Bengal gram. It is a widely cultivated legume that is rich in protein and essential nutrients. Plant growth regulators are active in small amounts and can modulate the natural growth regulatory system from the beginning

of seed germination to senescence and play a pivotal role in key metabolic processes. The micronutrient boron (B) enhances flower retention, pollen fertility, germination, pod setting, and development in addition to playing a significant role in photo assimilate translocation. Growth retardants like paclobutrazol can increase yield by favourably partitioning the assimilates when used at the right timing and concentration. The senescence of the vegetative organs and the remobilization of assimilates to the sink organs, such as developing seeds, are triggered in part by ethylene (C2H4). The present experiment was done to study the impact of boron, paclobutrazol and ethylene on different morpho-physiological, biochemical, yield and yield attributing traits in chickpea (variety JG-14). The treatment approach involved the use of different concentrations of paclobutrazol, boron, ethylene, and their combinations applied as foliar treatments. Analysis of data revealed significant difference between the treatments. It was found that pod weight plant-1, biological yield plant-1 and total plant biomass was recorded highest in the treatment having paclobutazol@ 90ml/ha at vegetative stage + boron@ 0.5% at budding stage. Seed yield showed highly significant correlation with seed storage profile viz. seed starch, seed protein content and seed soluble sugar. The most advanced maturity was obtained with the treatment combination P0B1E2 and the most delayed maturity was recorded in the treatment combination P1B0E0. Highest seed weight and yield was recorded for the treatment containing paclobutrazol@ 90ml/ha + boron@ 0.5% + ethylene @500gm/ha.

Key words: *Boron, chickpea, ethylene, paclobutrazol, seed protein, soluble sugar, starch.*

Effect of microwave treatment on phytoconstituents of buckwheat (*Fagopyrum esculentum*) grains with special emphasis on allergenic proteins

Aditi Biswas[@], Kuldip Chandra Verma*, Kumkum Giri[@], Pawanesh Tamta[#] and Nidhi Joshi[#]

[@] PG students, [#]Ph.D.: Department of Biochemistry, College of Basic Sciences and Humanities, Govind Ballabh Pant University of Agriculture & Technology, Pantnagar(U. S. Nagar)-263145, Uttarakhand, India.

Corresponding Author: Assistant Professor, Department of Biochemistry, College of Basic Sciences and Humanities, Govind Ballabh Pant University of Agriculture & Technology, Pantnagar(U. S. Nagar)-263145, Uttarakhand, India. E mail: kcbiochem@gmail.com

Abstract

Buckwheat is a widely consumed pseudo-cereal, has gained significant attention recently due to its high nutritional value, adaptability to various climates, and least cost of cultivation. During a field survey, it was reported that prolonged consumption of buckwheat leaves and grains causes digestive problems and numbness in the fingers, it is due to toxic components and allergens presents in buckwheat. In the present study, effects of different durations of microwave radiations on phytoconstituents of buckwheat grains collected from five different geographical regions of Himalaya were studied with special attention on allergenic proteins to make them suitable for human consumption on daily basis. Total phenols, total flavonoid, total antioxidant, protein, lysine, arginine, tryptophan, tannin, oxalate and phytic acid were estimated using standard spectrophotometic methods and protein profiling for allergenic proteins was done by SDS-PAGE. It was found that increase in the durations of microwave treatment led to a non-significant (p?0.05)decrease in total phenolic (8.3-12.1%), total flavonoids (9.0-

11.5%),total antioxidants (5-7%), protein (3.5-7.1%), tryptophan (4.1-6.4%), arginine (3-7%) and lysine (4.2-8.5%) content, whereas, significant(p?0.05)reduction was found in anti-nutritional factors viz. phytic acid (15-28%), tannic acid (15-20%) and oxalate(18-30%). SDS-PAGE analysis revealed that, duration of microwave radiations is directly proportional to the reduction in the major allergenic proteins (30,19 and 16-kDa)in buckwheat grains. Thus, it may be concluded from the current study that microwave radiated buckwheat grains are more amenable for daily consumption and for preparation of different by-products for the consumption of large number of population depends on the traditional food in Himalayan region without any digestive problems, especially for children and pregnant ladies.

Keywords: *Buckwheat, flavonoid, toxic proteins, microwave processing*

Green Synthesis of Magnesium and Iron Oxide Nanoparticles using Amaranth Leaves: Characterization and Antimicrobial Activity Assessment

[@]Pawanesh Tamtaand Kuldip Chandra Verma*

[@] Ph.D student, Department of Biochemistry, College of Basic Sciences and Humanities, Govind Ballabh Pant University of Agriculture & Technology, Pantnagar (U. S. Nagar)-263145, Uttarakhand, India. E mail: pawaneshtamta7351@gmail.com

*Assistant Professor, College of Basic Sciences and Humanities, Department of Biochemistry, Govind Ballabh Pant University of Agriculture & Technology, Pantnagar (U. S. Nagar)-263145, Uttarakhand, India.

E mail:kcbiochem@gmail.com

Abstract

Amaranth is a valuable pseudo-millet of Himalayan region and a promising food crop because of its beneficial biological qualities, diverse phytochemical composition, and broad therapeutic potential. The rising demand for the plant-based sources in nutraceuticals and pharmaceuticals necessitates exploring the nutritional and therapeutic aspects of Amaranth. Integrating nanotechnology with green synthesis of nanoparticles presents a promising interdisciplinary approach to investigate the nutritional and functional value of Amaranth aligning with eco-friendly and sustainable agriculture. This study is done to gain deeper insights on the biological actions of Amaranth leaves nano-formulation and its future application on the crop to assess the nutritional quality and its effect on the enhancement of bioactive components. Nano formulation of Mg and Fe were synthesized using Amaranth leaves. The UV Visible absorption spectrum exhibited characteristic magnesium oxide and iron oxide nanoparticle peak at 295 nm and 316 nm respectively.The DLS results con?rmed the formation of magnesium oxide and iron oxide nanoparticles with an Z-average size of 65.30 d.nm and 82.94 d.nm respectively.FTIR analysis con?rmed the surface functionalization of the synthesized nanoparticles with the biological molecules present in the extract. The nanoparticles exhibited ef?cient antimicrobial activity against E. coli and B. subtilis with the highest zone of inhibition by magnesium oxide nanoparticle of 31 mm at 500 ?g/ml for E. coli. The study highlighted the potential of Amaranth leaves in green synthesis of nanoparticles. Incorporating nanotechnology in further research could lead to the development of innovative products with enhanced nutritional and therapeutic properties, ultimately benefiting both

human health and agricultural sustainability.

Keywords: *Amaranth, Nanotechnology, Green synthesis, Bioactive components.*

Yield and quality response of broccoli for different irrigation and N fertilizer levels under deficit trickle irrigation

Kumari Yogita Pandey[1], Dr. Nitin Madane Changade[2], Dr. Princy Thakur[3]

[1]Research Scholar, [2]Associate professor, [3]Assistant professor
Department of Soil Science and Agricultural Chemistry, School of Agriculture
Lovely Professional University, Phagwara, Punjab, India

****Corresponding email.id – yogitapandey46@gmail.com***

Abstract

The present research was conducted at the Department of Soil Science and Agricultural Chemistry, Lovely Professional University, Punjab. The experiment was replicated three times in a randomized block design. It comprised 3 irrigation levels I1 (85% ETc), I2 (100% ETc), and I3 (120% ETc) with the combination of three nitrogen levels F1 (75% N+RDF), F2 (100% N+RDF), and F3 (150% N+RDF) revealed that treatment T6 containing irrigation at 100% ETc with N at 150 kg ha-1 recorded the maximum number of leaves, leaf size, plant spread, head weight, and head diameter. The highest yield plot-1 and total yield were also from the same treatment, T6. The average dry matter and vitamin C content were maximum in treatment T4 containing irrigation at 100% ETc + fertilizer at 75% nitrogen + RDF combination, whereas a higher dose of nitrogen was not responsible for increasing dry matter and vitamin C content and interactions between different components were non-significant for many parameters. Therefore, in this study irrigation and nitrogen regimes play an important role in the growth and yield parameters of broccoli. The treatment combinations irrigation 100% ETc with 150% nitrogen were found to be significant and superior over other treatments. The application of nitrogen with drip irrigation was quite beneficial for broccoli. Its application significantly increased growth, yield, and quality parameters.

Keywords: *Broccoli, NPK, Drip irrigation*

Integrated farming systems: a comprehensive approach for agriculture's sustainable development

Kumkum Bharti[1]*, Dr. Brinder Singh[1], Dr. Vikas Sharma[1]

[1]Department of Soil Science and Agricultural Chemistry, Sher-e-Kashmir University of Agricultural Sciences and Technology, Chatha, Jammu and Kashmir, 180009

****Corresponding author e-mail: kumkum.bharti13@gmail.com***

Abstract

The idea of integrated farming systems, or IFS, has come to light as a viable strategy to deal with many issues that current agriculture is facing, such as resource depletion, environmental degradation, and inequality in socioeconomic status. A single farming operation that includes crops, livestock, aquaculture, forestry, and other components can be integrated in a synergistic way through integrated farming systems. Through the optimization of resource usage, waste minimization, and enhancement of ecosystem services, IFS seeks to accomplish several goals, like increased resilience, productivity, and environmental sustainability. Crop-livestock integration, nutrient cycling, biodiversity preservation, and agroecological concepts are important aspects of integrated farming systems. IFS maintains ecological balance, soil fertility, and natural pest control by using different farming and non-farming practices like crop rotation, intercropping, aquaculture, livestock rearing, agro-sylviculture and integrated pest management. This reduces the need for external inputs while increasing farm output and resilience to climate change. Moreover, integrated farming systems provide several socioeconomic advantages, such as improved income output, diversification of sources of income, and rural development. Farmers can increase their economic viability and food security by combining several agricultural and non-agricultural components to take benefit from synergies, produce value-added goods, and reach a variety of markets. In summary, integrated farming systems offer a path towards adaptable, fair, and ecologically friendly farming systems. It offers a holistic approach to sustainable agriculture. We can improve food security, livelihoods, and resilience to climate change by using the synergies between various components. This will help us achieve sustainable development goals on a local, regional, and global level.

Keywords: *Integrated farming systems, Socioeconomic, Resilience, Climate change, Synergies.*

Comparison of encapsulation methods for co-encapsulation of probiotic culture with ascorbic acid and its efficacy evaluation

Kunal M. Gawai[1]*, Koushik Das[2], Ashish Shendurse[1] and Manish Kumar Parmar[1]

[1]College of Dairy Science and Post Graduate Studies, Kamdhenu University, Amreli - 365601 (Gujarat), India

[2]Executive (Quality Assurance) Gujarat Co-operative Milk Marketing Federation Limited, Anand - 388001 (Gujarat), India

Corresponding author e-mail: kunalgawai@kamdhenuuni.edu.in

Abstract

Probiotics are a part of fermented dairy products as they produce some essential compounds that can provide us with benefit. Probiotic culture Lactobacillus helveticus MTCC 5463 was co-encapsulated by extrusion and emulsion method with Ascorbic acid (AA) at different concentrations (60, 80, 100, 120 mg/ml) and evaluated for several parameters. Beads from emulsion method had a significantly lower mean diameter (37.83 µm) with comparison to extrusion method (113.85 µm) and as addition rate of ascorbic acid was increased, a significant increase was observed in mean particle diameter. Beads from extrusion method had a uniform spherical shape but beads from emulsion method had irregular shape and a rough surface. 100mg of AA showed significantly higher cell viability than other treatments. For extrusion method, it was 9.76±0.039 to 10±0.21 log cfu/g and for emulsion method it

was 10.13±0.075 - 10.23±0.013 log cfu/g. Beads from emulsion method showed a higher retention ($p<0.05$) of ascorbic acid (13.47 mg) than extrusion method (12.65 mg). Beads from emulsion method showed higher ($p<0.05$) probiotic EE% (90.64 %) than extrusion method (86.31 %) and 100 mg AA addition showed significantly good results. In emulsion method EE % of AA (73.93%) was higher than extrusion method (69.61%). Beads from emulsion method had a significantly higher ($p<0.05$) yield (68.32 %) than extrusion method (55.21 %). An increase in yield was observed, as the ascorbic acid concentration was increased.

Based on the above parameters from extrusion and emulsion method addition rate of 100 mg ascorbic acid/100ml of coating material, showed optimum results and was used in further studies. Regarding cell viability and AA concentration in Beads from emulsion method showed a significant difference when compared with extrusion method at 75?C. For antimicrobial activity four samples were prepared i.e. Control sample (C), encapsulated culture by emulsion method (Em), extrusion method (Ex), heat treated free cells (H). Em sample showed highest inhibition zone (16.33±2.08 mm) against Enterococcus faecalis ATCC 29212 and lowest inhibition zone (12.7± 0.58 mm) was observed against E. coli MTCC 1687 and Staphylococcus aureus MTCC 7373. For Ex sample highest inhibition zone (14.00±1.0 mm) was seen against Enterococcus faecalis ATCC 29212 and lowest inhibition zone (9.07± 1.15 mm) was observed against Staphylococcus aureus MTCC 7373. Similarly beads from emulsion method survived better ($p<0.05$) in simulated gastro intestinal conditions than beads from extrusion method. Thus, it is cleared that for co-encapsulating the probiotic culture along with ascorbic acid emulsion method was the best after its efficacy evaluation under different parameters.

Keywords: *Probiotics,microencapsulation, antimicrobial activity, ascorbic acid*

Information Acquisition dynamics of vegetable growers of North Western and North Eastern Himalayan region: A comparative study with a gender perspective

Kushagra Joshi* and L Kant**

*Sr. Scientist, ICAR VPKAS, Almora
**Director, ICAR VPKAS, Almora

Abstract

Information sources play a pivotal role in the diffusion of innovation, practices and technologies to the ultimate users. Farmers use various traditional and modern information sources to access and receive information from different sources. There is growing empirical evidence that, understanding the structural layout of the smallholder's information network is key to enhancing their access to information. Thus, there is a need to analyze and understand the functioning of this communication network in order to successfully manage and improve information flow between the researchers and farmers.The present study applied Social Network Analysis (SNA) methodology to explore the nature of information exchange networks prevailing among vegetable growers of NW & NE Himalayan region with a gender perspective. The study sample comprised of 640 vegetable growers spread across two districts of Uttarakhand and Sikkim. SNA properties (Nodes, Edges, and Measures of Centrality) were used to describe and visually represent the collected data. GEPHI 0.9.6 software was used for data analysis and interpretations. Across gender, the interpersonal information sources family members, and neighbours had shown the strong

information source contact for female farmers in Uttarakhand. It was evident that the factors that affect agriculture network usage among female vegetable growers were education, farming experience, hours dedicated to farming, group membership and contact with extension agency Income, land holding, access to mobile, contact with extension agency and frequency of contact were the main factors that affected the agriculture network usage among male vegetable growers. In Sikkim, for males, Block Agriculture Officer/ATMA had the highest closeness centrality score and for females, Shopkeeper/ Input dealer had the highest. For female growers, landholdig size, farming experience, group membership, ethnic group/caste were the significant determinants while for male growers, age, education, landholding, time spent in agriculture were the significant determinants.

The study findings will help the policymakers, technology developers, extension scientists and field extension agents learn about the existing information networks of the vegetable growers and help in designing and developing appropriate extension strategies so that they could get maximum benefit out of it.

Keywords: *Social network analysis; Information sources; Network centrality; Vegetable growers, Hill farmers*

A Comparative Analysis of the Physico-chemical and Antioxidant Properties of Oak tasar (*Antheraea proylei*) and Mulberry (*Bombyx mori*) Pupae Oils

Kusumala Suman* and Venkatesh Kumar R.

Department of Zoology, Babasaheb Bhimrao Ambedkar University, Raearelly Road, Lucknow 226025, Uttar Pradesh, India-226025

Corresponding author e-mail: kusumala21@gmail.com

Abstract

The research is related to theemerging potential of insect-based food as sustainable alternative to traditional farming.The current study aimed to evaluate the physicochemical, total phenolic content (TPC), and antioxidant properties of the oak tasar pupae oil (OTPO) and mulberry silkworm pupae oil (MSPO). The pupae oils were extracted using the Soxhlet technique. The radical scavenging activities of both oils were determined by an ABTS (2,2-azino-bis-3- ethylbenzothiazoline-6-sulphonic acid) assay whereas, the physicochemical properties of selected oils were analyzed by appropriate techniques. The oil yield was recorded as 24.62 ± 0.341% and 24.16 ± 0.764% for OTPO and MSPO respectively. The observed physicochemical properties were within a permissible range for consumables. Meanwhile, MSPO (150.50±0.45 ?g/ml) had a higher TPC when compared to OTPO (44.599±0.514 ?g/ml). Further, OTPO showed better antioxidant qualities than MSPO. Therefore, our research indicates the presence of significant bioactive components in the extracted oil samples, which exhibited the properties of edible oil and antioxidants.

Keywords: *Oak tasar, Mulberry, Pupae oil, Physicochemical, Antioxidants*

Opportunities and Future Prospects Tasar Seed Sector

Dr. Akula Venugopal

Director (Retd)Basic Tasar Silkworm Seed Organisation, Central Silk Board, Ministry of Textiles-Govt. of India, Bilaspur-495 112, Chhattisgarh

Corresponding author email: avgvrm@gmail.com

Abstract

Tropical tasar silkworm, Antheraea mylitta Drury (Lepidoptera: Saturniidae) is a wild sericigenous polyphagous economically important insect. India is the only country, which commercially exploits the wild silkworm in nature. A. mylitta popularly known as Tasar Daba Bivoltines and Trivoltines . The Tasar silkworms reared commercially on Terminalia arjuna, T. tomentosaandShorea robusta. Tasar culture is also permitted on other food plants viz., Lagerstromia speciosa, L. indiaca, L. parviflora, Syzygiumcumini and Zizyphusmauritiana. Recent developments and utilization of silk in the biobased industries like pharmaceuticals, biomaterials, cosmetics, food and energy (Reddy et al., 2021) has escalated the demand for silk across the world. Tasar silk industry is one of the most important cottage industries, contributing nearly 8.0 % from tasar silk among different varieties of total silk. Tasar raw silk production was 237 MT and 1166 MT during 2000-01 and 2010-11, respectively and increased to 3131.3 MT during 2019-20 (Anitha, 2011; Varmudy, 2011; CSB, 2020). The success of the entire sericulture industry is dependent on the quality of silkworm seed, hence the production of disease-free quality silkworm seed is a vital aspect. Basic Tasar Silkworm Seed Organisation (BTSSO), Bilaspur Chhattisgarh was established during the year 1998-99.It has seventeen Basic Seed Multiplication and Training Centres (BSM&TCs) and one Central Tasar Silkworm Seed Station (CTSSS) distributed in different states and are functioning under administrative and technical control of this organization. BTSSO's sole objective is to strengthen the silkworm seed sector by vitalizing the three-tier seed multiplication system on scientific lines, producing nucleus and basic tasar seed on quality parameters and its supply to tasar silk producing state agencies for further multiplication. With an aim to supply quality silkworm seed in adequate quantity to the rearers, an integrated three-tier seed multiplication system is in vogue involving both Central Silk Board and tasar producing states.

Varietal Identification of Rice cultivars of Madhya Pradesh using SSR Markers

M. J. Kujur[1]*, G. K. Koutu[2], S. K. Singh[3] and Yogender Singh[4]

[1]SRF, Department of Plant Breeding and Genetics, JNKVV, Jabalpur
[2]DRS, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur
[3]Scientist, Department of Plant Breeding and Genetics, JNKVV, Jabalpur
[4]Assistant Professor,Department of Plant Breeding and Genetics, JNKVV, Jabalpur

Corresponding author e-mail: monicajyotikujur@jnkvv.org

Abstract

Approximately 90% of the world's total rice production and consumption comes from Asia, making it largest producer and consumer in the world. China leads India in both area and production of rice. Rice

producers of India have the responsibility to feed the second most populated country in the world. The primary goal of rice breeding program in developing nations is yield maximisation, given the rising demand for food brought on by population expansion and the shrinking space allocated to rice farming. SSR markers have been used in the current work to perform genomic fingerprinting and divergence analysis on rice cultivars.For this 7 rice cultivars were selected and 22 SSRprimers were used for generating genomic fingerprints and assessment of genetic diversity and identificationof unique allele among them.Out of 22 SSR primers, 12 primers amplified unique allele for the different rice cultivars.Specific primers identifiedfor Luchai were RM 212 and RM 171. Only one primer RM 334, uniquely identified Dhaniya Dhan similarly for MTU 1010 and F8-5 only one primer RM 212 and RM 276 was identified respectively. For cultivar Khadda, primers indentified were RM 341, RM 276 and RM 231. Five primers namely RM 535, RM 161, RM 19, RM 276 and RM 25 could uniquely identifythe cultivar Kali Kamod. Two primers i.e. RM 307 and RM 276 were identified as specific primers for JRB-1. Theseunique SSR profiles can be used for varietal profilingand purity analysis, instead of using multiple random primers since SSR markers detect finer levelsof variation among closely related lines. In the clustering pattern the dendogram generatedbased on SSR markers grouped the 7 rice cultivars into two clusters. Sub-cluster I comprised of three cultivarsi.e., Luchai, F8-5 and MTU 1010. Sub-cluster II comprised of four via., cultivars Kali Kamod, Dhaniya Dhan, JRB-1 and Khadda which showed that these cultivars are totally divers for the rest of the 3 rice cultivars.

Key words: *Rice, SSR markers, Varietal Identification, Dendogram*

Phenotyping of Fusarium wilt Resistant Chickpea (*Cicer arietinum* L.)

Anita Babbar[1], M. J. Kujur[2]*, Monika Patel[3], Prachi Sharma[4] and Balkishan Chaudhary[3]

[1]Principal Scientist, Department of Plant Breeding and Genetics, JNKVV, Jabalpur, M.P.
[2]SRF, Department of Plant Breeding and Genetics, JNKVV, Jabalpur, M.P.
[3]JRF, Department of Plant Pathology, JNKVV, Jabalpur, M.P.
[4]Department of Plant Breeding and Genetics, JNKVV, Jabalpur, M.P.

Corresponding author e-mail: monicajyotikujur@jnkvv.org

Abstract

Host plant resistance is the major component in the management of fungal diseases in chickpea (Cicer arietinumL.). A deeper understanding of the genetically controlled yield and the factors that determine it is necessary for enhanced crop performance. Screening of 536 germplasm accessions from International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) to identify sources of wilt disease resistance was conducted at wilt sick plot at Seed Breeding Farm, JNKVV, Jabalpur, Madhya Pradesh during Rabi season 2022-2023. The resistant chickpea checks, JG 315 and JG 12 showed a highly resistant reaction, and the susceptible check JG 62 and K 850 showed a highly susceptible reaction across the wilt sick plot suggesting uniformity of infestation in the field. Ninety six out of 536 accessions showed high to moderate sensitivity towardsFusarium wilt showing average seed yield per plant of 13.83g, demonstrating the clear link between disease susceptibility and yield loss. Out of 96 resistant accessions four accessions was of kabuli type (ICC 3723, ICC 7886, ICC 12429 and ICC 13252). The test entries,ICC 10104was highly resistant to wilt and surpass the seed yield per plant (47.0g), total

number of pods per plant (291), total number of seed per plant (375) and harvest Index (58.75%) thanthe resistant check, JG 315. The resistant accessions had better biological yield and seed yield per plant, whereas the less resistant accessions had lower yields. The harvest index ranged between 36.9% to 71.7%. Fouraccessionsviz., ICC 10104 (47.4g) , ICC 12467 (42.5g), ICC 10208 (32.8g) and ICC 14384 (30.2g)showing highly resistant expression against Fusarium wilt and outperformed the resistant checks, JG 12 (34.7g) and JG 315 (38.4g), in terms of harvest index.

Key words: *Chickpea, Fusarium Wilt, Germplasm accessions, Phenotype*

Captive maturation and multiple breeding technology for endangered golden mahseer

M. S. Akhtar*, A. Ciji, M. Rajesh and D. Sarma
ICAR-Directorate of Coldwater Fisheries Research, Bhimtal-263136, Nainital, Uttarakhand
****Presenting author: mdshahbazakhtar@gmail.com; md.akhtar@icar.gov.in***

Abstract

The golden mahseer, Tor putitora, is a captivating cyprinid with significant cultural, economic, ecological, and recreational importance in the upland fisheries of the Himalayan sub-continent. Serving as a flagship species, it draws attention from global anglers, presenting substantial potential for eco-tourism and local livelihoods. Unfortunately, the species has witnessed a severe decline in its population within its natural habitat due to inherent and anthropogenic factors. Consequently, it has been designated as an endangered species on the IUCN Red List. The traditional method of breeding, which involved using wild gravid females, proved to be unsustainable and insufficient. This prompted the necessary development of captive brooders to facilitate mass-scale seed production. However, challenges arose in maintaining captive conditions, with female golden mahseer experiencing endocrine dysfunctions that hindered ovarian development. Recognizing the urgency of conservation, the ICAR-Directorate of Coldwater Fisheries Research (ICAR-DCFR) engaged in focused and extensive research. After several years of dedicated efforts, ICAR-DCFR successfully devised a technology for the captive maturation and multiple breeding of golden mahseer. This achievement marks a significant milestone in the conservation and rehabilitation of the species, providing a crucial lifeline for its survival. The breakthrough enables year-round production of golden mahseer seeds, representing a substantial advancement in ex-situ conservation endeavors. In conjunction with captive breeding, ICAR-DCFR has initiated widespread ranching programs in coldwater lakes and rivers. This strategic approach seeks to preserve and rejuvenate golden mahseer populations in their natural environments. ICAR-DCFR's commitment to ex-situ conservation through captive breeding and subsequent reintroduction aligns with global initiatives aimed at mitigating threats faced by this endangered species. This abstract underscores the vital role of breeding technologies in ex-situ conservation, highlighting how ICAR-DCFR's innovative approach contributes significantly to the sustainable rehabilitation of the golden mahseer.

Keywords: *Golden mahseer, Maturation, Multiple breeding, Ex-situ conservation; Photothermal.*

Constraints faced by NICRA project beneficiary respondents in adoption of technology interventions

Mandavkar P.M.[1], S.S. Sisodia[2], P. A. Sawant[3], R. Bairathi[4] and R.H. Meena[5]

*[1]Ph.D. Scholar, Department of Extension Education, RCA, Udaipur 310 001
[2]Professor & Head, Department of Extension Education, RCA, Udaipur,
[3]Director of Extension Education, DBSKKV, Dapoli, 415712 Maharashtra.,
[4]Professor, Directorate of Extension Education, MPUAT, Udaipur
[5]Associate Professor, Department of Agril. Chemistry and Soil Science, RCA, Udaipur.

CorrespondingAuthor's Email:pramodmandavkar102@gmail.com

Abstract

The National Innovations on Climate Resilient Agriculture (NICRA) project aims to enhance resilience of Indian agriculture to climate change and climate vulnerability through strategic research and technology demonstration. The present study was undertaken to analyse the socio-personal, management, economic and financial and other category constraintsin adoption of technology interventions of different crops in the study area.Thestudywasconfined toRatnagiri district from Konkan region and Aurangabad (Chattrapati Sambhajinagr)districts from Marathwada region ofMaharashtra state. All the ten operational villages of the NICRA Project i.e. five villages from Ratangiri district and five villages from Aurangabad (Chattrapati Sambhajinagar) district were selected. In the villages of Ratnagiri district, improved technology in paddy & horse gram were intervened and in Aurangabad (Chattrapati Sambhajinagr) district Maize & Bengal gram were intervened to the respondents through demonstrations activity during 2018-19 to 2020-21. Ex-post facto research design was used for this study.The data were collected using structured interviewschedule and a three-point continuum of severity was used for getting responses. To determine the intensity of constraints, the mean percent score for each item was worked out and ranked accordingly.

The study revealed that unawareness about climate change was moresevere constraint with MPS 60.24 ranked first in the priority of socio-personal constraints. Under management constraint, less use of soil test-based fertilizer application was first rank and more severe constraints with MPS 65.94.In economic and financial category first ranked and more severe constraints was high investment cost on farm machinery and land development. Whereas, in other constraints inability of officials to provide services during peak period was the moresevere constraint expressed by respondents having MPS59.28 and ranked first.The constraints put forwarded by the respondents from their field experience and insight can be used for further necessary action for obstacle-less delivery and devising new strategies to eliminate the flaws.

KeyWords: *Adoption,Beneficiary, Constraints, Socio-personal, Technology, Project*

Assessment of Genetic Homogeneity in Micro propagated Plants of *Dendrobium moniliforme* (L.) Sw.Using Molecular Markers.

Manisha Ghimire[1], Bijaya Pant[2]*

[1,2]Central Department of Botany, Tribhuvan University, Kathmandu, Nepal

Correspondence: mansaghimire9@gmail.com

Abstract

Dendrobium moniliforme(L.) Sw. is one of the valuable medicinal orchid belonging to the family Orchidaceae. It contains various compounds like moscatilin, bibenzyl derivatives, phenanthrenes and sesquiterpenes which possess high antioxidant and cytotoxic activity. This plant is used in both traditional Chinese Medicine and other folk medicine. The growing market demand leading to over collection along with the low propagation rate has emerged as a threat to its natural populations. To address both the issues of sustainable use and conservation, micropropagation via plant tissue culture can be a promising option. The present study was carried out to develop an efficient micropropagation technique of D. moniliforme, from in vitro culture of seed and to evaluate the genetic fidelity between the micropropagated andwild mother plants using a molecular markers system i.e. RAPD and ISSR. In present study, mature podswere cultured on the MS medium fortified with phytohormones and coconut water (CW). Young, healthy leaves derived from wild mother plants and micropropagated plantlets were used as explants for DNA isolation. Among the tested medium, the suitable medium for protocorm development was on full strength MS+10% CW. Maximum shoot multiplication and elongation was found to be on HMS + 0.25 mg/L Naphthalene acetic acid+10%CW. The FMS + 0.5 mg/L Indole-3-butyric acid (IBA), was found to be superior for the new root formations and for root length.

Similarly high degree genetic homogeneity was found among and within the mother and in vitro regenerated plantlets of D. moniliformeanalyzed by using RAPD and ISSR markers. The micropropagated plantlets were genetically identical to the mother plant, thus revealing the norms of nature conservation and sustainable use.

Keywords: *Dendrobium moniliforme, micropropagation, pod, genetic homogeneity, in vitro, Conservation.*

Reconnaissance of Chickpea Germplasm against *Fusarium oxysporum* f. sp. ciceris

Anita Babbar[1], Monika Patel[2]* Balkishan Chaudhary[2], M.J. Kujur[3], Prachi Sharma[4]

[1]Principal Scientist AICRP on Rabi Pulses, Department of Plant Breeding and Genetics, College of Agriculture, JNKVV, Jabalpur - 482004, Madhya Pradesh, India
[2]JRF, Department of Plant Pathology, College of Agriculture, JNKVV, Jabalpur - 482004, Madhya Pradesh, India
[3]SRF,Department of Plant Breeding and Genetics, College of Agriculture, JNKVV, Jabalpur - 482004, Madhya Pradesh, India
[4]Department of Plant Breeding and Genetics, College of Agriculture, JNKVV, Jabalpur - 482004, Madhya Pradesh, India

Corresponding author Email:monikapateljnkvv@gmail.com

Abstract

Chickpea (*Cicer arietinum* L.) holds significant importance as a primary cool-season legume across Asia and other global regions. It serves as a valuable and cost-efficient protein source, particularly advantageous for enhancing the nutritional profile of vegetarian diets. In India, it flourishes during the

rabi season but confronts various challenges including insect pests, drought, and cold stress. One notable challenge is Fusarium wilt, a soil-borne disease caused by Fusarium oxysporum f. sp. ciceris, which infects plants early on, manifesting symptoms at different growth stages and intensifying during the reproductive phase. Fusarium wilt substantially diminishes yields, resulting in losses ranging from 25 to 65 percent. Addressing this issue, a comprehensive screening took place in the sick plot at Seed Breeding Farm in JNKVV, Jabalpur, MP, during 2022-23. A total of 536 accessions underwent assessment utilizing an Augmented Block Design, with three checksviz.,JG 62 (Susceptible), JG 12, and JG 315 (Resistant). Observations were recorded ontotal plant emergence after 20 days after sowing and diseased plants were counted at 30, 45, and 60-days intervals. On the basis ofphenotypic screening 49 accessions exhibiting minimal Fusarium wilt infection, classified as resistant, 47 accessions noted as a moderately resistant, with disease incidence ranging from 6.3 to 20.0 percent, whereas 61 accessions showed moderately susceptible reactionswith disease incidence ranging from 22.2 to 30.0 percent. Furthermore, 140 accessions exhibited susceptibility, with disease incidence ranging from 33.30 to 50.0 percent. The remaining accessions showcased vascular wilting symptoms surpassing 50 percent, categorized as highly susceptible. Resistant accessions will be validated in lab and utilized in the breeding programme of chickpea improvement.

Keywords: *Chickpea, Wilt, phenotype, Resistant, soil-borne, Infection*

Enhancing Pigeonpea Growth and Suppressing Fusarium Wilt Through Trichoderma Biopriming

Monika Patel[1]*, Deeksha Singh Lodhi[2], & Sanjeev Kumar[3]

[1]JRF, Department of Plant Pathology, College of Agriculture, JNKVV, Jabalpur
[2]Department of Plant Pathology, College of Agriculture, JNKVV, Jabalpur
[3]Department of Plant Pathology, College of Agriculture, Office of Dean Faculty of Agriculture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur-482004 (MadhyaPradesh), India.

Corresponding address: monikapateljnkvv@gmail.com

Abstract

The wilt disease caused by Fusarium udum poses a severe threat to pigeonpea cultivation at both regional and national levels. To develop effective control strategies, pigeonpea seeds were subjected to biopriming with various strains of Trichoderma fungi including T. virens, T. viride, T. harzianum, T. aureoviride, and T. hamatum. Observations were made on germination rates, root and shoot lengths, as well as fresh and dry weight. Biopriming significantly influenced these parameters compared to untreated seeds. Seeds bioprimed with T. harzianum and T. aureoviride achieved 100% germination. Among bioprimed seeds, T. aureoviride showed the longest root length (54.74 mm), followed by T. hamatum and T. viride, in comparison to the control group (22.52 mm). Shoot lengths varied between treatments, with T. virens exhibiting the greatest increase. Regarding fresh weight, T. aureoviride bioprimed seeds showed the most significant enhancement in root weight (43.03 mm), followed by T. hamatum, compared to the control. Similarly, shoot fresh weight was highest in T. aureoviridetreated seeds. Analysis of dry weight revealed that T. aureoviride bioprimed seeds exhibited the highest increase in root weight (11.00 mm), followed by T. hamatum, compared to the control. Shoot dry weight was also highest in T. aureoviride

treated seeds.These results demonstrate that biopriming enhances germination rates, root and shoot lengths, and fresh and dry weights compared to untreated seeds. Particularly, biopriming with T. aureoviride significantly improves growth parameters and suppresses root infecting fungi.

Key words: *Trichoderma, Shoot, Germination, Fungi, biopriming*

Stevia Rebaudiana: Nurturing Renal Well-Being and Its Therapeutics Implications in Kidney Disease

Monika Saini, Shweta Mainwal and Rishabh Chitranshi

Shobhit University, Gangoh, Saharanpur-247341 UttarPradesh

Abstract

Stevia rebaudiana, a natural sweetener derived from the leaves of the Stevia plant, has gained significant attention for its potential role in nurturing renal well-being and its therapeutic implications in kidney disease. Stevia rebaudiana has vast impact on renal health and in managing kidney diseases. The bioactive substances found in Stevia rebaudiana, such as steviol glycosides, are thought to have renoprotective qualities. They also have anti-inflammatory, anti-hypertensive, and antioxidant properties, which further inhibit oxidative stress, inflammation, and hypertension-factors that contribute to the onset and advancement of kidney diseases. It has potential in supportive therapy such as diabetic nephropathy, hypertensive nephropathy, and other forms of kidney damage. Additionally, the low-calorie nature of Stevia makes it a favourable sweetener for individuals with kidney diseases, especially those with diabetes or obesity-related renal complications. The therapeutic implications of Stevia rebaudiana in kidney disease extend beyond its sweetening properties like ability to harmonize glucose metabolism, blood pressure, and inflammatory pathways makes stevia an inclusion in dietary interventions which aimed to prevent and manage renal disorders. However, it is essential to acknowledge the need for further research to establish conclusive evidence regarding the efficacy and safety of Stevia rebaudiana in renal health. In conclusion, Stevia rebaudiana holds promise as a natural sweetener with potential therapeutic implications in promoting renal well-being and managing kidney diseases. Further, research is needed to elucidate its mechanisms of action, optimal dosage, and long-term effects to integrate it effectively into comprehensive strategies for renal health management.

Keywords: *Stevia rebaudiana, kidney disease, natural sweetener*

Use of Microbial Consortia for Sustainable Production of Paddy Crops

Monika Saini* Rishabh Chitranshi and Rajiv Dutta

School of Biological Engineering and Sciences, Shobhit University Gangoh Saharanpur Uttar Pradesh 247341

Email:shivaniyasaini1997@gmail.com

Abstract

The sustainable production of paddy crops is essential for ensuring food security and environmental co-management. There has been growing interest in harnessing the power of microbial consortia to enhance crop yield, nutrient utilization, and overall ecosystem resilience. Microbial consortia vital roles in fostering sustainability in paddy crop production. A diverse community of bacteria, fungi, and other microorganisms, contribute to sustain paddy agriculture through various mechanisms, like nitrogen-fixing bacteria establish symbiotic relationships with paddy plants, reducing the reliance on synthetic fertilizers by converting atmospheric nitrogen into a plant-available form. Phosphate-solubilizing microbes enhance phosphorus uptake, promoting root development and nutrient utilization. The inclusion of biocontrol agents, such as mycorrhizal fungi and plant growth-promoting rhizobacteria (PGPR), aids in suppressing pathogenic organisms which further reduces the need for chemical pesticides. The study also assesses the efficacy of microbial consortia in enhancing paddy crop resilience to abiotic stresses such as drought and salinity, which are becoming increasingly prevalent due to climate change. , microbial consortia contribute to soil structure improvement. The secretion of extracellular substances by these microorganisms enhances soil aggregation, water retention, and overall soil fertility. This results in better aeration and drainage, reducing the likelihood of waterlogged conditions in paddy fields. Improved soil structure also enhances the resilience of crops to various environmental stressors, such as drought and flooding, thereby increasing overall crop yield and sustainability. These beneficial microbes also contribute to improved soil structure, water retention, and the decomposition of organic matter, thereby enhancing overall soil fertility. Microbial consortia further play a pivotal role in conferring tolerance to environmental stressors, including drought, salinity, and heavy metal contamination. This is crucial for ensuring crop resilience in the face of changing climatic conditions. The mitigation of greenhouse gas emissions, particularly methane, is achieved through the activities of specific microbes, contributing to climate change mitigation efforts. The utilization of microbial consortia offers a holistic and sustainable approach to paddy crop production, by promoting natural processes such as nitrogen fixation, nutrient solubilization and disease suppression, microbial consortia contribute to increased crop productivity while minimizing the environmental impact associated with conventional agricultural practices. The implementation of these microbial-based strategies holds promise for fostering sustainable agriculture practices and ensuring the long-term viability of paddy crop production systems.

Keywords: *Crop enhancement, microbial consortia, paddy crops, sustainable agriculture.*

Evaluation of ecological footprint of different hospitals in subtropical zone of Himachal Pradesh: A case study of Kangra district

Karina[1], MS Jangra[1], PK Baweja[2], Komal Thakur[1]

[1]Department of Environmental Science, College of Forestry, Dr Yashwant Singh Parmar University of Horticulture and Forestry, Nauni-173230 Solan, (HP)

[2]Directorate of Extension Education, Dr Yashwant Singh Parmar University of Horticulture and

Forestry, Nauni-173230 Solan, (HP)

Corresponding author Email: Jangra.2u@gmail.com

Abstract

The present investigation was carried out during the year 2020-2021 to assess the ecological footprint of 15 hospitals of Kangra district falling in subtropical zone of Himachal Pradesh. These hospitals including both government and private were selected randomly from five blocks of the district. The consumption of five components viz. electricity, water, material, solid waste and food stuff, was assessed using formula-based methodologies to assess the impact of changing lifestyle and consumption patterns in the selected hospitals on their biocapacity. The average ecological footprint of hospitals ranged from 116.5 to 271.4 gha. The block-wise descending order of ecological footprint was (814.2 gha) > Palampur (722.5 gha) >Nurpur (693.4 gha) > Dharamshala (535.8 gha) >Jawalamukhi (349.9 gha) which indicated that the hospitals in Jawalamukhi block were the most sustainable in the district. The descending order of food components contributed to the ecological footprint was Civil hospital, Palampur (216.1 gha) > Vivekanand hospital (206.2 gha) >Sai Mahima Shukla hospital (140. 3 gha) > Saxena hospital (129.8 gha) > Karan hospital (126.7 gha) > Dr. Rajendra Prasad Govt. Medical College and Hospital (112.8 gha) >Delek hospital (107.6 gha) > Civil hospital, Nurpur (96.5 gha) > Civil hospital, Jawalamukhi (76.0 gha) > Fortis hospital (74.7 gha) >Navjeevan hospital (73.8 gha) > Shree Balaji hospital (70.0 gha) > Dhiman hospital (55.6 gha) > Zonal hospital (48.7 gha). To ensure sustainable resource usage, strategies for decreasing the ecological footprint must be implemented by all the hospital specially located in the Kangra.

Keywords: *Ecological footprint, hospitals, Kangra district, sustainability, biocapacity, consumption.*

Evaluation of indoor air quality and factors affecting it - A study in rural area of Solan district of HP

Komal Thakur[1], MS Jangra[1], MK Brahmi[1] and Karina[1]

[1]Department of Environmental Science, College of Forestry,
Dr Yashwant Singh Parmar University of Horticulture and Forestry, Nauni-173230 Solan, (HP)

Corresponding author e-mail:Jangra.2u@gmail.com

Abstract

The study was carried out during the year 2020-2021 to assess the indoor air quality in rural areas of Solan district in Himachal Pradesh. The study was conducted by selecting six households randomly from each village which was selected from four panchayat (Nauni, Samror, Serbanera and Oachghat). Indoor air quality parameters such as PM10, NRSPM, TSPM, NO2 and SO2 were investigated. A well structured pre-tested questionnaire was used to assess the factors responsible for indoor air quality. The highest concentrations of PM10, NRSPM, TSPM, NO2, and SO2 were identified in Nauni village with mean values of 24.17, 20.37, 44.54, 12.54 and 0.35µg/m3 and the lowest concentrations in Nagali village with mean values of 16.63, 12.92, 29.55, 8.28 and 0.30 µg/m, respectively. The highest AQI was 18.55 in Nauni, while the lowest was 12.22 in Nagali. The rural area as a whole of the district

represented by four panchayat has a 'Good' Air Quality Index (AQI). The investigation found that the concentrations of indoor air quality parameters were within the permissible limits. However, the Nauni village showed the highest concentration of the pollutants. Nine factors were identified which were responsible to impair the indoor quality viz. fuel wood based cooking, smoke sources, mode of ventilation, insect/pest control measures, waste disposal near house, use of perfumes and air freshners, cowshed near house, intermittent cleaning and dampness in the house due to leakage. In order to reduce indoor air pollution, appropriate mitigation techniques should be used based on these identified factors to avoid further degradation and sustainable environment.

Keywords: *Air pollution, indoor- adverse effects, Air Quality Index, Mitigation, Indoor air quality, panchayat.*

Effect of environmental conditions on production of Selected Solanaceous Crops under passive solar greenhouses in Trans-Himalayan Ladakh, India

Amita Rawa*, Shalinder Kaur*

[1]Department of Horticulture, Defence Institute of High Altitude Research (DIHAR), DRDO, Leh, Ladakh- 194101,U.T., India
[2]Department of Botany, Panjab University, Chandigarh- 160014, U.T., India

e-mail: amitarawa.2015@gmail.com

Abstract

Extreme temperature variations, high UV rays, light intensity and low precipitation is the major environmental factors that limits the optimal field production of warm season crops in the arid high mountain regions. A comparative study was conducted in Ladakh at an elevation of 3344m (above mean sea level), to observe the effect of environmental conditions on few Solanaceous crops, their plant growth and yield in different naturally ventilated passive solar greenhouse compared to open field during summer season (May to mid-October). A temperature range of maximum 400C and minimum 50C, high UV-B radiation (0.27±0.04µW/cm2), light intensity (1003.6±130.9 lux), photosynthetically active radiations (1525.7±313µE/m2s) and soil temperature (16.8± 3.60C) observed in open field adversely affect the growth and yield of warm season crops particularly cherry tomato, brinjal and peppers. The overall growth (plant height number of leaves, stem diameter, chlorophyll content) of plants under greenhouses was higher than open fields. E.g. polycarbonate sheet used greenhouse (PC) exhibited 3-4 times higher, while polyethylene sheet used greenhouse (PE) yielded 2-3 times higher in cherry tomato, brinjal and pepper crops compared to open field. Further, overall yield (number of fruits and weight of fruit) production under both PC and PE was 6-8 times higher for brinjal, 4-5 times higher for peppers and 2-3 times higher for cherry tomatoes. Therefore, the study indicates that PC and PE sheet used greenhouses can be recommend for better plant growth and yield in areas with harsh environmental conditions like Ladakh.

Keywords: *Arid high mountains, polycarbonate, polyethylene, warm season crops, high UV and PAR*

Performance evaluation and selection of Sun Melon (*Cucumis melo* var. *inodorous*) cultivars for organic cultivation in trans Himalayan Ladakh

Kunzes Dolma

Defense Institute of High Altitude Research, DefenseResearch and Development Organization, Leh Ladakh-194101, India

Email:kunzes4243@gmail.com

Abstract

On farm trials were conducted during the summer season of 2022 and 2023 to study the feasibility of growing warm season crop Sun Melon in high altitude trans Himalayan Ladakh under low input production system. Four Sun Melon cultivars PS Melon Hybrid, Pusa Sunehari, F1 hybrid 411 and Pusa Sarda were grown in open field conditions under organic cultivation system using Farm Yard Manure and black polythene mulching. Pusa Sunehari and PS Melon Hybrid were among the highest yielding cultivars. The mean marketable yield of four varieties ranged from 5.9±1.5 kg to 2.9±0.6 kg respectively. Average marketable fruit weight ranged from 2.3±0.7 kg for cultivar Pusa Sunehari to 0.4±0.0 kg for cultivar Pusa Sarda. TSS ranged from 17.9±1.6 to 15.3±2.1 0BRIX respectively. Hedonic scale study was also performed and Pusa Sunehari was selected as the best performing variety among all four cultivars. Fruits are ready to harvest in mid August. This study suggests that sunmelons can be successfully grown in open field conditions in trans Himalayan Ladakh.

Key words: *High altitude, Low input, Organic, Off-season*

Comparison Between the Basaland Foliar Application of Boron and Physio-Chemical Properties of Soil in Maize

Mudit Tripathi

PhD Research scholar Department of Soil Science and Agricultural Chemistry, (Naini Agricultural Institute)

Sam Higgin bottom University of Agriculture,Technology and Sciences Prayagraj - 211 007, U.P., India

Abstract

An experiment was conduct edduring Kharif season (July2021-Nov.2021)which revealed after application of different levels NPK and boron applied through foliar application increases growth, yield of maize where as through basal application the soilphy sicaland chemical properties found to be best, in which maximum physical properties such as bulk density particle density % pore space water holding capacity varies from depth0-15cmto15-30cmwas1.305Mgm-3to1.310Mgm-3,2.546Mgm-3to2.548Mgm-3at15-30cm,46.87%at0-15cmand44.50%at,39.62%at0-15cmand37.95%at15-30cm,pH6.90at0-15cmand6.92at 15-30cm, EC0.278 dSm-1at 0-15 cmand 0.281dSm-1at15-30 cm,organic carbon 0.561% at0-15 cmand at 0.550 % at 15-30 cm, available nitrogen 332.45 kg ha-1 at 0-15 cm and 325.22 kg ha-1at 15 -30 cm, available phosphorus 35.75kgha-1at0-15cmand32.30kgha-1at15-30cm,availablepotassium221.46kg ha-

1 at 0 -15 cm and 219.54 kg ha-1 at 15-30 cm, available boron 0.85 mg kg-1 at 0-15 cm and 0.73 mg kg-1 at 15-30 cm with cost benefit ratio is 1: 1.83 best from T1[@ 0% RDF + 0% Boron].

Keywords: *Maize, Basal, Foliar and Boron, etc.*

Engineering banana bunchy top virus resistance through RNAi approach

Natarajan Nandhakumar[1] &[2], Krish Kumar[1], K. Soorianathasundaram[1], Dinesh Dhakshanamoorthy[2], Dinesh Jinger[2] and Malharimart and Jagannivas Kaledhonkar[2]

[1]Department of Fruit Crops, Tamil Nadu Agricultural University, Coimbatore, India

[2]Scientist, ICAR-IISWC-Research Centre, Anand, Gujarat, India

****Correspondence email:nandhakumarfruits@gmail.com***

Abstract

Banana bunchy top disease (BBTD), caused by the Banana Bunchy Top Virus (BBTV), causes significant losses for banana growers globally. In response, researchers pursued RNAi-mediated genetic transformation to confer resistance against BBTV. They successfully established efficient somatic embryogenesis protocols for 'Grand Naine' and 'Rasthali' bananas, inducing embryogenic callus from immature primordial male flowers. Higher callus induction frequencies were observed in IMFs located at the 6thto 8thbract positions of the inflorescence. Optimal cell proliferation in Rasthali and Grand Naine was achieved with an initial cell density of 3.0% of settled cell volume. Further culture conditions promoted embryo maturation and regeneration, with L-glutamine significantly enhancing somatic embryo development. Genetic fidelity of regenerated plants was confirmed through ISSR marker analysis. In a study on 'Rasthali' bananas, the efficacy of RNAi for BBTV resistance was evaluated. An RNAi construct targeting three BBTV genes (Rep, CP, and MP) was mobilized into Agrobacterium strain LBA4404 for transformation. Eighteen transgenic lines were generated and confirmed by PCR. All lines were assessed for BBTV resistance in a greenhouse, where plants were exposed to viruliferous aphids pre-exposed to BBTD. Symptom development and viral nucleic acids were monitored over 120 days. Three transgenic lines remained symptom-free, with a reduced viral load observed on days 45 and 105 post-inoculation. This study highlights the potential of RNAi in controlling BBTV in bananas.

Keywords: *Banana, Somatic embryogenesis, BBTV, RNAi, Agrobacterium and transgenic*

Biosafety and efficacy of autogenous immersion vaccination against *Lactococcus garvieae* infection in rainbow trout (*Oncorhynchus mykiss*) in India

Neetu Shahi*, Bhupendra Singh, Sumanta Kumar Mallik, Suresh Chandra

ICAR-Directorate of Coldwater Fisheries Research, Bhimtal, 263 136, Nainital, Uttarakhand, India

****Corresponding author: neetuicar@gmail.com; Neetu.Shahi@icar.gov.in***

Abstract

Rainbow trout (Oncorhynchusmykiss) is the topmost important coldwater species in fish farming of

hills of India. However, due to intensification and change in climate, farmed rainbow trouthas been facing the "warm water lactococcosis" disease caused by Lactococcusgarvieae. Vaccination by immersion is known to have several advantages over injection, such as reduced stress to fish and mass vaccinationwithin a short time. Therefore, in this study, the efficacy of the formalin-killed autogenous vaccine in rainbow trout (23.45 ± 5.87 g) was evaluated by immersion (20 min). Vaccination was done as primary and booster dose at an interval of 7 days, and fish were challenged 7 days post booster dose (pbd). The experiment was conducted in duplicate with two group: treatment group (TG; n=72) - vaccinated and infected by inducer; and control group (CG; n=72) -non-vaccinated and infected by inducer. Blood serum and organs (gill, liver and kidney) for histology was collected 3, 5, 7, 14 and 21 days pbd from TG and CG. Approximately 100% relative percent survival (RPS) was observed in TG in comparison to CG, when exposed to homologous L. garvieaestrains (3.56×106cfu/ml). The serum lysozyme activity and bactericidal activity increased significantly in TG, in comparison to CG on 21 days pbd. However, no significance difference was found in total protein, albumin, and globulin content of the serum of both the groups. Biosafety evaluation of the vaccine in rainbow trout (n= 10; 28.96 ± 18.56 g) indicated no pathological changesat tissue or cellular leveltill7 dayspbd. Animal behavior scoring, survival percentage, body weight, gross lesion scoring, and histopathology scoring confirm the biosafety of this vaccine in rainbow trout. The findings of this study suggested that the immersion of rainbow trout to formalin-killed L. garvieae vaccine protects against disease caused by L. garvieae.

Keywords: *Warm water lactococcosis, Antibiotic resistance, Vaccine, Rainbow trout, Immune gene*

Tor sattalensis (Cyprinidae), a new species under the genus Tordiscovered from mid-hill Himalayan region of Uttarakhand, India

Neetu Shahi[1],*, Debajit Sarma[1],[2], Bhupendra Singh[1], Radheshyam Haldar[1], Sumanta K. Mallik[1], Ravindra Posti[1], Pramod Kumar Pandey[1]

[1]ICAR-Directorate of Coldwater Fisheries Research, Bhimtal-263 136, Uttarakhand, India
[2]ICAR-Central Institute of Fisheries Education, Versova, Andheri West, Mumbai-400 061, Maharastra, India

Corresponding author: neetuicar@gmail.com; Neetu.Shahi@icar.gov.in

Abstract

A new species of mahseer under the genus Torwasdiscovered from Sattal Lake(29°21'08" N and 79°31'05" E) ofHimalayan regionof northern India. The T. sattalensiswas distinguished from other Tor spp.bycomplete lack of fleshy median lobe below the mandibular symphysis, shiny dark blue-black pigmentation on body, non-hypertrophic upper and lower lips, and highly reduced and thin maxillary and mandibular barbels. Thisspeciesis distinguished from its closely related sister species, T. tor by a shorter body depth (20.31 to 22.94 vs. 24.56 to 25.18 %SL), a longer caudal peduncle (18.46 to 21.91 vs. 16.47 to 17.31 %SL), lesser number of pre-dorsal scales (6 to 7 vs. 9 to 10) anda higher number of anal fin rays (8 to 9 vs. 5 to 6). By molecular evolutionary analyses based on cytochrome c oxidase subunit I (coxI), cytochrome b (cytb) and ATPase subunit 6&8 (ATPase6&8) genes, T. sattalensis formed a distinct cluster away from other mahseer species. Further, T. sattalensis differs from its congeners by a raw genetic distance of 0.690 to 0.730, 0.005 to 0.100 and 0.019 to 0.066in the coxI, cytb and

ATPase6&8nucleotide sequence, respectively.

Keywords: *Morphometric measurements, meristic counts,molecular taxonomy, osteology, principal component analyses*

Climate change and its impacts on Biodiversity of India

Nisar H. Bhat

Awantipora Forest Division Jammu and Kashmir Forest Department

Corresponding author email: Nisar.123@rediffmail.com

Abstract

Climate change refers to the long-term changes in temperature and weather due to human activities. Increase in average global temperature and extreme and unpredictable weather are the most common manifestations of climate change. In recent years, it has acquired the importance of global emergency and affecting not only the wellbeing of humans but also the sustainability of other lifeforms. Enormous increase in the emission of greenhouse gases (CO2, methane and nitrous oxide) in recent decades largely due to burning of coal and fossil fuels, and deforestation are the main drivers of climate change. Marked increase in the frequency and intensity of natural disasters, rise in sea level, decrease in crop productivity and loss of biodiversity are the main consequences of climate change. Obvious mitigation measures include significant reduction in the emission of greenhouse gases and increase in the forest cover of the landmass. Conference of Parties (COP 21), held in Paris in 2015 adapted, as a legally binding treaty, to limit global warming to well below 2 °C, preferably to 1.5 °C by 2100, compared to pre-industrial levels. However, under the present emission scenario, the world is heading for a 3-4 °C warming by the end of the century. This was discussed further in COP 26 held in Glasgow in November 2021; many countries pledged to reach net zero carbon emission by 2050 and to end deforestation, essential requirements to keep 1.5 °C target. However, even with implementation of these pledges, the rise is expected to be around 2.4 °C. Additional measures are urgently needed to realize the goal of limiting temperature rise to 1.5 °C and to sustain biodiversity and human welfare.

Keywords: *Climate change, Biodiversity, Deforestation, Emission of greenhouse gases, COP*

Unveiling Promising Strains for Bioremediation and yield Enhancement: Exploration of Stress-Resilient Endophytic Bacteriain *Mucuna pruriens* (L.) DC.

Nitish Kumar [a, b,] Sunita Singh Dhawan*

Nitish Kumar

[a]UGC-SRF,Department of Biotechnology, CSIR-CIMAP, Lucknow, India

[b] CSIR- Human Resource Development Centre Campus, Academy of Scientific and Innovative Research (AcSIR), Sector 19, Kamla Nehru Nagar, Ghaziabad, Uttar Pradesh 201002, India

Email: sls.nitishk@gmail.com

Dr. Sunita Singh Dhawan*(Corresponding author)

Senior Principal Scientist, Department of Biotechnology

CSIR- Central Institute of Medicinal and Aromatic Plants

P.O.-CIMAP, Lucknow, PIN 226015

Email: sunita.dhawan@cimap.res.in, sunitasinghdhawan@rediffmail.com

Abstract

Enhancing plant productivity and fortifying defense mechanisms against biotic and abiotic stresses is crucial for sustainable agriculture. To achieve this, researchers have investigated the use of endophytic bacteria as a viable alternative to chemical fertilizers and pesticides. The application of plant growth-promoting endophytes (PGPE) is crucial for enhancing plant growth and mitigating biotic and abiotic stresses, especially in regions vulnerable to increasing salinity. In this study, six endophytic bacteria were isolated from the different plant parts of healthy Mucunapruriens (L.) DC.grownCSIR-CIMAPLucknow, India. These endophytes exhibited various plant growth-promoting (PGP) activities. Among these,Enterobacter roggenkampii,Enterobacter mori andEnterobacter ludwigiiexhibited superior performance in imparting salinity stress tolerance to Mucunapruriens (L.) DC., with pronounced effects on seedling growth under stress conditions, with different salt concentrations in nutrient broth medium. Under salt stress in vitro, the bacteria culture exhibited competitive exopolysaccharide (EPS) production. The isolated endophytic microorganisms revealed significant potential for PGP activities, and under salinity stress suggests a sustainable solution for coastal agriculture amid changing climate conditions. In pot experiments, These microbes were evaluated for their tolerance to abiotic stresses and ability to promote plant growth. Plants inoculated with Enterobacter roggenkampii, Enterobacter mori and Enterobacter ludwigiishowed higher growth, yield, and physiological parameters, establishing the bacteria as a potential endophyte for enhancing salinity stress tolerance in Mucunapruriens (L.) DC.. This approach involving bacterial endophytes showcases a comprehensive strategy for addressing salinity-induced challenges in crop production.

Inventorization of invasive plants in selected districts of Sikkim Himalaya

Passangkit Lepcha*[1],[2], Rajib Gogoi[2] and Anup Chandra[1]

[1]Forest Research Institute deemed to be University, Dehradun, Uttarakhand

[2]Botanical Survey of India, Sikkim Himalayan Regional Centre, Gangtok, Sikkim

Corresponding author: lepchapassang24@gmail.com

Abstract

Invasive plants are gaining immense attention from ecologists as it is the second biggest threat to global biodiversity. Understanding the process of plant invasions and their impacts on species is crucial for protecting native species diversity. The significant increase in international commerce and travel will hasten the introduction, dispersal and spread of alien species in India. The negative impact of invasive plants is becoming more widespread throughout India, even extending into the Himalayan states.

Although the primary vital stage is the systematic catalogue of non-native species, investigations are still lacking regarding the description of alien species in India, the study of identification of potential invasion routes, and their effects on the local vegetation. Taking this into consideration, the current study attempted to catalogue the invasive plants of Sikkim Himalaya. Sampling plots were strategically laid throughout the elevations ranging from 500 to 2500 m above sea level at selected sites of Sikkim to record and assess the detrimental impact. The invasive species of the study area was documented taxonomically. A total of 18 invasive species belonging to 15 genera and 07 families were recorded from the study sites. The dominant family was Asteraceae (07 species) followed by Solanaceae (03 species). Although the study is in a preliminary stage still the findings suggest that the Himalayan ecosystem is vulnerable to invasion, with most non-natives spreading from the lowlands to the highlands. With rising elevation, the number of alien species steadily declined with species richness mostly peaked at mid-elevations.

Field Efficacy of Intercropping on Sucking Pest Complex of Whitefly (*Bemisia tabaci* Gennadius) of Mung bean (*Vigna radiate* L.)"

Pradeep Kumar[1]* and Anoorag R. Tayde[2]

Department of Entomology, Rajasthan College of Agriculture, MPUAT, Udaipur, Rajasthan

[1]Ph.D. Research Scholar, Department of Entomology and [2] Assistant professor, Department of Entomology, Sam Higginbottom university of Agriculture,Technology and Sciences, Prayagraj - 211007

Corresponding Author's Email:rathourpradeepkumar1996@gmail.com

Abstract

A field experiment was conducted during the 2019-2020 kharif season at the Central Agriculture Field, Sam Higginbottom University of Agriculture, Technology, and Sciences, located in Prayagraj, U.P., India. Mung bean, a short-duration crop prized for its high protein content and easy digestibility, was the focus. Intercropping, particularly with tall-statured crops like cereals and legumes, is crucial for ensuring sufficient food supply in developing nations. Mung bean is renowned worldwide for its nutritional value, serving as a rich source of protein, carbohydrates, and vitamins. Additionally, its ability to fix nitrogen in the soil through root nodules enhances soil fertility. India leads global production of Mung beans, accounting for 70% of the world's output, yielding approximately 1.5 to 2.0 million tonnes annually from 3 to 4 million hectares, with an average yield of 500 kg per hectare. Mung beans contribute 10-12% to the country's total pulse production, making India the largest producer of grain legumes globally. The experiment utilized a Randomized Block Design with seven treatments: T0 (Mung bean), T1 (Mung bean + Maize), T2 (Mung bean + Sunhemp), T3 (Mung bean + Dhaincha), T4 (Mung bean + Jowar), T5 (Mung bean + Bajra), and T6 (Mung bean + Okra). The objective was to assess the field efficacy of intercropping against the whitefly (Bemisiatabaci L.) pest complex affecting Mung beans. Results indicated that certain treatments, such as Mung bean + Sunhemp, exhibited promising outcomes against whiteflies, followed by Mung bean + Bajra, Mung bean + Jowar, Mung bean + Maize, Mung bean + Okra, and Mung bean + Dhaincha, all of which were significantly different from the control. Whitefly populations were monitored at 15, 30, and 45 days post-treatment, with the lowest population observed in the Mung bean + Sunhemp treatment.

Key words: *Whitefly, Mung bean, Dhaincha, Sunhemp, Jowar, Bajra, Okra, Intercropping*

Synthesis and Characterization of binary grafted guar gum through Green Protocol

Pramendra Kumar [a]*, Narendra Singh[a] , Sachin Gihar [a,b]

[a] Department of Chemistry, M.J.P. Rohilkhand University, Bareilly 243006, Uttar Pradesh, India

[b] Department of Chemistry, V.R.A.L Govt. Girls Degree College, Bareilly, Uttar Pradesh, India

Corresponding author e-mail: pramendra2002@gmail.com

Abstract

The microwave-assisted irradiation of guar gum is being optimized towards graft copolymers production. In this experiment, binary grafted guar gum was synthesized using acrylamide and acrylic acid monomers added before microwave irradiation to prepare a new PH sensitive adsorbent for heavy metal ions removal from waste water. The grafting efficiency was optimized by varying the reaction parameters that encompassed monomer concentrations among other factors such as; exposure time and microwave power. The designed adsorbent [GG-g-poly(Amco- AA)] was characterized copolymer's structure, thermal properties, crystallinity, morphology and elemental composition FTIR spectroscopy, TGA-DTA, XRD, SEM, and XPS techniques were used in this study. This is a biocompatible, low-cost, eco-friendly material and can be easily manufactured on a large scale. GG-g-poly(Am-coAA) has a high potential to be commercial and powerful adsorbents for the sorption and removal of toxic metals.

Keywords: *Guar gum, Grafting, Acrylamide , Acrylic acid, Adsorbent.*

Screening of Chrysanthemum Genotypes for Waterlogging Tolerance

Prativa Anand[1]*, Hari Krishna[2], AK Tiwari[1] and M.K.Singh[1]

[1]Division of Floriculture and Landscaping

[2]Division of Genetics

ICAR-Indian Indian Agricultural Research Institute, New Delhi-110012

Corresponding author e-mail: prativa.iari@gmail.com

Abstract

Water is among the most vital environmental factors affecting plant growth, development, morphology, and physiological and biochemical metabolism. Waterlogging dramatically reduces the oxygen (O2) diffusion rate in soils, which triggers O2 depletion, leading to the excessive accumulation of reactive oxygen species (ROS) in plants. The excessive ROS content can directly cause plant growth inhibition and yield decline and even plant death in severe cases. Chrysanthemum (Chrysanthemum morifolium Ramat.) is the second-most important ornamental species in the world, and it accounts for a large proportion of the total commercial production of these plants. Chrysanthemum is highly heterozygous and self-incompatible, and usually regarded as a natural hybrid arising from multiple Chrysanthemum species, as a result, it is often vegetatively propagated. Despite the advent of molecular breeding designs

in chrysanthemum, conventional crossbreeding between parental cultivars with contrasting target traits is the most effective breeding method, in which excellent F1 hybrids with traits of interest will be selected and vegetatively cultivated into a cultivar.Most chrysanthemum cultivars are susceptible to hypoxia and waterlogging conditions and it is one of the major abiotic stresses that negatively affect chrysanthemum growth and development, thus reducing its productivity. Development of screening methods for tolerant germplasms and the breeding of tolerant new varieties are of great importance in chrysanthemum. Therefore, a study was undertaken to screen fiftyfive genotypes of chrysanthemum for waterlogging tolerance.The waterlogging treatment was carried out for twelve days. Leaf wilting index (WI) was recorded based on a symptom severity scale from 1 to 5, with 1 indicating no symptoms. Various morphological parameters like shoot length, root length, fresh shoot weight, fresh root weight, dry shoot weight and dry root weight were recorded at different durations of waterlogging treatment and compared with control conditions. The SPAD values were also recorded during the study. The genotypes varied greatly in their response to waterlogging.

Aqua gardening: Prospectus of ornamental fish culture and ecotourism in mid hill region of Uttarakhand

Preeti Bhatt[1,2], R.S. Patiyal[1], Bipin C. Pathak[2] N.N. Pandey[1] and Sandhya Bohra[2]

[1]ICAR- Directorate of Coldwater Fisheries Research
Industrial Area, Bhimtal -263136, Nainital, Uttarakhand) India
[2]Govt. M.B.P.G. College Haldwani, Nainital-263139

Abstract

Globally, the ornamental fish industry is worth hundreds of millions of dollars and supports thousands of rural people in developing countries. World trade of ornamental fish is estimated to be about Rs. 2000 crores, but, India's share is only Rs. 15 crores, which is very insignificant. India is endowed with a suitable climate, abundant water resources, rich biodiversity and large manpower base. However, India's share in global ornamental fish trade is negligible and at present the ornamental fish export from India is dominated by the wild caught species. Among the 300 freshwater fish species, 30 species are considered ornamental fishes endemic to the Uttarakhand. Kolkata along with adjoining districts has become the major ornamental fish producing zones of India and a major export centre. About 90% of Indian exportis from Kolkata followed by 8% from Mumbai and 2% from Chennai. Ornamental fish industry in India seems to be rapidly growing and hence requires periodical evaluation of the export performance in order to boost its growth with appropriate policies. The overall domestic trade in this field is reportedly growing at the rate of 20% per annum (NABARD). An estimate carried out by MPEDA shows that there are one million fish hobbyists in India.

The development of protocol for ornamental fish breeding, seed production and management has provided important livelihood options for marginal and landless farmers in certain localities. The initiative taken by the Directorate of Coldwater Fisheries Research (DCFR), Bhimtal for the promotion ornamental fish culture in the upland coldwater region has also shown significant potential for aqua farming. Uttarakhand is the home of several important ornamental fishes, which can be explored as an income generation resources. In this context,ICAR-DCFR has taken an initiative towards setting up

brood banking, breeding, rearing and seed production units for the culture of these ornamental fishes in garden or backyard. Through this initiative, emphasizes has been given to produce OFS locally by farmer for the socio-economic upliftment of local people. Breeding and seed production of Koi carp, Gold fish, Barilius and Garra has already been standardised at the directorate. Seeds of OFS is also distributed to local people for aqua gardening.Directorate is actively working to promote a ornamental fish culture by popularizing techniques, helping them to take up these aqua gardening practices through a small pondof the size approximately 10×3×1 feet. Pond was constructed in kitchen garden and UV treated polysheet was lined. Stocking density of ornamental fish species (OFS) was @ 12 fry/per square feet and after6-8 months growth increment was 2.5-3.5 inches. The market price itself in Bhimtal was explored Rs. 20-25/ per piece. Net gain after deducting all sorts of expenditure was Rs 115/square feet and in second year Rs.150/ square feet. Thus this viable package of practice was transferred to many farmers of Bhimtal and Champawat. This package of practice may lead to breakthrough for livelihood security of mid hill people specially woman and youths.Thus an initiative of OFS culture in backyard is providing new avenues to local farmers for livelihood security.

Keywords: *Ornamental fish species(OFS), backyard, livelihood security, Breeding*

Flow Of Colors in Biosphere, With Special Reference to Blood

Priti Mathur[1]*, Balvindra Singh[1],

[1]Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus,

Gomti Nagar Extension, Near Malhaur Railway Station, Lucknow- 226028

**** pmathur@lko.amity.edu***

Abstract

During the course of evolution,colours from visible range of sunlight "VIBGYOR" trapped in form of energy, transformed, flowed from one organism to another organism and after decomposition it goes back to nature. Plants cells are producers having oxygen producing capacity. All oxygen carrying molecules in animal system share almost same structure and follow same metabolic pathway. Coproporphyrinogen III Oxidase is a common enzyme found in plant and animal for oxygen producing and oxygen carrying metabolism. Research work done to find out phylogeny of Coproporphyrinogen III Oxidase in order to understand relationship of above said molecules. ToolMEGA X used on Maximum Likelihood method based on JTT matrix model for statistical inference. Results showed that same pathway followed by different organism for oxygen trapping (green plants) and oxygen carrying moleculesi.e. connective tissue "blood" in animals. Results confirmed that, light trapping pigment is green in colour while blood can be of different colours in different animals.This series starts from plants, tapping energy of 680-700nm, and this green molecule i.e.chlorophyll converted into different coloured blood pigment like Violet, Indigo, Blue, Green, Yellow, Orange, Redin different organism. Relation of blood pigment with plants chlorophyll pigment shows that plants genes are inserted via plants prokaryotic /eukaryotic cells to animal prokaryotic /eukaryotic cells via food chain, mainly by ingestion, engulfing, symbiotic relationship. Genes of primitive photosynthetic bacteria/plant cells get inserted into genome of animal cells producing similar molecules and started same pathway with little

variation, depends on the nature of organism.

Key words: *MEGA X, Coproporphyrinogen III Oxidase, VIBGYOR,Maximum Likelihood method, JTT matrix, chlorophyll, blood*

Unraveling the association between Dairy Farmer Profiles and Climate Change Adaptation Strategies in South Gujarat

R. S. Ghasura[1]*, Durgga Rani .V[2], R.R. Singh[3]

[1]Assistant Professor, Dept of VAE, College of Veterinary Science and A.H.,KU,Anand
[2]Assistant Professor, Dept of VAE, College of Veterinary Science and A.H.,KU,Navsari
[3]Associate Professor &Head,Dept of LPM, College of Veterinary Science and A.H.,KU,Navsari

Corresponding Author: rghasura21@kamdhenuuni.edu.in

Abstract

This research paper delves into the intricate relationship between dairy farmer profiles and their employed adaptation strategies to counter the effects of climate change in South Gujarat. A comprehensive analysis has been undertaken to investigate the varied socio-economic demographic and farm-specific characteristics of the livestock farmers. The objective is to understand how these attributes play a role in influencing the adoption of climate-resilient practices.The primary objective is to derive crucial insights that can inform tailored strategies aimed at bolstering climate resilience within the dairy sector, thereby ensuring sustainable livelihoods for farmers amidst evolving climatic challenges.The comprehensive analysis, illuminates several significant correlations between farmer profile attributes and the adoption of adaptation strategies.Factors such as communication participation, cohesiveness, social engagement, farmer-to-farmer extension, herd size, modern farm equipment availability, experiences with extreme events, and access to climate-related information exhibited robust positive correlations at the 0.01% probability level, highlighting their substantial influence on adaptation strategies. Moreover, attributes including family education status, subsistence ratio, external family assistance, extension contacts, fodder sources, credit availability, productive animals in the herd, annual income, and farmers' awareness regarding climate change showcased noteworthy associations at the 0.05% probability level, contributing significantly to the array of adopted adaptation strategies.This nuanced understanding is crucial for developing targeted interventions that ensure sustainable livelihoods and bolster climate resilience among dairy farming communities.

Key words: *Adaptation Strategies ,Climate Change, Dairy Farme*

Faunal diversity in rice ecosystem of Chhattisgarh plain

R.K. Panse[1&]*, A.K. Saxena[2] and N.K. Bisen[3]

[1&3]JNKVV-College of Agriculture, Waraseoni, Balaghat, M.P., India
[2]Department of Entomology, JNKVV, Jabalpur, Madhya Pradesh, India

Corresponding author: rkpanseento@gmail.com

Abstract

The rice crop is cultivated in humid and hot climates. In India apart from socio-economic diversities of the state, diverse ecological and climatic conditions are found. Therefore, rice is grown throughout the year i.e. in Kharif, Rabi and summer seasons in our country from south to north and east to west. The research experiments on "Faunal diversity in Chhattisgarh plain rice ecosystem" was conducted at Research Farm of JNKVV-College of Agriculture, Balaghat, Murjhad Farm, Waraseoni and farmer's field of Balaghat district. Two blocks from the Balaghat district i.e.Lalburra and Waraseoni were selected for the survey works of the study. The insect biodiversity was calculated using the Shannon-Weaver method (Shannon and Weaver, 1949) along with various multivariate analysis. The species diversity data of pooled mean from Kharif, 2019 and Kharif, 2020 showed that the three species of stem borer i.e.S. insertulas, S. inferens and S. innotata were observed in the Balaghat district. Among all three species of stem borer, the highest population was recorded with yellow stem borerand it was contributed 71.24% followed by pink stem borer20.61% and white stem borer 8.16 %. The data on leaf folder was showed that the three species of rice leaf folder i.e.Cnaphalocrosismedinalis, MarasmiapatnalisandMarasmiaruralis were observed in the Balaghat district. Among all three species of leaf folder, the highest population (85.16%) was observed with C. medinalis in all three species of leaf folder followed by M. patnalis12.38% and M. ruralis 2.46%.The abundance of natural enemies in rice,the total numbers of five natural enemies i.e.hymenoptera wasp, orthoptera grasshoppers (meadow grasshopper), odonata fly (dragonfly and damselfly), hemipteran bugs and spider were observed at different stages of crop growth. The highest percent relative abundance of meadow grasshopper (29%) was recorded from the study area, while the lowest (15%) was in spider and hemipteran bugs. Among natural enemies, the abundance was in the order of meadow grasshopper > Odonata fly >hymenoptera wasp > spider > hemipteran bugs.

Keywords: *Insect diversity, faunal abundance, insect pests, natural enemies.*

Role of GIS and Remote Sensing in Natural Resource Management

Raghu Nandan Singh Khatana[1] and Shivangi Upadhyay[2]

[1]Assistant Professor, School of Agriculture, Suresh Gyan Vihar University, Jaipur

[2]Ph.D. Research Scholar, Department of Agricultural Economics, Rajasthan College of Agriculture, MPUAT, Udaipur

Abstract

With the innovations in technology, it is now more practical to use GIS and remote sensing technology to allocate surface and subsurface water resources as efficiently as possible for distinct technology. The data has been arranged in a scientific way through the extensive use of these technologies.Remote sensing is a useful tool for routinely gathering data over large areas, and GIS processing can help achieve the desired outcomes.Numerous opportunities exist for managing and monitoring natural resources at multi-temporal, multi-spectral, and multi-spatial resolutions with the aid of remote sensing and Geographic Information Systems (GIS).For managers of natural resources, comprehending the specialized capabilities of an ever-expanding array of image sources and analysis techniques is imperative. A wide range of applications of GIS andremote sensing tools for managing natural resources (soil, water, agriculture, forests, and natural hazards) are compiled in this review.Utilizing the research literature

on the subject, this study describes the function of GIS and remote sensing in the field of water resource engineering.In many situations, these approaches are expected to be the most effective ones available in the future for assessing and managing scarce water resources. In many aspects of various types of water resources projects, GIS and remote sensing techniques must be used effectively to replace, complement, and enhance ground data collection.The integrated use of GPS, GIS, and remotely sensed data by researchers, consultants, and managers of natural resources in government agencies, conservation organizations, and business will enable the development of management plans for a variety of natural resource management applications.Natural resource managers will benefit from this research's increased understanding of remote sensing science and their ability to collaborate with scientists to create and apply it in order to meet monitoring objectives.

Keywords: *Remote Sensing, GIS, GPS, Water, Natural Resources*

Enhanced Wastewater Treatment Using Membrane Bioreactor for Sustainable Pulp and Paper Production from Agricultural Residue: A Pilot Study

Savita Kalshan[1], Manju[2], Rajesh Dhankhar[1]*

[1]Department of Environmental Science, Maharshi Dayanand University, Rohtak, Haryana, India
[2]Department of Mathematics,Rajiv Gandhi Govt College for Women, Bhiwani, Haryana, India

Corresponding author e-mails: rajeshdhankar.EVS@mdurohtak.ac.in

Abstract

This research investigates the feasibility of employing a membrane bioreactor (MBR) for advanced wastewater treatment, specifically focusing on agricultural waste streams associated with pulp and paper production. Parameters such as Chemical Oxygen Demand (COD) reduction, Total Suspended Solids (TSS) removal, and membrane fouling potential are rigorously examined. A pilot project is implemented to assess the scalability and practical application of the MBR technology in treating agricultural wastewater, aiming to optimize the treatment process for sustainable and eco-friendly pulp and paper manufacturing. Results indicate promising advancements in both wastewater treatment efficiency and the potential for environmentally responsible resource utilization.

Keywords: *Membrane Bioreactor, Agricultural Waste, Pulp and Paper Production, Sustainable, Pilot Study, Wastewater Treatment.*

Effect of Potassium and Sulphur on Growth and Yield of Black Gram (*Vigna Mungo* L.)

Rakesh Yadav

Ph.D. Research Scholar, Suresh Gyan Vihar University, Jaipur, Rajasthan

Abstract

A field experiment was conducted during Zaid 2021, at Research Farm, Department of Agronomy. The soil of experimental plot was sandy loam in texture, nearly neutral in soil reaction (pH 6.83), medium

Organic Carbon (0.62%), Available low N (197.12 Kg ha-1), available medium K (198.71 Kg ha-1) and available medium S (31.21 Kg ha-1). The treatments details viz., T1: 20 kg K ha-1+ 15 kg S ha-1, T2: 30 kg K ha-1+ 20 kg S/ha, T3: 40 kg K ha-1+ 25 kg S ha-1, T4:20 kg K ha-1 + 15 kg S ha-1, T5: 30 kg K ha-1+ 20 kg S ha-1T6: 40 kg K ha-1+ 25 kg S ha-1, T7: 20 kg K ha-1+ 15 kg S ha-1, T8: 30 kg K ha-1+ 20 kg S ha-1, T9: 40 kg K ha-1+ 25 kg S ha-1 was used. The experiment was laid out in Randomized Block Design with nine treatments which are replicated thrice. The result showed that higher plant height (38.17 cm), maximum number of branches per plant (5.93), highest number of nodules per plant (15.73), maximum dry weight (8.63), maximum number of pods per plant (20.13), highest number of seeds per pod (6.20), test weight (33.60), seed yield (1456.67 kg ha-1), Stover yield (3086.67 kg ha-1), harvest index (32.06) and relative growth rate (0.013) were recorded significantly with the application of 40 kg ha-1 Potassium, 25 kg ha-1 Sulphur in Treatment T9, Highest crop growth rate (7.90) was recorded with 40 Potassium kg ha-1+ 25Sulphur kg ha-1 and highest gross return (80,191 ha-1), net return (56391 ha-1), and Benefit: Cost ratio (2.36) was recorded with the application of 40 kg ha-1 Potassium pulse 25 kg ha-1 Sulphur.

Key words: *Black gram, Potassium, Sulphur, Growth, Economics.*

The Wellness Boost of Incorporating Organic Foods in Your Diet

Hirdesh Kumar*, Rashmi Bajpai**

*PhD Scholar, Department of Horticulture, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya, Gwalior. (MP)

**Sr. Scientist, Krishi Vigyan Kendra Gwalior

****Corresponding author mail ID: hirdeshkumar468@yahoo.com***

Abstract

Organic food is widely believed to offer several potential health benefits compared to conventionally produced food. While scientific research on this topic is ongoing, some studies suggest that organic food may have certain advantages. It's important to note that the evidence is not always conclusive, and individual responses to organic food can vary. Here are some ways in which organic food may contribute to improved human health:Reduced pesticide exposure: One of the primary reasons people choose organic food is to minimize exposure to synthetic pesticides. Organic farming practices typically avoid or limit the use of synthetic pesticides, herbicides, and fertilizers. Some studies have shown that the residues of these chemicals in conventionally grown produce can be present at low levels in the food we consume. Organic farming methods aim to minimize such residues, potentially reducing the risk of pesticide-related health issues.Nutrient content: While research results are mixed, some studies suggest that certain organic foods may have higher nutrient levels compared to their conventionally grown counterparts. Factors such as soil quality and farming practices may influence the nutrient content of organic produce. However, the differences in nutrient levels between organic and conventional foods are not consistently significant across all studies.No synthetic additives: Organic food production restricts the use of synthetic additives such as artificial preservatives, colors, and flavorings. Choosing organic may help reduce exposure to these additives, which some people believe could have long-term health implications.Antioxidant content: Some studies have suggested that organic fruits and vegetables may

have higher levels of certain antioxidants. Antioxidants are compounds that help protect the body's cells from damage caused by free radicals, which are molecules produced during normal metabolic processes and in response to environmental factors like pollution.No genetically modified organisms (GMOs): Organic standards generally prohibit the use of genetically modified organisms (GMOs). Some people choose organic foods to avoid potential health and environmental risks associated with GMOs, although the scientific consensus is that GMOs approved for consumption are safe.It's important to note that the health benefits of organic food can vary depending on factors such as individual health conditions, overall diet, and lifestyle. Additionally, organic food is just one aspect of a healthy lifestyle, which should also include a balanced and varied diet, regular physical activity, and other health-promoting habits. It's always a good idea to consult with healthcare professionals for personalized advice on nutrition and health.

Keywords: *Organic food, Human Health, Organic farming nutrients, fertilizers, pesticides. Genetically modified organisms (GMOs): Benefits of Healthy Diet.*

Application of Forensic Science to Combat Illegal Logging & Trade

Raveena Thakur*, Bhupender Dutt, Rajneesh Kumar and Sunandini

Dept. of Forest Products, College of Forestry, Dr. YS Parmar University of Horticulture and Forestry, Nauni, Solan (HP) 173230

Email id*: raveenathakur008@gmail.com

Abstract

Illegal logging and the associated trade in illegally sourced wood products are major cause of deforestation which represents a massive threat to global biodiversity and act as a significant contributor to the continuation of unsustainable deforestation rates. International efforts to combat this problem consist primarily of the enactment of laws designed to discourage the trade in illegally sourced timber, and prohibit or limit the trade of specific species or those from specific areas. One of the key problems is that timber products do not generally possess the diagnostic features required for plant identification (i.e. the leaves, flowers and fruits of the tree) and hence reliable identification is extremely challenging. Thus, the role of forensic science comes into play. The forensic timber identification tools are used both for screening of suspect material and definitive identification of illegally sourced wood. Methods for tracking timber based on non-inherent features of wood are currently the most commonly used and can provide complementary information to assist with illegal timber investigations. However, for forensic diagnostic timber identification, only those methods which rely only on inherent wood characteristics (such as anatomy, chemistry and genetics) can provide reliable identification outcomes to support the law. Timber identification was historically a branch of wood technology, but is now considered to be part of the broad fields of wildlife forensics and forensic botany. India is the world's third largest importer of illegally logged timber. Many tree species are imported in India from International markets and sold in the local markets without their original identity. Thus, to identify species that may be falsely declared to avoid CITES controls, other trade restrictions; and/or wood that originates in protected areas or outside of approved forest management units, forensic science acts as a powerful tool. However, no one identification method can be a panacea; so synergistic approach can help in the identification

challenges to combat illegal logging and trade.

Keywords: *Forensic science, Timber identification, Logging, Challenges, CITES*

Optimization of Explant Type and Regeneration Medium For Cryopreservation of *Rubia cordifolia* L.

Rehan A Nadaf[1], Sangita Bansal*[2], Era Vaidya Malhotra[3], S.K Malik[3], Sundeep Kumar[2], Jyoti Kumari[4]

[1]The Graduate School, ICAR-IARI, New Delhi
[2]Division of Genomic Resources, ICAR-NBPGR, New Delhi
[3]Division of Germplasm Conservation, ICAR-NBPGR, New Delhi
[4]Division of Germplasm Evaluation, ICAR-NBPGR, New Delhi

Corresponding author:sangitabasnal@yahoo.com

Abstract

The medicinal climber plant Rubia cordifolia L., popularly known as Manjishta or Indian madder, is highly appreciated as a source of industrial dyeand its use in traditional Indian medicine including Ayurveda and Unani. This plant is not cultivated commercially due to lack of information and scarcity of genuine planting material, resulting in harvesting the material from natural habitats leading to loss of its genetic variability. It necessitates the conservation of diversity available in natural habitats before genetic erosion of thisspecies. Cryopreservation is the best choice for long-term germplasm conservation. Choice of suitable explant and regeneration mediumare crucial for a successful cryopreservation protocol. Therefore, this study was conducted to select the best explant and regeneration medium for R. cordifolia cryopreservation. For the explant-type experiment, three month oldin-vitro cultures of Rubia cordifolia were used and three different explants viz. shoot tips, nodal segments, and nodal halves(1 and 2 mm each)were tested. For regeneration medium, basal Murashige and Skoog (MS) mediumwith GA3either plain or supplemented with varied combinations of plant growth hormones Kinetin, and 6-y-y-(Dimethylallylamino)-purine(2-iP) were used. The nodal segments with a length of 2mm produced the best results, yielding 100% regeneration in seven days. Regeneration medium combination MS + 2-iP + GA3 showed the best regeneration response and shoot initiation was observed within 5 days of inoculation.These preliminary findings will aid in the optimization of a successful cryopreservation protocol for R. cordifoliafor its future conservation.

Upliftment of Scheduled Caste Community through adoption of scientific practices of composite carp farming in polytanks: Case study of Uttarakhand

Renu Jethi and N.N Pandey

ICAR-Directorate of Coldwater Fisheries Research, Bhimtal, Uttarakhand

Email: Renu.Jethi@icar.gov.in

Abstract

In North-Western Himalayan region, aquaculture is dominated by composite carp culture and rainbow trout farming. Aquaculture is a source of income and food for small and marginal farmers of hills. Low productivity of upland waters, slow growth rate in most of the fish species, low fecundity and poor landing and marketing facilities are some of the major obstacles in development and expansion of cold water fish production in mountain region. Composite fish culture is a proven technology being demonstrated by ICAR-DCFR, Bhimtal in hill region of Uttarakhand under scheduled Caste Sub Plan (SCSP) programme to create rural livelihood. A cluster approach is adopted for the implementation of need-felt scientific interventions.A successful model of composite fish farming with horticulture was demonstrated at Harinagar village of Nanital district. Total 32 farmers of Matsya UtapadanVipananSahkaari Samiti, Harinagar were benefitted by adopting scientific fish farming. Major technical intervention was done for stocking of advanced fingerlings in proper species composition of exotic carp, appropriate and effective supplementary feeding for increasing fish production. In order to estimate yield gap, data was collected from farmers of Harinagr village practicing composite carp culture. Technology yield gap I was found to be 19 kg per 100 m3. Constraints faced by fish farmers in adoption of scientific practices were identified and prioritized. Cost of pond construction, insufficient financial assistance, availability of fish seed, availability of fish feed loss due to natural calamities, fish mortality were major constraints with mean score of 4.6, 4.1, 4.0, 3.9, 3.8 and 3.2, respectively. There is need to encourage the fish farmers to adopt scientific practices and start hatcheries at local level. These efforts will result in enhanced yield and availability of input at local level. This successful model of composite carp farming may be replicated in other hill regions.

Key words: *carp farming, Yield gap, constraints, upliftment, hill region*

Assessment of the biochemical makeup, antioxidant capacity, antimicrobial and medicinal applications of ziziphus leaf extract

Richa Mishra[1], Vivek Kumar Mishra[2], Neelam Pathak[1]

[1]Department of Biochemistry, Dr. Ramamohar Lohia Avadh University, Ayodhya

[2]Department of Biotechnology, Dr. Ramamohar Lohia Avadh University, Ayodhya

Corresponding author e-mail:pathak.neelam007@gmail.com

Abstract

Ziziphus mauritiana, also known as Indian jujube. it is a tropical fruit tree species belonging to the family Rhamnaceae. In India, there are 90 or more cultivars, varying in the tree's habit; leaf shape; fruit form, size, color, flavor and keeping quality; and fruiting season. plant is used in the treatment of fever, indigestion, liver disease, diarrhea, wound healing, and jaundice and has various pharmacological properties. Ziziphus mauritiana is recognized for its traditional uses in different areas, as its fruits are consumed globally. The present study aimed to measure the presence of different bioactive compounds in the leaf of Ziziphus mauritiana plant and to explore its antioxidant potential by assaying free radical scavenging activity (FRSA), superoxide anion radical scavenging activity (SARSA) and reducing power (RP). The study was further carried out to assay the antimicrobial properties by disc diffusion method to ascertain its pharmaceutical application. The results of the present study showed the presence of high phytochemical constituents such as ascorbic acid, total phenolic, flavonoids, and carotenoids in the

leaf. Methanolic leaf extract showed significant antioxidant potential and antibacterial activity against pathogenic bacteria. Hence, results obtained in the present study suggest that leaves of Ziziphus can be used as a source of functional ingredients for nutraceutical/pharmaceutical drug industries to treat diseases induced by oxidative stress.

Keywords: *Ziziphus mauritiana, Antioxidant, Antimicrobial, medicinal Application.*

Biochar as a potential strategy for Carbon Sequestration and Climate Change Mitigation

Riya Kalsotra[1]*, Dr. Peeyush Sharma[1], Dr. Vikas Abrol[1]

[1]Department of Soil Science and Agricultural Chemistry, Sher-e-Kashmir University of Agricultural Sciences and Technology,Chatha,Jammu and Kashmir,180009

Corresponding author e-mail: riyakalsotra.9876@gmail.com

Abstract

Biochar, a carbon-rich material produced from organic waste, has gained attention as a promising solution for carbon sequestration and climate change mitigation.This abstract explores the role of biochar in reducing greenhouse gas emissions and enhancing soil health. Biochar has the ability to lock carbon in the soil for an extended period of time, helping to mitigate climate change by reducing greenhouse gas emissions.When biochar is added to soil, it acts as a stable carbon sink, meaning that it can store carbon for hundreds or even thousands of years. This is because biochar is resistant to decomposition and can remain in the soil for a long time without releasing carbon back into the atmosphere.By incorporating biochar into agricultural practices, we can enhance soil carbon sequestration, which not only helps to reduce atmospheric carbon dioxide levels but also improves soil fertility and nutrient retention.It also improves the soil's ability to retain water and nutrients, which can lead to increased crop productivity. This, in turn, reduces the need for synthetic fertilizers and irrigation, which helps to lower greenhouse gas emissions associated with conventional agricultural practices. It improves soil structure and stability, making it more resilient to climate change impacts such as extreme weather events. It also increases water holding capacity, reducing the risk of drought and enhancing the overall health and productivity of the soil. Overall, biochar shows great promise as a potential strategy for carbon sequestration and climate change mitigation and its ability to capture and store carbon , improve soil health, and reduce greenhouse gas emissions makes it an exciting avenue for addressing climate change. By utilizing biochar in agricultural practices, we can contribute to a more sustainable and resilient future.

Keywords: *Biochar, carbon sequestration, carbon sink, decomposition*

Enhancing pine needles (*Pinus roxburghii*) biodegradation by optimizing pH, temperature and substrate concentration through fungal consortium

Rukhsana Bano, Diksha Bhartiand Manvika Sahgal*

Department of Microbiology, College of Basic Sciences and Humanities, G. B. Pant University of Agriculture and Technology, Pantnagar-263145, Uttarakhand, India

Corresponding author e-mail:Sahgal.manvika@gmail.com

Abstract

Pinus roxburghii, commonly known as the "chir pine," is indeed a species of pine tree native to the Himalayan region and the Indian subcontinent. Pine needles are known for their flammability. The accumulation of dry pine needles on the forest floor can create a significant fire hazard, especially during periods of hot and dry weather conditions. Pine needles are acidic, containing tannins and terpenes, which can lead to soil acidification that can affect the growth of certain plant species and soil-dwelling organisms. In the present investigation, the isolated four fungi (WRP1,WRP2, WRP9 andWRP13) were screenedfor cellulase and laccaseenzyme activities qualitatively.All four fungal isolates were capable of showing lignocellulolytic enzymes activity. The potential fungal isolates WRP9 exhibiting maximum relative laccase enzyme (1.7) activity index(Ilac) on PDA amended with 0.01% of guaiacol and maximum Icmcvalue (1.3) was recorded for the isolate WRP5on CMC agar plates. Further, the consortium of above fungi was used for the biodegradation of pine needles by the production of hydrolytic enzymes viz.,CMCase, FPase and Beta glucosidase.The enzymes production was optimized at three different variables viz., temperature (20oC, 30oC and 40oC), pH (3.0, 5.0 and 7.0) and substrate concentration (1g, 2g and 3g)and the emphasized were made on their interaction. The results revealed that the maximum reducing sugar was produced at pH 5.0, substrate 2g and temperature 30oC that was 0.138, 0.175 and 0.198mg/ml forCMCase,FPaseand Beta glucosidase respectively as compared to control (0.004, 0.013 and 0.112mg/ml, respectively).It is suggested that the fungi showed the significant role in the production of enzymes to degrade the pine needles and produces optimum amount of reducing sugar.

Keywords: *Pine needle, Reducing sugar, Optimization, Biodegradation, Fungal consortium, Cellulase*

Case study on preventable tourism pollution in Malvan coast coral reefs ecosystem, Maharashtra, India-suggest drone based MCS measures

S. Ramkumar[1]*, Vaibhav D Mhatre[1]., Punam Khandagale[1], L. Ranjith[2], KR Sreenath[3], Grinson George[3] and V Venkatesan[1]

[1]ICAR-CMFRI Mumbai Regional Station, Fisheries University Road, Seven Bungalows, Versova, Mumbai-400061

[2]ICAR-CMFRI Tuticorin Regional Station, South Beach Road (Near Rochi Park), Tuticorin-628001

[3]ICAR-Central Marine Fisheries Research Institute (CMFRI), Post Box No. 1603, Ernakulam North P.O.,Kochi-682 018

*Mumbai Regional Station of ICAR- CMERI, Seven Bungalows, Maharashtra

Corresponding author email: ramfrm@gmail.com

Abstract

An assessment of marine litter in a patchy coral reef ecosystem in Malvan, Sindhudurg District, Maharashtra, was conducted in 2023.This ecosystem provides water tourism activities, such as snorkelling, SCUBA diving, and water sports activities, for tourists.The coral reef building type and pristine clear water attract a diverse variety of flora and fauna at a depth range of 5 to 15m.The availability of dive centers attracts many tourists every year during the peak season from March to May.Therefore, an underwater line transect survey was conducted in most of the explored underwater diving sites of

Sindhudurg Fort, Malvan. The study aimed to quantify the marine litter rate, and 24 transects were surveyed at four depths of 5m, 8m, 12m, and 15m in triplicates. The results revealed that the estimated total marine litter biomass rate was highest for ghost fishing nets (130.99), followed by cosmetics (89.78), metal tins (74.82), plastic bags (46.24), diving accessories (14.65), and plastic pouches (12.76). The highest percentage of marine litter was found at a depth of 8m (44%) followed by 5m (38%) and 12m (29%). The study also found that the most striking effects of tourism-induced marine debris were on the symbiotic zooxanthellae found on live corals, leading to coral mortality or coral bleach, which may affect the biodiversity of the whole ecosystem in the long run. The potential harm posed by the anchoring of motorized tourist boats (15-35 per day) to the construction of reef-building corals, particularly plate corals, is a significant concern. Moreover, oil spills resulting from these boats, which transport tourists to the sites, also threaten the long-term survival of this coral ecosystem.Therefore, the current study highlights the dire situation in the pristine coral reef ecosystem of the Sindhudurg fort with regard to awareness, enforcement of non-biodegradable amendments, and proper disposal of tourism-based marine litter.This study provides initial information on the extent of marine litter in the Sindhudurg Fort and emphasizes the need for environmentally friendly tourism activities.This study also suggests monitoring control surveillance (MCS) measures using advanced tools, such as drones coupled with artificial intelligence, to minimize the cost of surveillance measures and large coverage of areas in minimal time.

Keywords: *Tourism, Malvan, Sindhudurg, India, Litters, Sanctuary*

Effect of Nutrient Solution (NPK) on Biochemical Changes and Yield of Hydroponic Maize Fodder Cultivar

S.A. Dhage*, U.S. Gaikwad, D.K. Deoakar, D.K.Kamble, R.G.Nimase and A.T.Lokhande

Dept. Animal Husbandry and Dairy Science

Post Graduate Institute, MPKV Rahuri,Dist: Ahmednagar 413 722.M.S.

(Mahatma Phule Krishi Vidyapeeth Rahuri, Ahmednagar.M.S.)

****Corresponding email: dhagesameer@yahoo.co.in***

Abstract

An experiment was conducted to study the effect of Nutrient solution (NPK) 19:19:19 on Amylase activity and Starch concentration in hydroponic maize cultivar (frican tall, ganga safed-2, manjari composite and panchganga) with effect of different level of Nutrient (NPK) solution spray 19:19:19 and evaluated on 0 day, 7th day and 14th day of growth periods. It was observed that alpha amylase activity (mg of maltose release/g. of sample/min) for African tall, Ganga safed-2, Manjari composite and Panchganga were 1.13, 1.19, 0.93, and 1.07 mg of maltose release/g of sample/min, respectively at 0 day i.e. sprouted grain in hydroponic maize fodder. The amylase activity was 2.40, 2.49, 2.17, 2.31 and 1.95, 2.06, 1.80, 1.90 mg of maltose release/g of sample/min. respectively for African tall, Ganga safed-2, Manjari composite and Panchganga at 7th and 14th day of growth. It was concluded that the higher percentage of starch were recorded for African tall, Ganga safed-2, Manjari composite and Panchganga were 64.60, 60.38, 54.70 and 65.69 respectively at 0 day i.e. sprouted grain in hydroponic

maize fodder. The starch (%) were 49.29, 43.28, 32.19, 50.56% and 46.59, 48.37, 41.15, 30.46 %, respectively for African tall, Ganga safed-2, Manjari composite and Panchgangaat 7th and 14th day of growth. During growth i.e. germination period there was decline in DM and starch content, however, higher amylase activity (1.19% and 2.49%) at 0 and 7th day but slightly decreased at 14th day (2.06%) in ganga safed-2 and higher total sugar content (8.66%, 10.21% and 11.24%) at 0, 7th and 14th day in african tall variety. Nutrient solution affected significantly on plant enzyme activity and total sugar concentration. Application of 0.75% of NPK in african tall can yield more fodder as compared to other varieties.

Keywords: *Hydroponics, Amylase activity, Starch Concentration, nutrient solution,*

Antifungal Effect of Various Plant Essential Oils on the Growth of Some Fungi Causing Post-Harvest Diseases in Pomegranate (*Punica granatum* L.)

Sadiksha Khanal[1]* and Sanjay Kumar Jha[1]

[1]Central Department of Botany, Tribhuvan University, Kirtipur, Kathmandu, Nepal

Corresponding author email: khanalsadiksha71@gmail.com

Abstract

Inorganic fungicides control the post-harvest loss of pomegranates, butwith alarming health issues in consumers. Plant essential oils can be an organic alternative to control the post-harvest loss of pomegranate fruits in imported/ commercial and local sectors. The study aims to inhibit the growth of fungal pathogens on pomegranatesusing leaf essential oils from Psidium guajava L. (Guava)and Cinnamomum tamala(Buch.-Ham) T.Nees&C.H.Eberm. (Cinnamon). Results from previousstudies claim that the antifungal activity of the essential oils could inhibit the growth of several disease-causing pathogens and are "Generally Recognized As Safe (GRAS)" for consumption. A total of 90 imported and local infected pomegranates were collected from residential gardens, fruit markets, and hawkers in Kathmandu, Hetauda, and Butwal,and were kept at 4°C until use.After surface-sterilizing the fruits, 6 mm of diseased tissues were inoculated in Petri dishes with PDA mediums using Three-Point Inoculation Technique for 5-14 days at 20-25°C. For morphological identification, a tissue sample from the pure cultureswere observed for identifiable characters. Upon inspecting, three genera of disease-causing fungi;Geotrichum sp., Aspergillus sp., and Penicillium sp. have been identified from expert mycologists, while the rest are left to be characterized. Later, the morphologically identified fungi will be examined for molecular analysis.Additionally, leaves of Cinnamon and Guava were collected to prepare essential oils in a Clevenger Apparatus for 5-6 hours, and preserved at 4°C for Gas Chromatography-Mass Spectrometry (GC-MS) analysis and to evaluate the Antioxidant Activityof the fresh fruits after their application.The collected fruits will also be tested for Surficial Fungicide Residue Level. Finally,Disc Diffusion tests will be carried out to evaluate the Mycelial Growth Inhibition Capacity (%) of the essential oils on the identified pathogens. The results of the research will focus onformulating an organic approach to control the fungal diseasesand post-harvest loss in pomegranates.

Keywords: *Pomegranate fruits, Post-harvest diseases, Molecular analysis, GRAS,Essential oils, Mycelial growth inhibition*

The compositional analysis of waste lignocellulosic biomass sources in Uttarakhand to explore their fuel potential

Sakshi Sangwan[1,2,*], Kritika Guleria[1], Anjali Kumari[1], Chandra Shekhar Pant[1], Archana Singh[2], Devakanta Pahad Singh[1]

[1]Defence Institute of Bio Energy Research, Haldwani -263139, Uttarakhand, India

[2]Department of Chemistry, Meerut College, Meerut-250003, Uttar Pradesh, India

E-mail: sangwansakshi05@gmail.com

Abstract

The rapid industrialization and the increasing living standards of people have resulted in rise in the energy demand. Fossil fuels are the primary source of energy, accounting for over 80% of global energy consumption, depleting continuously. Biomass is a promising renewable energy source that can meet the energy requirements of the world. This will help to reduce the effects of fossil fuel combustion on global warming. Biomass has been widely utilized for fuel production in thermochemical processes, such as pyrolysis, gasification, combustion and torrefaction. When biomass is utilized as a feedstock for thermochemical conversionsto upgraded fuels, various factors which affects the quality and yield of the fuel are moisture content, ash content, elemental composition, and calorific values. Therefore, understanding the biomass characteristics is very important when it comes to thermochemical processes for the fuel production.This study focuses to evaluate the compositional analysis of various waste lignocellulosic biomass sources in Uttarakhand, to explore their fuel potential.The suitability of four different waste lignocellulosic biomass namely pine needle, pine saw dust, camelina husk, and rice straw were assessed for the fuel production. A comparative study of proximate, ultimate,and calorific value analysiswas performed by using TGA, elemental analyzer and bomb calorimeter respectively. The characterization of biomasses revealed that with high calorific value and low ash content, pine needle biomass has great potential for thermochemical conversionsto upgraded fuels.

Keywords: *Renewable energy, biomass, fuel, calorific value*

Exploration of Operational Factors in Microwave-Based Parboiling of Rice

Sanjana Pandey*

Ph.D. Scholar, Department of Post-Harvest Process and Food Engineering, Jabalpur, M.P., India

Email:sanjanapandey001@gmail.com

Abstract

Rice (Oryza sativa) is the primary sustenance for approximately half of the global populace. However, mitigating losses in rice's post-harvest processing is imperative to adequately meet its demand. Parboiling, a crucial pre-milling treatment of paddy, plays a pivotal role in minimizing these losses. In this study, the impact of microwave (MW) heating on moisture absorption during the hot soaking phase of paddy for parboiling was investigated. Notably, at lower power levels (320 W), a moisture absorption rate of 45% was observed, which outperformed other power levels when the same heat energy (120 KJ) was supplied. The prolonged exposure to lower power (320 W) for 365 seconds achieved a higher moisture

level (45%), facilitating starch gelatinization and subsequently enhancing rice hardening, leading to improved head rice yield. Utilizing a Completely Randomized Design (CRD) statistical approach, we systematically analyzed moisture absorption in paddy during hot soaking in an MW oven. The combination of lower power level (320 W), extended exposure time (365 sec), and energy input (120 KJ) yielded maximum moisture absorption and subsequently led to the highest head rice yield (67%).

Keywords: *Rice, parboiling, pre-milling treatment, microwave heating, moisture absorption, gelatinization, starch, head rice yield, Completely Randomized Design (CRD), statistical analysis.*

Land use changes: a key ecological driver regulating methane oxidizers in upland soils

Shashank Tiwari*, Jay Shankar Singh

Department of Environmental Microbiology, Babasaheb Bhimrao Ambedkar University, Lucknow, Uttar Pradesh 226025, India

E-mail: tshashank41@gmail.com

Abstract

Land use changes have been recognized as one of the key ecological drivers in regulation of methane (CH4) consumption from dry upland soils. This study investigated the impact of land use changes and different soil depths (0-10, 10-20 and 20-30 cm) on soil physicochemical properties and methanotrophs abundance in dry tropical region of Vindhyan uplands. Four different land use types (agriculture land, mixed forest, savanna and natural forest) were selected for a comparative study. Among the different land uses and soil depths, results indicated significantly higher soil moisture (SM), organic-C, inorganic nutrients, water holding capacity (WHC) and methanotrophs abundance at 0-10 cm depth of natural forest compared to other sites. Across different land uses, number (8.11X107 pmoA copies g-1 of dry soil) of methanotrophs isolated from the natural forest soil was statistically higher than the soils of other land use types. The variations in pmoA gene numbers across different land uses and soil depths were significant ($P < 0.001$). The pmoA gene numbers were positively correlated with soil C/N ratio ($R2 = 0.9233$) and moisture ($R2 = 0.9675$) contents. The decreasing order of pmoA gene abundance across different land uses was natural forest > mixed forest > savanna > agriculture land. The result suggest that land use changes (conversion of natural forest to agricultural land) alter the major soil properties (SM, WHC, organic matter, C/N ratio, etc.) and significantly reduce the methanotrophs and pmoA gene numbers. The land use management practices (application of bio-fertilizers in place of chemical fertilizers), especially for the degraded agricultural soils, could be beneficial option to mitigate the negative impacts on soil methanotrophs and their CH4 sink activity in the upland soil of Vindhyan region.

Keywords: *Dry tropical soils, Land use changes, Methanotrophs; Savanna, etc.*

Plant Extracts for the Management of Root Knot Nematode (*Meloidogyne javanica*) in Black Gram (*Vigna munga*)

***Shilpi Rawat[1], Rashika Tamta[1], Shivani Rawat[2], Meena Aladha[1], Tannu Rani[1], Pramod Chauhan[1], Ankita Tewari[1], Diksha Mathpal[1] and Satya Kumar[1]**

[1]Deaprtment of Plant Pathology, College of Agriculture, GBPUAT, Pantnagar
[2]Deaprtment of History, DSB Campus, Kumaun University Nainital.
*Assistant Professor, Deptt of Plant Pathology, GBPUAT, Pantnagar

Abstract

Black gram (Vigna munga L. Hepper) family Fabaceae is a vital pulse crop in India, facing significant yield losses due to various abiotic and biotic factors, with nematodes, particularly Meloidogyne sp., being a primary cause. Among economically important species, Meloidogyne javanica infestation poses a substantial threat, especially in tropical and subtropical regions. The aim was to identify the plant posses to have natural compounds capable of effectively managing the root knot nematode without the adverse effects associated with chemical pesticides. This approach aligns with the growing demand for sustainable and environmentally friendly agricultural practices. Testing four ethanolic plant extracts offers a potential solution to mitigate Meloidogyne javanica infestation in black gram cultivation, contributing to sustainable pest management strategies in agriculture.In vitro evaluations of ethanolic plant extracts from Moringa oleifera (MoE), Ageratum conyzoides (AcE), Urticadioca (UdE)and Cannabissativa (CsE) against Meloidogyne javanica demonstrated potential nematicidal activity. Testing all the plant at the concentrations of 100ppm, 200ppm, 500ppm, and 1000ppm revealed MoE to be the most effective, with maximum mortality ofJ2 (second-stage juvenile) at 1000ppm over a 96-hour exposure period. Concentration and exposure duration time is positively correlated with J2 mortality, while concentration negatively correlated with egg hatching. Calculated LC50 values indicated that MoE had the lowest concentration required to kill half of the nematode population, followed by AcE, UdE, and CsE. Based on the in vitro trials, our findings indicate that these plant extracts have the potential to be used as natural alternatives for controlling Meloidogyne javanica infestation. It suggests these plants as promising alternative for controlling plant parasitic nematodes. The findings highlight the need for further research in this area to develop effective and sustainable strategies for nematode management in agriculture.

Exploring Genetic Diversity in Riverine Buffaloes: Insights from ddRAD Analysis

Shiv K Tyagi, Arnav Mehrotra, Amit Kumar, Sonal Sharma &Ashwni K Pandey*

Division of Animal Genetics, ICAR-IVRI, Bareilly, UP, 243122

ashwni.pandey@gmail.com

Abstract

Riverine buffaloes are an important livestock species in many parts of the world, providing milk, meat, and draft power. Understanding the genetic diversity and population structure of riverine buffaloes is essential for their conservation and improvement. This study used ddRADseq to investigate genetic diversity in riverine buffaloes from different genetic diversity indices. The ddRADseq data were used to estimate regions of India. A total of 96 riverine buffaloes were sampled, representing six different breeds (Murrah, Mehsana, Surati, Bhadawari, Pandharpuri and Toda). Population structure analysis was also performed to identify genetic clusters within the sample population. The results showed that Murrah has had the greatest genetic diversity over the generations among all the sampled populations,

while Toda had the least. The PCA plot separated the individuals of the six breeds. The phylogenetic tree constructed using the IBS matrix showed that the animals clustered among their respective breed groups. In Admixture, At K = 6, all the breeds were assigned to their own clusters, with varying levels of Murrah ancestry appearing in other breeds.Overall, this study provides new insights into the genetic diversity of riverine buffaloes in India. The findings suggest that riverine buffaloes have high levels of genetic diversity overall. This information can be used to develop targeted breeding and conservation programs for riverine buffaloes.

Keywords: *ddRAD, SNPs, PCA*

An Economic Analysis of 3 HP Solar Water Pump in Tribal area of Udaipur District, Rajasthan

[1]Shivangi Upadhyay*, [2]Vijender Kumar, [3]Narendra Yadav, [4]Lal Chand Yadav

[1,2,3,4] PhD Research Scholar, Department of Agricultural Economics and Management, Rajasthan College of Agriculture, MPUAT, Udaipur, Rajasthan

Corresponding author's email: shivangiupadhyay9256@gmail.com

Abstract

Solar energy is the most appropriate energy form in the Indian context among all renewable energy sources. India has taken the lead in promoting the development of a solar-based economy worldwide. Solar water pumps have emerged out as a feasible and budget-friendly technology to increase energy access for sustainable agriculture. They have proved to be a better substitute to electric and diesel pumps owing to increasing diesel prices and vulnerable state of electricity in India. Because of the increased affordability of solar pumps after subsidies, the popularity of solar pumps has increased in Rajasthan, which has resulted in an increased rate of adoption. Considering the role of solar pumps in current scenario and that of future, this study was conducted to analyse the economic viability of a 3 HP solar water pumps. The findings of the study revealed that the 3 HP solar water pump was economically feasible based on NPV, PBP and B:C ratio.

Keywords: *Solar water pump, payback period, net present worth and benefit-cost ratio*

Comparative Analysis of Organic, Natural farming and Integrated crop management in Maize-Wheat cropping system in Tarai region of Uttarakhand

Shobhana Singh[1]*, D. K. Singh[1], Subhash Chandra[2], Sumit Chaturvedi[2], S. P. Pachuari[3] and Ajay veer Singh[4]

[1],[2]Department of Agronomy, G. B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand

[3]Department of Soil Science, G. B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand

[4]Department of Microbiology, G. B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand

**** Corresponding Author e-mail: shobhanasingh26@gmail.com***

Abstract

A field experiment was conducted at the N. E. B. crop research centre of G. B. Pant University of Agriculture and Technology, Pantnagar in 2022-23. This study explores the effect of organic, natural farming and integrated crop management (ICM) on yield and yield parameters within a maize-wheat cropping system enhanced by intercropping cowpea and chickpea with the main crops, under the paradigm of climate-resilient agriculture. Through meticulous experimentation and data analysis, we explore the comparative effects ofabsolute control (T1), natural farming (T2), organicfarming (T3), ICM multivariate (T4) and ICM (T5) management practices on crop yield and key parameters, aiming to identify strategies for optimizing agriculture resilience in the face of climate variability. Our results unveil a hierarchical trend in yield performance, with ICM multivariate (T4) showcasing the highest yield compared to organic farming and natural farming methods, complemented by intercropping cowpea and chickpea. Detailed assessments of yield parameters, including crop biomass, grain yield and overall productivity resulted significantly higher yield under ICM multivariate (T4) within the maize-wheat cropping system under climate-resilient conditions. Byintegrating agronomic practices, soil health management, and pest control measures, ICM emerges as a transformative strategy for bolstering yield resilience in intercropping system. The synergistic effects of these integrated practices and intercropping contribute to enhanced crop performance and productivity, particularly in challenging climatic conditions. Furthermore, economic analyses demonstrate the long-term viability of integrated crop management, with favorable returns on investment compared to conventional organic and natural farming approaches. The economic benefits derived from higher yields and improved yield parameters position ICMM as a sustainable and economically viable solution for climate-resilient agriculture in maize-wheat cropping system with intercropped cowpea and chickpea.This study provides valuable insights into the efficacy of integrated crop management as a strategic approach for optimizing yield parameters in the context of climate-resilient agriculture, enhanced by intercropping practices. By emphasizing the importance of holistic management practices and intercropping strategies, this research contributes to the advancement of sustainable agricultural strategies that address both environmental and economic challenges.

Keywords: *Organic, Natural farming, Integrated crop management, Resilient, Sustainability*

Indian livestock owners' selective management practices for risk amelioration of obstructive urolithiasis in relation to calf-dam tying

Sujoy Khanna[1]*, Sandeep Potliya[2], Anita Ganguly[2], Harpreet Singh[2], B.R. Maharana[2], Davinder Singh[3], G.R. Gowane[4] and Lohit Sharma[5]

[1]*Directorate of Extension Education, Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, India-125004

[2]Haryana Pashu Vigyan Kendra, Karnal, [3]Haryana Pashu Vigyan Kendra, Mahendergarh, Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, India-125004

[4]Senior Scientist, Animal Genetics & Breeding Division, ICAR-NDRI, Karnal-132001

[5]Department of Livestock Production Management, LUVAS, Hisar

****Corresponding Author: joykhanna20@gmail.com***

Abstract

Obstructive urolithiasis is a life-threatening and painful disease in both the sexes of dairy animals. In buffaloes also, both sexes can be affected by obstructive urolithiasis, but formation of urinary tract calculi, leading to blockages are primarily observed in male steers due to their urinary tract anatomy. The Objective of the study was to assess Indian livestock owners' selective management practices as risk factors for obstructive urolithiasis in buffalo male calves in conventional housing of India, in relation to the wide spread tying practice of calf with his dam, calf-dam tied separately and tying practice according to the circumstances.The present study was carried on buffalo male calves suffering from obstructive urolithiasis from August, 2023 to February, 2024. Case history, clinical signs and detailed management practices followed by calf owners were recorded after diagnosis was confirmed before surgical treatment was applied for correction of this condition. The correlation coefficients of all the observable changes or signs and symptoms in buffalo male calvessuffering from obstructive urolithiasis in relation to the different calf tying practices were found to be non-significant. The risk factors like calf receiving high-protein ration consisting of cereal grains and excess sodium bicarbonate in diet indicated significance at $P<0.01$ for calves tied separately from their dams / had separate mangers as compared to kept tied together / use the same manger. Tying of calf with dam, use of same manger or separate but adjacent mangers for feeding them, deficiency of salt in diet and decreased water intake are effective in the development of obstructive urolithiasis. So, by upgrading knowledge of the livestock owners about it, the burden of the disease on dairy industry and the individual livestock owners can be reduced. The results of this study would be helpful for preventive planning for obstructive urolithiasis in dairy calves.

Keywords (5-8): *Obstructive Urolithiasis,Nutrition, Grazing, Symptoms, Manger placement*

Arterial blood gas variables in dairy calves suffering from obstructive urolithiasis and their relation to urine pH

Sujoy Khanna[1]*, Sandeep Potliya[2], Anita Ganguly[2], B.R. Maharana[2], Davinder Singh[3], Harpreet Singh[2], G.R. Gowane[4] and Lohit Sharma[5]

[1]*Directorate of Extension Education, Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, India-125004

[2]Haryana Pashu Vigyan Kendra, Karnal, [3]Haryana Pashu Vigyan Kendra, Mahendergarh, Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, India-125004

[4]Senior Scientist, Animal Genetics & Breeding Division, ICAR-NDRI, Karnal-132001

[5]Department of Livestock ProductionManagement, LUVAS, Hisar

Corresponding Author: joykhanna20@gmail.com

Abstract

Obstructive urolithiasis is a life-threatening and painful disease in dairy calves. Homeostatic equilibrium in the body depends a lot on the acid base balance of blood and minor alterations in blood pH can alter the cellular functions of the body. The objectives were to determine the association between urine pH and blood acid base indicators in buffalo male calves and to set urine pH cut-off value to predict

obstructive urolithiasis. The present study was carried on buffalo male calves suffering from obstructive urolithiasis from August, 2023 to February, 2024. Arterial blood samples were taken by standard method from coccygeal artery in heparinised vials. Actual blood pH, partial pressure of carbon dioxide (pCO2), partial pressure of oxygen (pO2), actual bicarbonate (HCO3-), standard bicarbonate (SBC), actual base excess (ABE) and standard base excess (SBE) were determined by blood gas analyzer immediately after sampling at 37°C. The mean pH of arterial blood was recorded as 7.499 and mean pH of urine was recorded as 7.923.Arterial blood pH prediction equation was createdusingindependent variables and r2 was found to be 0.983. As the animal turns anorectic there occurs a decrease in plasma glucose levels. The digestive disorder results in hypochloraemia due to sequestration of chloride ions in the digestive tract. There occurs a retention of chloride in the gut to compensate for large increase in potassium ions, decrease intake of chloride following anorexia, diffusion of chloride to peritoneal cavity and total body water expansion relative to total body chloride. Majority of the animals develop alkalosis with derangement of acid-base balance and electrolyte. The assessment of urine pH could be a quick and cost-effective tool to monitor the level of metabolic alkalosis and for further detection of obstructive urolithiasis in male dairy calves.

Keywords **:** *Obstructive Urolithiasis,Acid-base, urine pH, blood pH*

Enhancement of wood decay resistance by using nanoparticles

Sunandini*, Bhupender Dutt, Rajneesh Kumar and Raveena Thakur

Department of Forest Products, College of Forestry, Dr. Yashwant Singh Parmar University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh, 173230, India

****Corresponding author e-mail: choprasunandini01@gmail.com***

Abstract

Wood being a cellular material with excellent strength-to-weight properties had long been available in the society in the form of timbers, furniture, papers and many other functional materials. During exterior use, wood constituents are readily degraded by weathering, fungi and termites. The wood species deteriorates due to the breakage of wood polymers by UV radiations and decay by micro-organisms. This is solved so far at some extent by using the concept of nanotechnology. Nanotechnology is the design, characterisation, production and application of structures, devices and systems by controlling shape and size at nanometre scale. The addition of the nanofiller into the wood and wood-based panel helps to develop new and improved products. Nanomaterials provide high dimensional stability and long-term biological resistance to the wood. The main reason for the use of nanotechnology in Wood Science and Technology is the unique characteristic of nano-based materials to effectively penetrate deeply into wood substrates, which, in turns, results in the alteration of their surface chemistry. The increase surface area (per unit mass) will result in the increase in chemical reactivity, making some nanomaterials useful as catalysts to improve its efficiency. Nanosized materials like metal nanoparticles (silver, gold, copper) and metal oxides (zinc oxide, aluminum oxide) are widely used to improve the durability, biological resistance, fire resistance, UV resistance and wood absorption of wood-based products. Nanoparticles increase the decay resistance of wood by reducing moisture availability. The application of nanotechnology in forestry sector particularly in wood-based products could result in

stronger, multifunctional and lighter products than traditional forest products. Together with its strength properties and affordability nanotechnology becomes a viable solution to reduce the need for solid wood.

Keywords: *Nanomaterials, Nanotechnology, Dimensional stability, Biological resistance, Efficiency, Multifunctional products*

A meta-analysis on impact of seed rates and soil health management practices on soil quality and yield of blackgram

Suranjana Biswas

Ph. D. Scholar, Department of Agronomy, GBPUAT, Pantnagar

Abstract

Blackgram (Vigna mungo L.) is an important leguminous crop with significant economic and nutritional value. This study aims to investigate the combined effects of varying seed rates and soil health management practices on soil quality parameters and yield outcomes in blackgram cultivation. A comprehensive meta-analysis was conducted, synthesizing data from experimental studies conducted at CRC, G. B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand during 2022-23. The experiment was laid out in Factorial RBD design comprising of two seed rates (Normal and 125 % of Normal) and six soil health management practices comprising of Recommended Dose of Fertilizer (RDF), Humic Acid and Plant Growth Promoting Rhizobacteria (PGPR) treatments applied alone or in different combinations. The results revealed that there was no significant effect of the two seed rates on crop yield, whereas, among the different soil health management practices, combined application of RDF, PGPR and Humic Acid recorded significantly higher crop yield as compared to other treatments. The same treatment also improved the organic carbon status of the soil and thus improving soil health. There was no significant interaction between seed rate and soil health management practices. These findings underscore the importance of optimizing seed rates and implementing sustainable soil management practices to enhance both crop productivity and soil health in blackgram cultivation systems.

Keywords: *Blackgram, humic acid, PGPR, seed rate*

Integrating Ethnic Seeds into One Health Initiatives for Sustainable Well-being

Suryapal Singh[1] and Harshita Singh[2]

[1]Ph D Seed Science and Technology Chaudhary Charan Singh Haryana Agricultural University Hisar

[2]Harshita Singh Subject Matter Specialist Centre of Excellence Vegetables, Department of Horticulture Haryana Gharaunda Karnal

Abstract

The convergence of One Health initiatives and the preservation of ethnic seeds represents a crucial synergy for the sustainable well-being of both human populations and the broader environment. One Health, a holistic approach recognizing the interconnection of human, animal, and environmental health,

has gained traction in addressing global health challenges. Simultaneously, the conservation of ethnic seeds, which are traditional, locally adapted crop varieties nurtured by diverse cultural communities, embodies a reservoir of genetic diversity critical for food security and resilience.This paper explores the intricate relationship between ethnic seeds and the One Health framework, elucidating the significance of preserving traditional seed varieties to support biodiversity, cultural heritage, and health. Ethnic seeds not only contribute to the cultural identity and livelihoods of communities but also harbor genetic traits valuable for adapting to environmental stressors and changing climate patterns. Their conservation aligns with the One Health approach by promoting sustainable agriculture, food security, and the prevention of zoonotic diseases.Furthermore, the integration of ethnic seeds into One Health initiatives offers an opportunity to bridge the gap between indigenous knowledge and modern scientific practices. Collaborative efforts can leverage indigenous wisdom in seed preservation, fostering a more comprehensive understanding of ecosystems, biodiversity, and traditional agricultural practices. This synergy can lead to innovative solutions for mitigating health risks, enhancing agricultural sustainability, and ensuring a diverse and nutritious food supply.In conclusion, the amalgamation of ethnic seeds into the One Health paradigm presents a promising avenue for global health, agriculture, and cultural preservation. This integration calls for interdisciplinary collaboration, policy support, and community engagement to foster a harmonious relationship between human, animal, and environmental health while safeguarding the invaluable diversity encapsulated within ethnic seed varieties. Embracing this union holds the potential to fortify the resilience of communities and ecosystems, advancing a more holistic and sustainable approach to health and well-being.

Physiological and biochemical responses to *Fusarium solani* induced wilt in *Dalbergia sissoo*

Sushant Sharma[1], Santan Barth wal[1], Amit Pandey[2], V.K.Varshney[3], Ajay Thakur[1]

Genetics and Tree Improvement Division, Forest Research Institute (FRI), Dehradun,Uttarakhand, India.

Forest Protection Division, Forest Research Institute (FRI),Dehradun,Uttarakhand, India.

Chemistry and Bioprospecting Division, Forest Research Institute (FRI), Dehradun, Uttarakhand, India.

Author for correspondence: sharma.sushant2511@gmail.com

Abstract

Dalbergia sissoo, shisham (vern.) is an important timber and agroforestry species of found chiefly along the riverine regions in India, naturally. Shisham is a pioneer species with nitrogen fixation capacity and is a part of the khair (Acacia catechu)-shisham mixed forest type. The increase in shisham mortality across its inhabited regions as well as plantations has been a cause of great concern over the years. Ganoderma lucidum and Fusarium solani are the fungal-pathogens responsible for dieback and shisham wilt, respectively, across India. Fusarium solani is a ubiquitous, soil-borne pathogenic fungus. Production of pathogenesis related (PR) proteins is one of the defence mechanisms employed by the host plants against phytopathogens. These molecules include enzymes which destabilise fungal cell wall by hydrolysing cell wall components into their constituent subunits and thus confer resistance against the

invasive pathogens. The aim of this study was to understand the physiological and biochemical responses of D. sissoo against F.solani. One year old clones of D.sissoo were subjected to infection with spore suspension solution prepared from virulent strains of the fungi. Data for physiological parameters was recorded using a portable photosynthesis system (CIRAS). Later, root samples were collected from infected and control groups post infection and were used for isolation of total protein. Chitinase, a prominent PR protein was quantified from the total protein using spectrophotometry. This study would provide a valuable insight to this host-pathogen interaction, where the knowledge so far is still at its infancy. Moreover, it would not only further our understanding about the resistance mechanism employed by the host for the mitigation of biotic stress, but would also be useful for identification and development of disease resistant varieties.

Keywords: *shisham wilt, Fusarium solani, Ganoderma lucidum, PR proteins, disease resistance, host pathogen interaction*

Assessment of Genetic Diversity of Ocimum sanctum Via RAPD and SSR Markers and Estimation of Its Antibacterial Activity

Tanima Rajbanshi[1], Kanchan Karki[2], Kuldip Chandra Verma[3]

[1]Young Professional-I, Department of Biochemistry, College of Basic Science and Humanities, Govind Ballabh Pant University of Agriculture & Technology,Pantnagar (U.S. Nagar)-263145, Uttarakhand, India. E mail: tanimarajbanshi71@gmail.com

[2]Scientist B, Molecular Biology and Genetic Engineering Department, Uttarakhand Council for Biotechnology (UCB), Haldi- 263145, U.S. Nagar, Uttarakhand, India. Email: ksinghbiophysics@gmail.com

[3]Assistant Professor, College of Basic Science and Humanities, Govind Ballabh Pant University of Agriculture & Technology, Pantnagar (U.S. Nagar)-263145, Uttarakhand, India. E mail: ***kcbiochem@gmail.com***

Abstract

Tulsi (Ocimum sanctum) is a divine plant of Hinduism and Ayurveda, as a heavenly bush with diverse therapeutic properties. It is usedas medicinal and aromatic plant in pharmaceuticals, natural remedies, flavourings, perfumes, cosmetics, and other natural products. In the current study, the genetic diversity among six distinct genotypes of Tulsi viz. Rama tulsi, Vana tulsi, Shyama tulsi, Lemon basil, Maruva tulsi and Stevia basil collected from Pantnagar and Haldi were investigated. The genotypesdemonstrated genetic diversity amongthem for SSR and RAPD markers, providing the scope for improving the crops furtherthrough breeding programs. Cluster analysis showed maximum similarity between Vana & Rama and Lemon & Vana genotypes, whereas, minimum similarity was observed between Stevia& Shyama. SSR 3 and SSR 4 were observed to be more prominent for assessment of genetic diversity among tulsi biotypes. The similarity matrix data also showed that the Stevia& Shyama can be used to reduce genetic erosion to a minimal extent and broaden genetic diversity. The correspondence genetic distance among fivegenotypes revealed their genetic relatedness. Jaccard's similarity coefficient ranged from 0.20 to 0.80 with maximum similarity between Vana and Rama & Lemon and Vana, minimum similarity between Stevia and Shyama.Essential oil was extracted and its antibacterial activity were tested byproduced

inhibition zone. In the disk-diffusion method, the essential oil of tulsi showed zones of inhibition (20 ± mm, 12 ± mm, 10 ± mm and 16 ± mm) against the tested bacterial strains. The result showed the effective response against all the strains, prominently effective against Micrococcus yunnansis.

Keywords: *Ocimum sanctum, SSR, RAPD, Antimicrobial, Essential oil*

Induction of Triploidy in Snow Trout (*Schizothorax richardsonii*) Using Hydrostatic Pressure

Toshibaa[1], H.C.S Bisht[1], N.N. Pandey[2]

[1]Department of Zoology, D.S.B. Campus Kumaun University Nainital-263002, Uttrakhand

[2]Principal Scientist (Aquaculture), ICAR-Directorate of Coldwater Fisheries Research, Bhimtal-263136

****Author E-mail: toshibaa117@gmail.com***

Abstract

Snow trout is one of the dominant genera in Schizothoracinae group, endemic to the Himalayas. This species contributes a major share in the wild composition, but does not consider as candidate species for coldwater aquaculture due to its slow growth in captive condition. Triploidy Induction in snow trout by pressure shock improves the Fish growth having extra genetic material. Six healthy brooders were selected in ratio of 1:1 male and female to obtain the eggs. Time Temperature Unit-delay timing after fertilization to retain the second polar body (TTU) and exposure time of pressure shock treatment were standardized for better triploid induction rate (TR). Pressure shock at 5000, 7000 and 9000 psi for three level of time exposure 5, 6 and 7 minutes was applied to green eggs at 19.9-20.10C water temperature. In all operations, pressure at 7000 and 9000 psi and exposure time of 6 and 7 min resulted as all dead eggs. Viable eggs were obtained with pressure of 5000 for exposure time of 5 minute. At pressure of 7000psi for exposure time of 6 min triploidy induction rate was recorded as 10-16%, while at 5000psi for 5 min induction rate was recorded highest as 80-90%. Study reveals that 90% triploidy induction is feasible with pressure shock.The efficiency of triploidization was confirmed by counting the number of chromosomes. The chromosome count of induced triploids was 3n=147 while diploid fish had 2n=98. In conclusion, this paper presents optimal conditions for triploidy induction in snow trout with hydrostatic pressure shock, which will contribute to promote the progress of breeding industry and enhance the aquaculture production of indigenous snow trout for livelihood support to the people dwelling in hills.

Keywords: *Snow trout, Triploidy induction, Pressure shock, Chromosomes, Diploids*

Mitigating the Impact of Salt Stress on Seed Quality of Tomato (*Solanum lycopersicum* L.) through ZnO Nanoparticle-Based Priming

Tuhina Ghosh[1], Shiv K Yadav[1], Sangita Yadav[1], Kousik Atta[2]

[1]* Division of Seed Science & Technology, ICAR-Indian Agricultural Research Institute, Pusa Campus, New Delhi, India

[2] Faculty of Agricultural Sciences, GLA University, Mathura, Uttar Pradesh, India

Corresponding author Email: tuhina.ghosh41996@gmail.com

Abstract

The 'protective food' tomato is one of the most extensively cultivated and consumed vegetables in the world, ranking in second only to potatoes. However, several abiotic stresses including salinity stress seriously impacted tomato production. As such, it is imperative to tackle the effect of salinity stress. The use of nanoparticles for seed priming has gained a lot of attention recently, because of their incredibly small size (1-100 nm) and easier penetration of plant tissue. Furthermore, zinc is an essential micronutrient, primarily involved in the major metabolism in plants. Tomato seeds primed with ZnO NP @ 750 ppm for 6 hours showed the highest germination (92%), seed vigour index I (1399), and seed vigour index II (1813) among the different concentrations of ZnO nanoparticle and soaking durations employed. The tomato genotypes (QA001 and QA002) used in this study revealed significant impacts on seedling physio-biochemical and seed quality attributes under salinity stress (50 and 100 mM NaCl). In comparison to the control condition, there was a significant increase in the mean germination time (MGT), total phenol content (51-82%), total soluble sugar (TSS) content (93-151%), total soluble protein content (57-71%), proline content (84-131%), superoxide dismutase (SOD) activity (20-32%), peroxidase (POD) activity (20-43%), catalase (CAT) activity (19-39%), and malondialdehyde (MDA) content (12-31%) under salinity stress (50 and 100 mM NaCl). In both genotypes, ZnO nano-priming was found to significantly reduce the MGT and MDA content over the unprimed seed under both control and salinity stress conditions. It also significantly increased the germination%, seed vigour index I and II, chlorophyll, phenol, TSS, total soluble protein and proline content, SOD, POD, and CAT activity. Overall, nano-priming enhanced the chlorophyll synthesis, antioxidative machineries, and osmotic adjustment, thus lessened the negative effects of salt stress by reducing ROS formation and lipid peroxidation in cell membranes.

Key words: *Nano-priming; salinity stress; antioxidant; seed vigour; osmotic adjustment*

Isolation, characterization and optimization of extracellular phytase producing *Bacillus velezensis* AUPPB07

Ushakar Mishra*, Sushma Kumari, Benazir Fatima and Abha Singh

Microbial Biodiversity Lab, Department of Botany, Faculty of Science, Patna University, Patna-800005, India

Email: ushakarmishrasai@gmail.com

Abstract

Lentil (Lens culinarisMedik.) is one of important pulse crops belonging from familyfabaceae, because of its nutritional quality. They have some anti-nutritional factors such as, phytic acid (PA) which needed to catalyzed for bioavailability of phosphorus. The study aimed to quantify PA by Wade Method as well as, isolation and characterization of phytase producing bacteria. The lentil seeds were procured from farmland of Patna and were wet processed by submerged fermentation for 0h, 24h, 48h and 72h. PA content was evaluated in decreasing order, as 59.80 ± 3.323, 52.45 ± 0.711, 45.98 ± 1.081, 40.13±

0.726 mg/100gm (n=3) respectively. This depicting impact of fermentation process on PA. From the fermented (72h) sample, isolation of bacteria was done by serial dilution followed by streak plate. All 28 bacterial isolated were purified and streak on phytase screening media for primary screening followed to phytase assay by modified ammonium molybdate method. Among them the selected isolate (AUPPB 07) shows halozone of 2.78 ±.29 mm and enzyme activity of 1.18 ± 0.08 U/ml. It was white opaque irregular margin colony on NA plate. It shows positive result for Gram reaction, gelatin hydrolysis, nitrate reduction, utilization of sucrose, glucose, maltose, mannitol, lactose, fructose and galactose while negative for VP reaction, MR test, H2S production, citrate utilization. This potent bacterium was identified as Bacillus velezensis AUPPB 07 (Accession No. OR192967) by 16S rDNA gene sequencing. The optimized conditions for phytase production were 48 h of incubation time, 5.5 pH, 35 °C temperature, 1 % inoculum size, 1 % of glucose as carbon and 1 % of peptone as nitrogen source. The strain showed increment of 38 % phytase production in optimised media (1.18 ± 0.08 U/ml) than in pre-optimised media (1.56 ± 0.87 U/ml).

Keywords: *Bacillus velezensis, Phytase, fermentation, optimization, phytic acid.*

Screening of guava genotypes and species for wilt tolerance rootstock

V.P. Santhi[1]*, R. Thilagavathy[2], D. Janaki[3] and A. Santhi[4], R. Arulmozhian[5] and P. Paramaguru[5]

*[1]Department of Horticulture, Anbil Dharmalingam Agricultural College and Research Institute, Trichy - 27
[2]Agricultural College and Research Institute, Echangottai
[3]Sugarcane Research Station, Sirugamani, Trichy
[4]Forest College & Research Institute, Mettuppalayam
[5]Horticultural College & Research Institute for Women, Trichy-27

Corresponding author email ID: santhi@tnau.ac.in

Abstract

The open-pollinated seeds were collected from identified genotypes viz., Mirzapur Seedling, Philipink, Chinese guava, Lucknow 49, Surka Chitti Natputani, Panneer guava and Cheeni, Allahabad Safeda, Lalit were sown in portrays for screening of guava genotypes for wilt tolerance rootstock. Four sps. of guava seeds namely Psidium cattleianum var. cattleianum, Psidum chinensis, guineense, and Psidium cattleianum var.lucidum were collected from IIHR through Material Transfer Agreement for this study. The open-pollinated seeds were treated with GA3 200ppm and soaked overnight and sown in portrays and pots. Guava wilt casual organism Culture of Fusarium Oxysportum f.sps. psidii has been multiplied and inoculated in the root 9 seedlings of each genotype were transplanted in polybags in sterilized media. Fusarium oxysporum f. sp. psidii culture was inoculated in the root zone of seedlings after six months of transplanting. Snyder's medium was used for the study of rhizosphere populations of the fungus Fusarium. Treatments imposed with a Completely randomized block design with 3 replications. The observations will be recorded at 3rd and 6th after inoculation of Fusarium oxysporum f. sp. psidii culture is wilt incidence (%), Rhizosphere colonization (cfu per gram), and Population of Fusarium in

the rhizosphere (cfu per ml). The species P.cattleianum var. lucidum, P. cattleianum var. cattleianum did not express any wilting symptoms (0.0%) in both the seasons (I and II). Significantly lowest (30.67 and 29.33%) root colonization (Fusarium oxysporum f. sp. psidii under artificially pot culture experiment) per cent was recorded in P. cattleianum var. lucidum, P. cattleianum var. cattleianum (30.73 and 33.44 % and 29.47 and 29.47 %) in season I & II respectively. The two sps.of guava P. cattleianum var. lucidum, P. cattleianum var. cattleianum and are having in built resistance to Fusarium oxysporum f. sp .psidii which could be exploited for the development of wilt resistant rootstock.

Evaluation of garlic germplasm for high yield and quality

V.P. Santhi[1]*, P. Raja[2], L. Rajendran[2], S. Karthikeyan[2] and K. Geetha[1]

*[1]Department of Horticulture, Anbil Dharmalingam Agricultural College and Research Institute, Trichy - 27

[2]Horticultural Research Station, Ooty, The Nilgiris

Corresponding author email ID: santhi@tnau.ac.in

Abstract

The area grown for garlic in Nilgiri District is about 238.28 hectares. Among 72 accessions were collected from different parts/villages in Nilgiri Districts of Tamil Nadu. The net plot area was 2m2 (1 X 2 m2). Each accessions was replicated three times. The first 72 accessions collected were planted in a randomized block design with three replications and evaluated for four years. All 72 accessions were collected and evaluated during the main season of May-August in the field at Nanjanad farm, Horticulture Research Station, Ooty. Observations were taken on growth yield and quality characteristics. Pooled analysis data of four years revealed that accession number 72 recorded the maximum plant height (67.92 cm) with erect green foliage, number of leaves (6.75), maximum equatorial diameter (45.78mm), polar diameter (42.39 mm), the maximum number of cloves (15.76) with the highest yield (16.94 tonnes/ha) followed by AS 11 (13.70 tonnes/ha) over the local check AS-1(Ooty - 1). Among the 72 entries, accession AS 72 recorded the highest bulb yield of 16.94 tonnes/ha followed by AS 11 recorded 13.70 tonnes/ha. Accession AS 72 contributes to maximum plant height, pseudostem length, average bulb weight, and equatorial and polar diameter. Among the 72 entries, accession AS 72 recorded the maximum content TSS (47? brix), allicin (3.87µg/g of sample) and Polyphenol (3.08µg/g of sample) followed by AS 11 recorded TSS (42? brix), allicin (3.16µg/g of sample) and Polyphenol (3.49µg/g of sample). Accession AS 72 recorded the highest bulb yield of 16.94 tonnes/ha followed by AS 11 recorded 13.70 tonnes/ha. Accession AS 72 contributes to maximum plant height, pseudostem length, average bulb weight, equatorial and polar diameter, TSS, Allicin content and polyphenol content.This accession is suitable for cultivation in Nilgiris as a substitute for the existing local type grown.

Screening and evaluation of bush type dual purpose French beans for high yield and quality

V.P. Santhi[1]*, P. Raja[2], K. Gurusamy[3], L. Srimathi Priya[4] and K. Geetha[1]

*[1]Department of Horticulture, Anbil Dharmalingam Agricultural College and Research Institute, Trichy - 27

[2]Horticultural Research Station, Ooty, The Nilgiris
[3]Department of Food Process Engineering, AEC&RI, TNAU, Coimbatore - 3
[4]Horticultural College and Reseach Institute, Periyakulam

Corresponding author's e mail ID: santhi@tnau.ac.in

Abstract

French beans are low in calories, about 31 calories to a cup (cooked), and contain vitamins A, B, C, calcium, phosphorus and some iron, in addition to protein (20%) and fiber. Beans are great food for fat restricted diet because most beans contain only 2-3% fat. Recent studies have shown that eating beans on a daily basis helps to reduce cholesterol while providing excellent nutrition. Since they are one of the richest sources of fiber, they can actually help to lower bad cholesterol level. It is necessary to establish seed bank for maintaining the germplasm of different French beans in Nilgiris. Developing a suitable high yielding variety will help to improve the economy of the farmers of Nilgiris.Sixteen accessions of traditional french beans (Bush and Pole beans types) were collected from different elevations and evaluated for yield and quality at Nanjanad Farm, HRS, Ooty. The 10 entries of bush beans were replicated three times and the experiment was conducted in a randomized block design at Nanjanadu Farm, HRS, Ooty. Observations were taken on growth parameters of Plant height, Number of branches, number of compound leaves, days taken of flowering, number of pods, days taken for pod setting, pod length, pod diameter and pod weight per plant and yield and quality parameters of protein, carotein and total anti oxidant activities were recorded. As indicated in the pooled means of four years, among the bush bean types, accession number FBB-7 (Aruvath avarai) has recorded highest pod yield of 712.73 g/ plant, pod weight of 15. 80g/ pod. Among the bush bean types, accession number FBB-7 (Aruvath avarai) has recorded the maximum plant height (67.21), no. Of branches (6.80), no. of compound leaves (44.70), Days taken for flowering, (25.29), Days taken for pod setting (42.00), No. of pods (34.15), Pod length(18.48 cm), Pod diameter(3.35cm) and Pod weight (15.80g), highest pod yield of 712.73 g/plant, pod weight of 15. 80g/ pod. The data on quality parameters revealed wide variations in chemical composition in all the ten superior accessions. Protein content varied from 3.23 (%) to 9.59 (%). Accession No. FBB 7 recorded high protein content of 9.59 %. Carotene content was found to be maximum in FBB - 7 (1.08mg /100g) and minimum in 0.42 mg / 100g in FBB 6 and FBB 9. The total antioxidant activity was found to be maximum in FBB 7 (1775ug/g) and minimum in FBB 9 (0.42 ug /g).

Diagnosis of the economically important oriental fruit fly, *Bactrocera dorsalis* (Hendel), based on a mitochondrial cytochrome oxidase-1 based species-specific primer fromthe Indian population

Varun Arya and Srinivasa N*

Department of Entomology & Agricultural Zoology, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi - 221005, Uttar Pradesh, India.

Corresponding author e-mail: srinivasa@bhu.ac.in

Abstract

The oriental fruit fly, Bactrocera dorsalis,is a well-known, well-established polyphagous pestof economic importance in India. It has a huge influence on the indigenous market as well as theexport-import of horticultural commodities, especially mango and guava. The immature stages (maggots) are the internal feeders, which devour the fruit pulps, degrading the marketability of the crop.The identification of B. dorsalis is again a challenging task, as the adult morphological characters closely resemble those of B. zonataand B. correcta, both of which share a common host, and the immature stages are inconspicuous. DNA barcoding of the mitochondrial cytochrome oxidase-1 (mtcox1) gene is again an alternative solution, but it is an expensive and time-consuming process. Our study aimed at developing a simple polymerase chain reaction(PCR) based species-specific primer (SSP) for B. dorsalis that could rapidly identify the pest and reduce the post-DNA extraction time to 2-3 hours.The SSP (DORFP1/DORRP1) was designed by studying the variations within the mtcox1 gene of B. dorsalis and its related fruit fly species.The correct PCR annealing temperature was identified by performing gradient PCR and cross-amplification was tested with the DNA template of five closely related fruit fly species.The individuals of B. dorsalis were collected in methyl-eugenol based parapheromonebottle traps from eight different Indian states in order to check the validity of the SSP.The sensitivity of the SSP was tested by diluting the DNA template to the lowest concentrations (60 ng/µl-1pg/µl). The SSP showed positive results by visualization of a single 506 bp-sized amplicon in a 2% agarose gel.The SSP was reported to be sensitive to ?1pg/µl of template DNA, and clear bands were observed in the specimens collected from different states. This method proved to be a single-step robust molecular assay that can have applications in quarantine stations, thus preventing the further spread of the invasive pest species.

Keywords: *Bactrocera dorsalis, Species-specific primers, Mitochondrial cytochrome oxidase-1, Polymerase chain reaction, Plant quarantine, DNA.*

Evaluation of enzymes associated with methionine biosynthesis in developing maize

Veena Devi[1]*, Dharam Paul Chaudhary[1], Mehak Sethi[1], Ritesh Singh[2]

[1]Division of Biochemistry, Indian Institute of Maize Research, PAU Campus, Ludhiana, India-141004

[2]Division of Agronomy, Indian Institute of Maize Research, PAU Campus, Ludhiana, India-141004

Corresponding author's email: veenayadav.rj@gmail.com

Abstract

Methionine is an essential amino acid, limited in the maize kernel which plays an important role in the growth and development of poultry birds. Synthetic methionine is added to the poultry feed to meet the nutritional requirements of poultry birds thus resulting in the enhanced feed cost. Moreover, synthetic methionine supplements did not provide the desired nutritional impact due to the presence of both L- and D-forms of methionine. Therefore, an urgent need arises to develop high-methionine maize cultivars. The present study was designed to understand the synthesis and accumulation pattern of methionine and the role of key enzymesi.e.aspartate kinase, serine acetyl-transferase, and cystathionine-?-synthase associated with methionine biosynthesis in maize. Methionine content and the activities of key enzymes were evaluated at the 15th, 30th, and 45th DAP. Methionine starts accumulating well before the 15th DAP which keeps increasing with kernel maturity. Aspartate kinase and cystathionine-?-synthase showed

similar trends in their activities in both high and low-methionine maize. However, serine acetyl-transferase showed a positive correlation with the methionine at all the stages of kernel suggesting that sulfur reduction profoundly affects the methionine accumulation in maize. Moreover, homology analysis of SAT enzyme isoforms showed that higher expression and enzymatic activity of ZmSAT1 arespecifically pivotal for the bio-fortification of methionine in maize. It is, therefore, concluded that serine acetyl-transferase is the most important target for genetic engineering to enhance methionine content for improving the quality of maize protein.

Keywords: *Aspartate kinase, Methionine, Poultry feed, Serine acetyl-transferase*

Biochar enriched feed enhances fish production in inland saline water

Vidya Shree Bharti*, Tao Kara , Arun konduri , Vinod Kumar Yadav , Babita Rani

ICAR-Central Institute of Fisheries Education

Abstract

In the present scenario, waste management, especially agro-waste, is one of the major challenges. India is an agrarian country and the economy depends on agriculture and a huge amount of agro-wastes are generated. In this study, biochar was prepared from paddy straw Banana peduncle and sugarcane bagasse and was used in the feed of genetically improved farm tilapia (GIFT) and Shrimp at 0.5% (w/w) and 2% basis respectively to study its effect on growth and haematological parameters. An experiment was carried out in triplicate in 500-l capacity FRP tanks comprising Three treatments and one control. Tanks were filled with inland saline soil to maintain 25-cm soil's bed and water with 12 ppt salinity. It was observed that growth parameters like SGR% (specific growth rate), weight gain (WG%), and feed conversion ratio (FCR) were significantly improved ($p < 0.05$) than the control. Biochar-enriched feed also significantly improved the haematological parameters like red blood cell (RBC), white blood cell (WBC), haemoglobin (Hb) haematocrit % (HCT), mean cell haemoglobin concentration (MCH), and MCV (mean cell volume) in treatment groups than the control. Feeding biochar as feed additives was also found to decrease catalase (CAT) and enhanced amylase and lipase activities in treatments as compared to control ($p < 0.05$). It can be concluded that the application of biochar as a feed additive enhanced the growth and overall health of the fish, and it can enhance fish production.

Keywords : *Biochar · Sugarcane bagasse · Feed additives · Paddy straw · Inland saline · GIFT, Banana peduncle*

Microsatellite marker-based genetic relationship and diversity analysis among three wild relatives of flax (*Linum usitatissimum* L.)

Vijay kumar Kailasrao Raut[1], Ankit Saroha[1], Vikender Kaur[1], Dhammaprakash Pandhari Wankhede[1], Aneeta Yadav[2], Mamta Singh[1]

[1]ICAR-National Bureau of Plant Genetic Resources, New Delhi, India

[2]Faculty of agricultural sciences and allied industries, Rama University, Kanpur

Corresponding author email: mamta.singh@icar.gov.in

Abstract

Flax is one of the oldest domesticated crops of Indian agriculture with more than 200 wild and weedy relatives distributed globally. Due to their genetic divergence and growth preferences under specific niches globally, there exists crossability barriers among them. Lack of understanding the systematic phylogenetic evolutionary relationship among these species is a major issue to define the flax gene pool. In this regard flax wild relatives were augmented from USDA-ARS, to enrich the germplasm diversity at NGB, New Delhi. A subset comprising 59 accessions representing 3 wild species namely L. bienne (15 acc.), L. perenne (12 acc.) and L. lewisii (32 acc.) were subjected to molecular diversity analysis using 15 SSR markers to understand the genetic relationship among the species. A total of 51, 40, 90 alleles with a mean of 3.4, 2.67, 6.0 alleles per locus (K) were found in L. bienne, L. perenneand, Linum lewisiirespectively. Overall, 181 alleles with a mean of 4.022 alleles per locus were found in all three Linum species ranging from 1 to 14 alleles per locus.The high number of alleles per locus reveals the allelic abundance of the individuals belonging to the three species indicating wider genetic base of gene pool of this crop. Maximum number of alleles detected per locus (K=14) were in L. lewisii with primer 49-668637. Polymorphic information content (PIC) ranged from 0.034 (Primer 43-JA 23) to 0.898 (Primer 49-668637) among all three Linum species with a mean of 0.509. Out of 15 SSR markers used for study, 11 in L. bienne, 10 in L. perenneand, 12 in L. lewisii were found highly polymorphic (PIC ? 0.50%), depicting the discriminating power of these loci to differentiate between the genotypes. The value of observed Heterozygosity (Hobs) ranged from 0 to 0.87.The Shannon-Weaver information index (I) ranged from 1.22 (L. lewisii) to 0.87 (L. bienne) averaging 0.95 with a maximum of 2.44 (loci 49-668637) detecting abundant genetic diversity among the 3 populations.Cluster analysis grouped 59 accessions into two major clusters. Cluster I grouped all 32 L. lewisii accessions together. While Cluster II contained two sub-clusters. Cluster II-A grouped all the 12 L. perenne accessions while, Cluster II-B grouped 15 L. bienne accessions together, indicating that the two species are closely related together and distantly related to L. lewisii. The high discriminating efficiency of these markers to distinguish among the species indicated the utility of these markers for genetic diversity analysis and establishment of evolutionary relationship among flax species.

Key words: *Diversity, flax, L. bienne, L. perenne, L. lewisii, microsatellite marker, wild relatives*

Efficacy of biochar under water deficit conditions on soil health and rice yield

Vikas Abrol[1], Sheikh Amjid[1], Peeyush Sharma[1], Vikas Sharma[1], A.P. Singh[2], Ajmer Brar[3]

[1]Division of Soil Science and Agricultural Chemistry, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu-180009, India

[2]Division of Agronomy, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu-180009, India

[3]Department of Agronomy, Punjab Agricultural University, Ludhiana, India

****Corresponding author email- abrolvics@gmail.com***

Abstract

Rice is staple food of majority of global population and one of the most water demanding crop. Producing rice to meet dietary requirement of the burgeoning population in wake of dwindling water resources is

a serious challenge for agricultural scientists. We designed an experiment to study the effect of different soil amendments (biochar, B and polymer, PAM) on soil properties, growth, yield and water productivity of rice (Basmati-370). The experiment was laid out in two factorial CRD with three replications comprising two levels of irrigation viz. I1 (continuously flooded upto 5 cm) and I2 (water deficit) as one factor-I and soil amendments (consisting of biochar and PAM alone as well as in combination with each other, 100 % RDF and control) as factor-II. The soil was sandy clay loam in texture, mildly alkaline in reaction, EC within a safe limit, with a low organic carbon, low available nitrogen, medium phosphorus and potassium. The results evinced that The I2system recorded the highest average water use efficiency, over continuous flooding and the magnitude of water use efficiency increased by 1.52 and 2.2 times over the 100% RDF and control among soil amendments. The continuous flooding system produced the highest average grain yield of over water deficit. However, among the soil amendments, B10PAM10 produced the highest mean grain yieldand significantly influenced the soil properties. The study demonstrated that conjunctive use of biochar and polymer (B10 PAM10) under water deficit condition proved to be promising combination that improved soil health, grain yield and water use efficiency in rice.

Keywords: *Basmati, biochar, polymer, irrigation regimes, water use efficiency*

Characterization of 1- aminocyclopropane-1- carboxylic acid (ACC) utilizing bacteria from rhizosphere of *Chicorium intybus* and determination of PGPR activities

Vineeta Bhatt[1]*, Ankur Agarwal[1], Jyotsana Maura[1],*Merwyn P. Raj[1], Devkanta P Singh[1], Veena Pande*.

[1]Defence Institute of Bioenergy Research (DIBER), DRDO P.O Arjunpur, Haldwani 263139 Uttarakhand, *Kumaun University Nainital 263001

Corresponding author mail id; vineetabhatt416@gmail.com

Abstract

Chicorium intybus, commonly known as chicory, widely cultivated plant species valued for its nutritional, medicinal, and forage purposes. However, its growth and productivity are significantly challenged by abiotic stress, particularly salt stress, which is becoming prevalent due to worldwide soil salinization. The current scenario of agricultural system is highly dependent on the application of large quantities of chemical fertilizers however; the extensive use of chemical fertilizers leads to a wide variety of problems to environment such as soil deterioration, nutrient imbalance and effect on soil micro flora. Therefore, there is a need to substitute these chemical fertilizers in more eco-friendly options to sustain soil health. During last decade, PGPR has received lot of scientific attention as beneficial substitute to crops, but not so much in medicinal plants. In this study, PGPR strains containing 1-aminocyclopropane-1-carboxylic acid (ACC) deaminase were isolated from the rhizosphere soil of Chicorium intybus using the medium ACC as the sole nitrogen source. PGPR isolates were identified as Bacillus subtilis and Pseudomonas plecoglossicida following 16S rRNA gene sequencing analysis. The isolated strains showed various PGP traits such as Indole acetic acid (IAA), Ammonia production, Biofilm formation, can grow at temperature 50°C and can tolerate 1000 mM NaCl stress. Chicorium intybus commonly known as Kashni, its PGPR is still unexplored and stress tolerance induced by PGPRs need to be evaluated

moving towards sustainable approach.

Keywords: *Chicorium intybus, Plant growth promoting rhizobacteria (PGPR), ACC utilizing, sustainable approach*

A Comprehensive Review of the Latest Trends in Hydroponics Practice and Technology for Horticultural Crops

Viswanath M

Scientist, Department of Horticulture, Dr. YSRHU-Horticultural Research Station, Kovvur, Andhra Pradesh, India.

Corresponding author e-mail: viswahorti123@gmail.com

Abstract

Hydroponics is a soilless production method that offers high-quality, nutritious, fresh, and residue-free crops. It has the potential to overcome the challenges posed by climate change, freshwater shortage, and the need for fertile land. Hydroponics production is gaining prominence worldwide due to its effective resource management and cultivation of high-value crops. Developed nations like the Netherlands, Australia, France, England, Israel, Canada, and the United States are leading the way in hydroponic innovation and cultivation. Hydroponics technology offers several advantages over traditional soil-based crop production. It has shorter crop growth times, year-round output, low disease and insect attacks, and eliminates labor-intensive tasks like weeding, spraying, and watering. The Nutrient Film Technique (NFT) has been successfully used for large-scale cultivation of leafy vegetables, resulting in significant water savings of 70 to 90%. To successfully implement commercial hydroponic technology, it is important to devise low-cost methods that are easy to use, sustainable, require less manpower, and have reduced installation and operational costs. Hydroponics has the potential to be a superior approach for growing various fruits, vegetables, and livestock feed, addressing the future need for global nutrition.

Keywords: *Hydroponics, soil-less, water, media, NFT*

Effect of holding solutions to enhance the presentability of *Clarkia amoena* (Lehm.) A. Nelson & J.F. Macbr

Vivek Bhanwala[1]*, Suman Bhatia[2]

[1]Department of Horticulture, Maharana Pratap Horticulture University, Karnal, HR, 132157
[2]Department of Floriculture and Landscape Architecture, Dr. YS Parmar University of Horticulture and Forestry, Solan, Himachal Pradesh, 173230

Corresponding author e-mail: vivekbhanwala0700@gmail.com

Abstract

The current study, entitled "Effect ofholding solutions to enhance the presentability of Clarkia amoena(Lehm.) A. Nelson & J.F. Macbr," was carried out during 2020-21 in the Department of

Floriculture and Landscape Architecture of Dr. YS Parmar University of Horticulture and Forestry, Nauni, Solan (H.P.). The study comprised of postharvest experiments to standardized different holding solution(s) to improve appearance of godetia (Clarkia amoena). The holding experiment was laid out in completely randomized design (factorial) with 13 treatments in which sucrose (2%), 8-HQC (100 and 200 ppm) and BA (5, 10, 15 ppm) were used in different combinations with 3 de-leafing treatments. It was observed that holding solution of sucrose (2%) + 8-HQC (100 ppm) + BA (10 ppm) was concluded best regarding floret and leaf appearance. The floret appearance display freshness score (4.56 out of 5) and colour score (4.64 out of 5). While, leaf appearance in relation to yellowing was found less (3.58 out of 5) under treatment 8-HQC (100 ppm) + BA (10 ppm). From the present investigation, it can be concluded that the overall presentability score (88.37 out of 100) of cut flowers was obtained best under solution comprising sucrose (2%) + 8-HQC (100 ppm) + BA (10 ppm).

Keywords: *Clarkia amoena, Postharvest, Floret diameter, Vase life, De-leafing*

Carbon Dynamics in Various Land Use Systems

Anushka Mishra
Ph.D. Research Scholar, Department of Soil Science and Agricultural Chemistry
Lovely Professional University, Phagwara 144411, Punjab.

Corresponding id: anushkamishra442@gmail.com

Abstract

The movement, transformation, and cycling of carbon within Earth's ecosystems are referred to as carbon dynamics. It includes all of the several channels by which carbon is transferred between the atmosphere, soils, vegetation on land, and seas. The processes of photosynthesis, respiration, decomposition, carbon storage, and carbon sequestration are all included in the field of carbon dynamics. The act of removing carbon dioxide (CO2) from the atmosphere or other sources and storing it for a long time in order to slow down global warming is known as carbon sequestration. There are many different ways to sequester carbon, from technological methods like carbon capture and storage to natural processes like afforestation, or planting trees, and ocean storage. Carbon dynamics in grassland ecosystems are influenced by land conversion, fire regimes, and grazing management. Type of crops, soil management techniques, and agricultural practices all influence the dynamic carbon dynamics seen in crops.Carbon inputs from crop residues, organic amendments, and root exudates affect the amounts of organic carbon stored in the soil. Comprehending the dynamics of carbon in various land use systems is crucial in formulating efficacious methods to mitigate climate change and maintain sustainable land management practices.By integrating land use planning, conservation efforts, and carbon-friendly practices, we can foster carbon-positive landscapes, contributing to global efforts to combat climate change.

Keywords: *carbon dynamics, land use system, carbon sequestration, climate change*

Potency of Halotolerant-PGPR on Kalanamak rice under salinity stress

Omisha Kannaojiya and Kumari Sunita*
Plant Physiology and Biochemistry PGPR lab Department of Botany,
DDU Gorakhpur University, Gorakhpur, India

Corresponding email: ksunita78@gmail.com

Abstract

Salinity poses a significant global challenge, impacting agricultural productivity and food security. Roughly 10% of the world's agricultural land is affected by salinity, with approximately 40% of India's cultivated area experiencing soil salinity-a major threat to the country's food security. This environmental factor destabilizes membranes and disrupts nutrient balance in plants, resulting in delayed morphological and biochemical development, thereby diminishing agricultural output worldwide.In response, halo-tolerant plant growth-promoting rhizobacteria (HT-PGPR) have emerged as potential bioinoculants to enhance crop yields in saline environments. Our research aims to assess the individual and combined effects of salt-tolerant PGPR on the growth and yield of kalanamak rice in saline conditions, spanning NaCl concentrations of 100 mM, 200 mM, 300 mM, and 400 mM.Despite the adverse impact of salinity on rice morphology, PGPR consistently fosters the growth of kalanamak rice. Moreover, rice inoculated with Pseudomonas strain DTPF3 demonstrates heightened antioxidant activity, including increased levels of proline and catalase, compared to non-inoculated plants. This study highlights PGPR as promising bioinoculants for enhancing development and yield in salt-tolerant crops by modifying morpho-physiological and biochemical traits under salinity stress.

Green synthesis of ZnO and TiO2 Nanoparticles using *Ipomoea carnea* leaf extract and its consequences on Black Carrot (*Daucus carota* L.) cv. Pusa Asita

Deen Dayal Upadhyay*, Gajanan Pandey

[1]Department of Chemistry, Babasaheb Bhimrao Ambedkar University, Lucknow, U.P. India- 226 025

Corresponding author Email: ddupadhyay10813@gmail.com

Abstract

Nano fertilizers (NFs) are modern nutrient management tool for plant, having abilities to advance soil productiveness, crop productivity and quality of agricultural products. Since, they are required in very small quantity, thus, reduces cost of crop production. Among diversecrucial or advantageous plant nutrients, Zn and Ti are significant micro-nutrients having numeral beneficial consequence on crop growth, yield, and quality and post-harvest life. In this study,ZnO and TiO2 nanoparticles (NPs) have been synthesised through green method by using Ipomoea carnea(morning glory) leaves extract.Physio-chemical investigation was carried out by using UV-visible spectroscopy, BET, HR-TEM, XRD, EDX, FTIR, XPS and particle size distribution studies. Subsequently, the consequence of foliar spray of aqueous solution of ZnO and TiO2 NPs was assessed in respect of vegetative growth, yield and quality of black carrot (Daucus carota L.) cv. Pusa Asita. There were 8 treatments viz. Control (no fertilizer), recommended dose of fertilizer (RDF), TiO2 (5, 10 and 15 ppm), ZnO (50, 75 and 100 ppm) with 3

replications following Randomised Block Design having 24 plots (1 m x 1 m). The interpretations were taken for vegetative growth, edible root yield and root quality parameters. Although, the growth, yield and quality factors were found superior (root yield 43.84 g/plant) under conventional system of recommended dose of fertilizers (RDF) of NPK, however, TiO2 NPs also revealed very promising consequenceadjacent to RDF as compared to ZnO NPs. In all the doses, 5 ppm TiO2 foliar application along with 50% NPK was found to be the best in terms of vegetative growth, root yield (38.73 g/plant) and quality of black carrot. Therefore, it can be concluded that 5 ppm TiO2 NPs is good for black carrot production.

Keywords: *green synthesis; nanofertilizer; nanoparticles; black carrot.*

Floristic composition and diversity of plant in High-altitude meadows of Byans valley, Kumaun Himalaya

Deepa Rana[1], Jeet Ram[1]

[1] Department of Forestry and Environmental science,Kuamun, University Nainital 263001

Corresponding Author E-mail:deepa1512rana@gmail.com

Abstract

Alpine meadows are highly variable and have a diverse range of species. These areas are well known for their scenic beauty, floral diversity, and repositories of several valuable medicinal herbs. Climate, productivity, biotic interaction, habitat heterogeneity, and history have all been used to explain variation in species diversity along environmental gradients. Because of their topography and history, mountain ecosystems around the world typically have distinct biological communities and a high level of endemism. The plant community of a region is a function of time; however, slope, latitude, aspect, rainfall, and humidity play a role in the formation of plant communities and their composition. Alpine meadows' valuable resources are primarily used as medicinal plants and for grazing by domestic and wild animals. Bughiyals in the Uttarakhand Himalaya have been grazed by both migratory Trans-human race animals such as buffaloes, horses, sheep, and goats and local inhabitants' cattle. The present study deals with species composition and vegetation analysis of Byans valley in Pithoragarh district of Uttarakhand the study was conducted in altitudinal range between 3200-3800m. the herb density was ranged between 95 to 2850ind/ha. Based on result Danthonia cachemyriana 2890 ind/ha was dominant grass followed by Poa pseudamoena 1670 ind/ha and Iris kumaonensis 1490 ind/h and Geranium 95 ind/ha is dominant herb. To investigate the effects of disturbance and climate change on species richness and biodiversity in these places, more thorough research is required.

Keyword: *meadows, Habitat, Valley, Alpine, Topography, Diversity*

Monitoring of Insect Pests and their Associated Natural Enemies on Pigeon pea at Pantnagar, Uttarakhand

Divya Rawat[1]*, Ruchira Tiwari[2], Elluru Sireesha[3]

[1]* Ph.D. Scholar, Department of Entomology, College of Agriculture, G. B. Pant University of

Agriculture & Technology, Pantnagar-263145 (Uttarakhand), India.
[2] Professor, Department of Entomology, College of Agriculture, G. B. Pant University of Agriculture & Technology, Pantnagar-263145 (Uttarakhand), India.
[3]SMS (Plant Protection), Krishi Vigyan Kendra, ANGRAU, Kalyandurgam, Anantapur- 515761, Andhra Pradesh, India.

Corresponding author e-mail: divyarawat1908@gmail.com

Abstract

Pigeon pea, Cajanus cajan (L.), is an important legume crop grown throughout the tropics and subtropics, mostly in Asia, Africa, Latin America and the Caribbean region. In Asia, though India is the largest producer of pigeon pea, contributing more than 90 per cent of the world's production, productivity has always been a concern. The low productivity of pigeon pea in the country may be attributed to many reasons, among which damage by insect pests is of paramount importance. More than 250 species of insect pests are known to infest pigeon pea crop at its various growth stages in India inferring losses that vary from 27 per cent to even 100 per cent. The insect pests and their associated natural enemies on pigeon pea crop grown in Pantnagar (Uttarakhand) have been recorded during the Kharif crop seasons 2021-22 and 2022-23. A total of 24 insect pests belonging to 6 orders and 22 families were recorded. The incidence of insect pests were observed during all the crop stages. Among these, 5 species were recorded as major, 13 as minor and remaining 06 as negligible pests. A total of three species of insect pests viz., Maruca vitrata (Fabricius), Melanagromyzaobtusa (Malloch) and Helicoverpaarmigera (Hübner) constituting the pod borer complex have been recorded along with Pod bug, ClavigrallagibbosaSpinola were found to be the most destructive key pests. Gram pod borer, H. armigera attained its peak during 45th MSW (10.66 larvae/plant) and 49th MSW (7.00 larvae per plant) in 2021-22 and 2022-23 respectively. Highest number of maruca webs (23.80 webs/plant) were recorded during 42th MSW and 15.47 webs/ plant recorded during 44th MSW respectively in two consecutive years. Peak population of pod fly (1.20/plant) was recorded during 48 MSW and 1.10/plant during 48th MSW in the two consecutive years respectively. A total number of 9 natural enemies belonging to 5 orders and 9 families were recorded on the insect pests associated with pigeonpea crop throughout the crop seasons. Nine natural enemies viz., Campoletischloridae, Braconid wasp, Coccinellaseptempunctata, Assassinbug, Eucanthoconabug, Tachinid fly, Hoverfly, spiders were found to be associated with the insect pest complex, regulating the insect population under natural conditions.

Keywords: *Insect pests, Monitoring, Natural enemies, Pigeonpea, Uttarakhand.*

Agri - Horticultural Entrepreneur Opportunity in Uttarakhand

Dr. B. S. Kalakoti

Monard Industries, Bazpur, Udham Singh Nagar, Uttarakhand -263401

Abstract

Chief Minister of Uttarakhand has given a slogan "Swad Ke Saath Swasthya"(Good taste with good health) is value addition to Horticultural and Agricultural produce and enhancing shelflife of the products has a great scope in Uttarakhand. The present paper deals with Horticultural produces like fruit and

vegetables one hand and Millets to other hand. To install small scale entrepreneurial facility for such produces and their usefulness, medicinal values and buyer companies are also mentioned. The regular fruits from hilly region of Uttarakhand are regular produce and covering the market, these fruits are Apple, Oranges, Grapes, Apricot, Plum, Litchi, Mangoes, Guava etc. The present paper is a new segment of new crops and their value addition, usefulness and end users for fruit and vegetable crops. The Millet sector due to the International year of Millets and Named as "Sri Anna"described for their medicinal values and value addition. As consumer continues to explore natural environment to over come from synthetic products this paper deals with this problem, also market is hungry for new natural products.

The Horticultural Produce like fruits and vegetables crops covering following sectors:

1. Natural food colouring sector
2. Natural fabric colouring sector
3. Natural cosmetics
4. Medicinal fruits

Agri produce focused on Millets like - Finger Millets, Fox tail millets, Barnyard millets, Black soya beans are described for their value addition and medicinal values.

Keywords: *Agri-Horticultural produces for sustainable development of Uttarakhand*

Role of Agricultural Journalism for empowering farmers and rural people in India

Dr. Babita Adhikari

Guest Faculty, Faculty of Agriculture and Agro-forestryKumaun University, Nainital,263001

Abstract

Effective communication is crucialtool for societal change and transformation. Shuwa et al, (2014) stated mass media are agents of information, education, entertainment and motivation to farmers for accepting agricultural innovations. Therefore, mass media is an instrumental for bringing any kind of change in current scenario. Since the time of its inception, Radio and television technology played crucial role in development through projects like Radio Rural Forum, Farm School on AIR, Farm and Home Unit, SITE Experiment, Kheda project and Country wide classroom (CWC) project. Indian press on another hand has potential for bringing change. For example, The Hindustan Times feature "Our Village Chhatera" brought out in February, 1969 was one of the best documented rural feature series. Shetkari, Grassroots are another popular of farm journals. Simultaneously, Internet has brought ICT Revolution in India which is important for Knowledge Management. The Agropedia project, implemented by a consortium led by ICRISAT is addressing the challenge of KM in Indian agriculture using the advances in ICTs. Platforms such as Agropedia, Vikaspedia support development and sharing of appropriate and relevant content for researchers, farmers, industry, traders, and policy makers. At same time, advent of community radios hasopened avenues for alternative journalism. With the global scenario, the definition of journalism has been broadening in India also. The concepts of Community radio stations have decentralized the process of communication for common man. Simultaneously, Internet enabled all the stakeholders of rural and agriculture setup to communicate in a better way. In

present scenario where mainstream media highlight on burning and political issues, development journalism is paving way for unheard voice of farmers and rural people. In agrarian country like India, the need of hour is to strengthen the fourth pillar of democracy in light of agriculture and rural development. Looking into the crucial role of agricultural journalism in nourishing a well informed agrarian society, it is important now to give boost to this field.

Keywords:*Agricultural and Rural Development, Community Radio, ICT, Alternative Journalism, AdikeAgropedia*

Microgreen: A tiny plant with superfood potential

Mahinder Partap[a,b,1] , Diksha Sharma[a,1] , Deekshith HN[a,1] , Meenakshi Thakur[a] , Vipasha Verma[a] , Ujala[a,b] , Bhavya Bhargava[a,b],*

[a] Floriculture Laboratory, Agrotechnology Division, Council of Scientific and Industrial Research (CSIR) - Institute of Himalayan Bioresource Technology (IHBT), Post Box No. 6, Palampur 176061, HP, India [b]Academy of Scientific and Innovative Research (AcSIR), Ghaziabad 201002, Uttar Pradesh, India

Abstract

The design of novel and functional foods is a major driver of innovation in the food industry, which strives to meet consumer's rising demand and expectations for healthy foods. In recent years, microgreens have received popularity as functional foods due to their high-density nutrients and bioactive or secondary metabolite content. The morphology of microgreens is comprised of well-developed cotyledonalary leaves, immature true leaves, and a central stem. The scientific literature has documented numerous studies on microgreens such as nutritional content assessment, metabolite accumulation, nutraceutical potential, and shelf life enhancement. Physical, chemical, biological, and cultivation factors significantly increased the microgreen's photosynthetic efficiency, growth, nutrient profile, antioxidant activity, and metabolite content. Using omics data, scientists have investigated the underlying molecular mechanism and potential gene(s) associated with nutrients, specialized metabolites, stress resistance, shelf-life enhancement, and disease resistance in nutraceutical plants.

Keywords: *Antioxidant, Bioactive compounds, Food-omics, Functional food, Microgreens, Nutraceutical, Soilless cultivation*

Nutrient management in gobhi sarson (*Brassica napus* L.) - maize (*Zea mays* L.) cropping system

Deekshith H N, B S Mankotia, S Manuja

Abstract

A field experiment was conducted during2019-20 and 2020-21 at the CSKHPKV, SAREC, Kangra to study the effect of nutrient management in gobhi sarson - maize cropping system. Eleven treatments viz., T1-Control; T2-100% PK to both crops; T3-100 % NP to both crops; T4-100 % NK to both crops; T5-100% NPK to both crops; T6-150% NPK to both crops; T7-100% NPK + S @ 35 kg ha-1 to gibhi

sarson and 100% NPK to maize;T8-100% NPK +Zn @ 25 kg ZnSO4 ha-1 to gobhi sarson and 100% NPK to maize; T9-100% NPK + B @ 1kg ha-1 to gobhi sarson and 100% NPK to maize; T10-100% NPK + FYM @ 2.5 t ha-1to gobhi sarson and 100% NPK to maize; T11-SPNF (Gobhi sarson + Pea) followed by Maize +Soybean , were tested in RBD. Gobhi sarson significantly responded to the higher dose (T6), FYM (T10), sulphur (T7), zinc sulphate (T8) and boron (T9). Significant residual effect of FYM was also observed on maize. The system productivity (gobhi sarson equivalent yield) of was significantly more in T6 (3356 kg ha-1) being at par with T10 (3220 kg ha-1) over T7 (3026 kg ha-1), T8 (3012 kg ha-1) and T9 (2905 kg ha-1) and T5 (2819 kg ha-1) and respective net returns of Rs. 109.2, 103.1, 94.9, 94.0 and 89.1 thousand ha-1 with benefit cost ratio of 1.81, 1.73, 1.64, 1.62, and 1.55. Sulphur (T7) along with the recommended dose (RDF) increased oil content percent and oil yield in gobhi sarson. T6 recorded more N, P, K, S, Zn and B uptake in cropping system followed by T10, T7, T8 and T9. The system productivity in SPNF practice (2395 kg ha-1) was 15.0 % less as compared RDF whereas net returns were less by 8.2%. Thus, for more productivity and profitability in gobhi sarson-maize farmer should apply higher dose to both the crops. Application of 2.5 t FYM or 35 kg sulphur ha-1 or 25 kg ZnSO4 to gobhi sarson should be done to realize more system productivity and profitability as compared to RDF to both the crops.

Potential of Biosurfactant Synthesizing Novel Indigenous Bacterial Strain to Remediate Petroleum Contaminated Sites.

Dr. Diksha Sah[1]*and Prof. Jeet Ram[2]

[1.]Guest Faculty, Faculty of Agriculture and Agroforestry, Kumaun University, Nainital, Uttarakhand.

[2.]Dean, Faculty of Agriculture and Agroforestry, Kumaun University, Nainital, Uttarakhand.

Corresponding author e-mail*: dikshasah412@gmail.com

Abstract

Extensive worldwide usage of Petroleum Hydrocarbons for energy, leads to the disposal of various contaminants into the environment posing serious possible hazardous issues to the environmental as well as human health. In addition, remediation process is extensive, laborious and requires ample amount of chemical which is in contrast with the sustainable development goals. Therefore, it's imperative to develop green technology-based solution for the remediation purposes. Current study highlights the potential of hydrocarbon-degrading bacterium D- 6 in the diesel oil degradation. This bacterium was isolated from soil that had been contaminated with diesel oil in the Haldwani&Lalkuan region of Uttarakhand. Based on the study of 16S rRNA sequences, strain D-6 has been recognized as Onchobactrum intermedium. According to gravimetric analysis, the selected bacterial isolate Onchobactrum intermediumbreaks down 55.17% of diesel oil in 35 days at 30 °C. As compared to control, on treating diesel oil with Onchobactrumintermedium, reduction in half-life of diesel from 76.5 days to 27.5 days was noticed. GC-MS analysis of residual diesel demonstrated degradation of organic components between C9 and C27, with C21 showing remarkable degradation efficiency. Additionally, D-6 was found to be a possible producer of biosurfactants, lipopeptides biosurfactant production by i.e., 2.85 g L -1 was documented. Also, the biosurfactants it synthesizes could increase the emulsification of diesel oil and make Onchobactrum intermedium more favorable for diesel oil

degradation.

Keywords: *Bacteria, Petroleum Hydrocarbons, Biosurfactants, Bioremediation, Environmental Pollution*

Lactobacillus spp. as Biopreservative: A significant approach of shelf life extension in commercial food production

Dr. Garima Verma

School of Biological Engineering and sciences, Shobhit University, Gangoh, Saharnpur, India

Email: garimav467@gmail.com

Abstract

Gram-positive (+) and gram-negative (?) bacteria release a large number of peptides known as bacteriocins that have antibacterial qualities. Lactic acid bacteria are common bacterial species that generate bacteriocins. These days, particular focus has been placed on plantaricins-natural antimicrobial peptides made by strains of Lactobacillus plantarum. As food biopreservatives and/or starters in dairy, meat, and fish products, Lactobacillus plantarum and its bacteriocins have been widely used. They have also been used to treat diseases caused by pathogenic bacteria, such as reducing the symptoms of irritable bowel syndrome (IBS) and reducing the number of colonies of pathogenic bacteria in the wound-burning model in mice. Additionally, plantaricins play a powerful preventive role against UTIs. Even though a lot of research has been done on the various bacteriocin types and theircharacterstics. The present review aims to described potential of antimicrobial peptides derived from Lactobacillus spp. and some of their features and applications in general. Also mentioned are the most common methods of isolation and purification.

Keywords: *Biopreservation, antimicrobial peptides, food safety, shelf life*

Riparian plant diversity along the Sharda River in Champawat district of Kumaun Himalaya

Kavita Joshi[1], Jeet Ram[1]

[1] Department of Forestry and Environmental Science, Kumaun University, Nainital, 263001

****Corresponding author e-mail: kavitajoshi0310@gmail.com***

Abstract

The rivers have always been essential in the advancement of human civilization. They are responsible for a variety of ecological services and functions that support the well-being of humans and biodiversity. Riparian areas bordering rivers are well known around the globe for their essential function of managing water levels and preserving biodiversity. The riparian areas area primary components interacting with both aquatic and terrestrial ecosystem's plant communities, therefore also known as transition zone between these two ecosystems. The present study was carried out in the riparian zone along the Sharda River in Champawat district of Kumaun Himalaya. The riparian zone around this river is forested with Teak-sisso mixed forests. The density of the study area ranged between12 ind/hect to 130ind/hect. The

maximum density was shown by Tectona grandis (140 ind/hect) followed by Acacia catechu (115 ind/ hect) and the minimum density was shown by Lanneacoromandelica (14 ind/hect).

TheChampawat district's southern terai region has an abundance of groundwater, yet dynamite use for road construction, forest fires, and other factors have altered the course of water in the area. Riparian ecosystems have been severely impacted by anthropogenic activities like dam construction, mining, altered land use, and habitat degradation, as well as natural factors such excessive flooding and climate abnormalities.Hydrological regime conservation, the elimination of armouring and de-channelization from watercourses, and the rebuilding of the physical structure of habitats may help in restoration of such ecosystems. In these ecosystems, it may promote naturally occurring vegetation regeneration and support the preservation and management of these ecosystems.

Keywords: *River, Riparian ecosystem, Riparian vegetation, disturbance, Restoration*

Comparative Study of Analytical Methods for Determination of Curcumin in Turmeric *Curcuma caesia* Roxb.

Kritika Guleria*, Ankur Agarwal, S Merwyn, Sakshi Sangwan, Harendra Gathala, Om Prakash, Basant Ballabh, Rachna Joshi, HS Meena, Devakanta Pahad Singh

Defence Institute of Bio-Energy Research, Haldwani-263139, Uttarakhand, India

****E-mail: guleriakriti@gmail.com***

Abstract

Curcuma caesia Roxb. is one of the indigenous plants commonly known as 'Black turmeric', member of Zingiberaceae family & currently acquiring attention among researchers.Turmeric essential oil & Curcuminoids constitute to form turmeric oleoresin. Curcuminoids being one of the major components composed of polyphenolic pigments possessing antioxidant & anti-inflammatory properties. Curcuminoids content of turmeric varies between 2-9% based on its cultivar, soil and climatic conditions (Priyadarsini, 2014). Among Curcuminoids, 'Curcumin' is one of the active ingredients present mainly in the rhizome of Curcuma species. There are many analytical approaches like spectrophotometric (UV-Vis spectrophotometry & Infrared (IR) Spectroscopy), chromatographic, capillary electrophoresis and biosensor techniques which are used for monitoring & evaluating curcuminoids. The chromatography methods mainly TLC and HPTLC having significant limitations like optimization of Mobile phase, broadness of spots, plate-to-plate variations etc. Comparatively HPLC method can be opted for its rapid analysis for curcuminoids determination & LC-MS/MS for determining at very low levels of curcuminoids in any sample matrices. Spectrofluorimetry and Electrochemical methods are the more advanced and rapid. The selection of analytical method for curcuminoids analysis can be opted on the basis of factors like purpose of the analysis, type of sample matrix, detection limit and limit of quantification. Monitoring the Curcumin content in turmeric powder or food products is critical for the quality control during processing and storage. This will enhance the capability of farmers to expect a higher price for turmeric species having good oleoresin content. This also opens the opportunity to extract Oleoresin and Curcumin from raw turmeric as value added products for entrepreneurship development for the export market and pharmaceutical market.

Keywords: *Curcuminoids, Turmeric, Curcumin Content, Oleoresin*

Performance assessment of constructed wetland-microbial fuel cellfor treatment of wastewater containing heavy metals and bioelectricity generation

Maitreyie Narayan[1]*, Nandan Singh[2], Praveen Solanki[3], Rajeev Kumar Srivastava[4]
[1,2]Department of Forestry and Environmental Science, D. S. B. Campus, KumaunUniversity, Nainital, India
[3]Krishi Vigyan Kendra, Narsinghpur, M.P., India
[4]Department of Environmental Science, GBPUA&T, Pantnagar, India

Corresponding author email id: maitreyie25apr@gmail.com

Abstract

Due to the high mobility and toxicity of heavy metals, it is of significance to develop a low-cost and effective method to treat heavy metals contained wastewater. Currently, constructed wetland combined with microbial fuel cell (CW-MFC) technique has exhibited the possibilities in heavy metals removal. A microbial fuel cell coupled with constructed wetland (CW-MFC) was built to remove heavy metals (Cr, Fe, Pb, and Cd) from domestic wastewater. The performance for the constructed wetland combined with microbial fuel cell (CW-MFC) for treatment of domestic wastewater and plants (Canna and Reed) performance towards the heavy metal healing as well as electricity generation was systematically investigated. With macrophyte-integrated constructed wetland, the BCF value of Cr is 0.38, Fe is 0.54, Pb is 0.31 and Cd is 0.16 with Canna similarly the BCF value of Cr is 0.04, Fe is 0.57, Pb is 0.51 and Cd is 0.36 with Reed. The RCF value is 1.39, 1.94, 1.29 and 0.65 of CR, Fe, Pb, and Cd when planted with Canna and when the wetland plant was Reed the value of RCF was 0.58, 1.52, 1.25 and 1.6 of Cr, Fe, Pb, and Cd. Finally, TF was 0.27 of Cr, 0.28 of Fe, 0.32 of Pb and 0.25 of Cd (Canna) and 0.07 of Cr, 0.37 of Fe, 0.43 of Pb and 0.22 of Cd (Reed) after 5 days. All values are in ppm. The maximum voltage, current, power, power density, and current density were observed in the treatment second with Canna when HRT was 3 Day and its values were 81 mV, 84 mA, 6804 mW, 43.73 mW/cm2 and 0.53 mA/cm2. Wastewater parameters like BOD and COD were also investigated. This study established that CW-MFC proved as an efficient system for the remediation of heavy metals and BOD, COD in polluted water along with bioelectricity generation alsoprovides a theoretical guidance for the optimal construction of CW-MFC and the resource utilization of wastewater containing heavy metals.

Keywords: *Microbial fuel cell, Constructed wetland, Bioelectricity, Heavy metal, Treatment, Macrophyte.*

Rapid Assessment of Insect Pollinators of Apple orchards during blooming season in district Nainital, Kumaun Himalaya, Uttarakhand

Manoj Kumar Arya, Tanuja Bisht and Surabhi Bisht

Insect Biodiversity Laboratory, Department of Zoology, D.S.B. Campus
Kumaun University, Nainital-263002, India

Corresponding Author e-mail: dr.manojkumar19@rediffmail.com

Abstract

The Himalaya is the world's greatest mountain range and is considered as the repository of ecological and cultural diversity. From Indian Himalayan region, among the Western Himalaya includes three states namely, Jammu and Kashmir, Himachal Pradesh and Uttarakhand (Garhwal and Kumaun Himalaya). Many temperate crops, including apple, peach, pear, plum, apricot and kiwi fruits are grown in the Kumaun Himalayan region of Uttarakhand, which boosts Uttarakhand's fruit growers' economies. The current investigation was carried out in six apple orchards in the Kumaun Himalayan area of Uttarakhand state's highlands of Nainital district. The proposed study with appropriate methodology was therefore conducted in this region to provide information on evaluating the taxonomic composition, distribution, diversity and abundance of insect pollinator population associated with apple fruit orchards during blooming season i.e. February, March, April and May. During the present study, 29 species of pollinators under 24 genera belonging to 19 families and four insect orders were recorded. Maximum number of species was represented by order Hymenoptera with 10 species, followed by Lepidoptera and Diptera with nine species each and Coleoptera having single species. Across the total six orchards of apples studied, orchard-1was visited by 24 species (442 individuals) of insect pollinators, orchard-2 was visited by 17 species (175 individuals), orchard-3 was visited by 15 species (159 individuals), orchard-4 was visited by 12 species (114 individuals), orchard-5 was visited by 16 species (113 individual) and orchard-6 was visited by 10 species (81 individuals) of insect pollinators, respectively. The findings of the present study demonstrated that Apis cerana was the most dominant and abundant species followed by Pieris brassicae,Agliascaschmirensis, Pieris canidia,Vanessa cardui,Apis mellifera, Syrphusfulvifacies,Vanessa indica and Eristaliscerealis. On the other hand, Componotuscompressus,Halictussp., Eristalishimalayensisand Tabanusorientiswere the least abundant species among the total insects recorded during the entire study period.

Keywords: *Apple,Insects, Orchards, Pollinators, Species.*

Phenotyping of Fusarium wilt Resistant Chickpea (*Cicer arietinum* L.)

Anita Babbar[1], M. J. Kujur[2]*, Monika Patel[3], Prachi Sharma[4], Balkishan Chaudhary[3], Pappu Dewda[5] and R. B. Yadav[6]

[1]Principal Scientist, Department of Plant Breeding and Genetics, JNKVV, Jabalpur, M.P.
[2]SRF, Department of Plant Breeding and Genetics, JNKVV, Jabalpur, M.P.
[3]JRF, Department of Plant Pathology, JNKVV, Jabalpur, M.P.
[4]Department of Plant Breeding and Genetics, JNKVV, Jabalpur, M.P.
[5]FEO, Department of Plant Breeding and Genetics, JNKVV, Jabalpur, M.P.
[6]Sr-TA, Department of Plant Breeding and Genetics, JNKVV, Jabalpur, M.P.

Corresponding author e-mail: monicajyotikujur@jnkvv.org

Abstract

Host plant resistance is the major component in the management of fungal diseases in chickpea (Cicer arietinumL.). A deeper understanding of the genetically controlled yield and the factors that determine it is necessary for enhanced crop performance.Screening of536 germplasm accessions from International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) to identify sources of wilt disease

resistance was conducted at wilt sick plot at Seed Breeding Farm, JNKVV, Jabalpur, Madhya Pradesh during Rabi season 2022-2023. The resistant chickpea checks, JG 315 and JG 12 showed a highly resistant reaction, and the susceptible check JG 62 and K 850 showed a highly susceptible reaction across the wilt sick plot suggesting uniformity of infestation in the field. Ninety six out of 536 accessions showed high to moderate sensitivity towardsFusarium wilt showing average seed yield per plant of 13.83g, demonstrating the clear link between disease susceptibility and yield loss. Out of 96 resistant accessions four accessions was of kabuli type (ICC 3723, ICC 7886, ICC 12429 and ICC 13252). The test entries,ICC 10104was highly resistant to wilt and surpass the seed yield per plant (47.0g), total number of pods per plant (291), total number of seed per plant (375) and harvest Index (58.75%) thanthe resistant check, JG 315.The resistant accessions had better biological yield and seed yield per plant, whereas the less resistant accessions had lower yields. The harvest index ranged between 36.9% to 71.7%. Fouraccessionsviz., ICC 10104 (47.4g) , ICC 12467 (42.5g), ICC 10208 (32.8g) and ICC 14384 (30.2g)showinghighly resistant expression against Fusarium wilt and outperformed the resistant checks, JG 12 (34.7g) and JG 315 (38.4g), in terms of harvest index.

Key words: *Chickpea, Fusarium Wilt, Germplasm accessions, Phenotype*

Effect of Water Stress on Phenology, and Seed Germination of Abies spectabilis in the Western Himalayan Treeline Region

Nandan Singh*, and Ashish Tewari

Department of Forestry and Environmental Science, D. S. B. Campus, Kumaun University, Nainital - 263001, Uttarakhand, India

Corresponding author e-mail: nandanforestry@gmail.com

Abstract

Abies spectabilis, a dominant timber-producing species in the Himalayas, plays a dynamic role in ecological balance and sustains various habitats across temperate to subalpine altitudes. Himalayan montane forests are showing signs of changes in growth, regeneration, and population density of forest tree species due to ongoing climate change, including its upper distribution limit. The research was conducted at Tungnathtreeline areas located at 30°11´02?N and 79°39´36?E, ranging from 3100 to 3500 m asl elevation in the western Himalayas. The study presents a comprehensive perspective on how water availability and its intricate interactions with climatic and ecological variables shape the dynamics of treeline ecosystems. The study's phytosociological analysis of treeline sites revealed the complex interplay between species composition, adaptability, and regeneration potential. The eco-physiological aspects of water balance were thoroughly explored, underscoring how plants employ various strategies to cope with changing water availability. The soil moisture content ranged from 32.17 to 73.50%.Poor regeneration and high mortality of A. spectabilis seedlings were observed in studied treeline sites. The dynamic nature of water potential (pre-dawn (?PD) and mid-day (?MD)) across seasons and years varied between -0.13 and -1.25 MPa. Osmotic potential at full turgor varied from -0.72 to -1.77MPa, these adjustments are crucial for key life cycle events of vegetative and reproductive phases of species. The strong correlation of water potential (?) and phenophases emphasizes the importance of water status in regulating these vital processes.Furthermore, the study delved into the

seed maturation and germination processes, highlighting the significance of ? and moisture content in seed development and germination success. The maximum germination of 46.33% was observed when the seed moisture content was 30.90±3.11%. These findings highlight the critical role of water stress in influencing various aspects of tree behavior, from phenology to seedling regeneration in treeline areas.

Keywords: *A. spectabilis, Water Potential, Phenology, Germination, Seed Maturity, Treeline*

Impact Of Climate Change and Anthropogenic Distirbance of *P. roxburghii* Sarg and Mixed Broadleaf Forest in Uttarakhand Himalaya

Neeta Arya and Jeet Ram

Department of Forestry and Environmental Science Kumaun University, Nainital

Email: neetaaryadr@gmail.com

Abstract

Forest diversity is the main source of livelihood of the people living in the Uttarakhand Himalaya. Forest biodiversity is used for fodder, fuel wood, timber, leaf litter for manuring crop fields, industrial raw materials and several non-timber forest products. Pinus roxburghii and mixed broadleaf forest are the major forest forming tree species in this region. The Object of the present study was evaluate the species diversity and growth dynamics of different naturally regenerated tree species in gap of different sizes in a Pinus roxburghii Sarg (Chir-pine) dominated forest and mixed broadleaf forest. These forests were selected between 1300-2000m elevations in Nainital district and varied in species composition. A total of 201 species were recorded in Pinus roxburghii forest of Nainital. Among which 19 were trees, 44 were shrubs and 138 were herbs. Tree density ranged from 294.0 trees/ha in open canopy to 355.0 trees/ha in close canopy forest. In case of shrub, density showed the reverse pattern to trees (density ranged from 27773.4 shrubs/ha in close canopy to 30887.1 shrubs/ha in open canopy) whereas no trend was found in herb density. Among herbs, an Oplismenus composite was dominating in close canopy forest, Polygonum fulgans was dominating in moderate canopy forest. While Carex nubigena and Justicea simplex dominate in open canopy forest. A total of 192 species were recorded in close canopy, moderate canopy and open canopy of mixed broadleaf forest of Nainital, among which 30 were trees, 45 were shrubs and 117 were herbs. The highest tree density (398 trees/ha) was found in close canopy forest and which decreased with increased disturbance level. Shrub density was highest (2568.4 shrubs/ha) in close canopy forest whereas the lowest (23042.9 shrubs/ha) density was recorded in moderate canopy forest. Pinus roxburghii forest was more diverse than the mixed broadleaf forest include all the growth form tree, shrub and herb.

Exploring the Potential Therapeutic Effect of Datura metel Compound against Cancer EGFRK: Insight from Molecular Docking, MD Simulation

***Pankaja Pandey[1] and Subhash Chandra[1]**

[1]Computational Biology & Biotechnology Laboratory, Department of Botany, Soban Singh Jeena University, Almora-263601, Uttarakhand, India

Presenting Author- pandeypankaja91@gmail.com

Abstract

The Epidermal Growth Factor Receptor (EGFR) plays a crucial role in cancer-related signaling pathways, including Wnt/?-catenin, transforming growth factor (TGF-?), and phosphoinositide-3-kinase (PI3K). Genetic mutations can result in persistent EGFR activation, leading to uncontrolled cell division and cancer development. Advanced-stage cancer patients often develop resistance to existing inhibitors, necessitating the exploration of novel therapeutic options. In this study, we investigated the therapeutic potential of compounds derived from Datura metel. Initially, 104 compounds were identified using IMPPAT. ADMET predictions, drug-likeness assessments, and molecular docking via Vina-GPU-2.0 were performed to evaluate their medicinal effectiveness. Subsequently, 31 compounds with promising characteristics underwent molecular docking, revealing four with significant binding affinity to conserved catalytic residues of the EGFR-TK target, surpassing erlotinib. Molecular dynamics simulations were conducted on selected compounds, with CID-44576309, CID-101630647, CID-101630646, and CID-101630645 exhibiting stable complexes over a 100 ns trajectory. MMPBSA calculations indicated that 12-Deoxywithastramonolide displayed a strong binding affinity for the EGFR-TK enzyme, with a binding free energy of -71.479 kJ/mol. These findings highlight a group of potentially effective compounds from Datura metel, suggesting their promise as anticancer drugs.

Keywords: *EGFR, Datura metel, Molecular Docking, Molecular Dynamic Simulation*

Flow of colours in Biosphere, with special reference to blood

Priti Mathur[1]*, Balvindra Singh[1],

[1]Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus,

Gomti Nagar Extension, Near Malhaur Railway Station, Lucknow- 226028

First and paper presenting author:pmathur@lko.amity.edu

Abstract

During the course of evolution,coloursfrom visible range of sunlight "VIBGYOR" trapped in form of energy, transformed, flowed from one organism to another organism and after decomposition it goes back to nature. Plants cells are producers having oxygen producing capacity. All oxygen carrying molecules in animal system share almost same structure and follow same metabolic pathway. Coproporphyrinogen III Oxidase is a common enzyme found in plant and animal for oxygen producing and oxygen carrying metabolism. Research work done to find out phylogeny of Coproporphyrinogen III Oxidase in order to understand relationship of above said molecules. ToolMEGA Xused on Maximum Likelihood method based on JTT matrix model for statistical inference. Results showed that same pathway followed by different organism for oxygen trapping (green plants) and oxygen carrying moleculesi.e. connective tissue "blood" in animals. Results confirmed that, light trapping pigment is green in colour while blood can be of different colours in different animals.This series starts from plants, tapping energy of 680-700nm, and this green molecule i.e.chlorophyll converted into different coloured blood pigment like Violet, Indigo, Blue, Green, Yellow, Orange, Redin different organism. Relation of blood pigment with plants chlorophyll pigment shows that plants genes are inserted via

plants prokaryotic /eukaryotic cells to animal prokaryotic /eukaryotic cells via food chain, mainly by ingestion, engulfing, symbiotic relationship. Genes of primitive photosynthetic bacteria/plant cells get inserted into genome of animal cells producing similar molecules and started same pathway with little variation, depends on the nature of organism.

Keywords: *MEGA X,Coproporphyrinogen III Oxidase, VIBGYOR,Maximum Likelihood method, JTT matrix, chlorophyll, blood*

A scale to measure entrepreneurial triats of mushroom growers of Jammu region of Jammu & Kashmir (UT)

Priti Singh[1], Jasbir Singh Manhas[2], Poonam Parihar[1]*, Sachin Gupta[3]

[1]Division of Agricultural Extension Education, Faculty of Agriculture, SKUAST- Jammu, Chatha, J&K, 180009

[2]Directorate of Extension, SKUAST- Jammu, Chatha, J & K, 180009

[3]Division of Plant Pathology, Faculty of Agriculture, SKUAST- Jammu, Chatha, J&K, 180009

Corresponding address: thakurrpriti@gmail.com

Abstract

Due to the dearth of a suitable scale for measuring the entrepreneurial traits of mushroom growers about mushroom production technology in Jammu region of J&K, it was necessary to construct an entrepreneurial traits scale for the purpose. Therefore, an attempt was made to develop a test for measuring the entrepreneurial traits of mushroom growers about mushroom production technology. Relevant 39 statements covering8 dimensions namely, achievement motivation, decision making ability, economic motivation, risk taking ability, self-confidence, locus of control, planning ability and cosmopoliteness was prepared. These statements represented the entrepreneurial traits of mushroom growers.After calculating the relevancy percentage and relevancy weightage of the statements, reliability and validity were worked out. The final scale consisted of 30 statements. The scale developed will have utility in identifying and studying the mushroom entrepreneurs in framing policies by the Government and designing trainings and seminars by training and research institutions. The researchers of social sciences will find the scale useful for studying entrepreneurial traits of mushroom entrepreneurs. The financial institutions can adopt the scale in deciding criteria for extending the loans to the new entrepreneurs. The entrepreneurs themselves may use the scale to assess their own entrepreneurial skills.

Keywords: *Entrepreneurship, Traits, Dimensions, Mushroom, Scale*

Meta-topolin induced in vitro organogenesis, genetic and biochemical fidelity assessment of Incarvillea emodi (*Wallich ex Royle*) Chatterjee: A wild ornamental of Western Himalayas with medicinal potential

Priti1,[2]#, Vipasha Verma[1],#, Rohini Devi[1] , Diksha Thakur[1], and Kamlesh Verma[1], Bhavya Bhargava[1,2],

[1] Floriculture Laboratory, Agrotechnology Division, Council of Scientific and Industrial Research

(CSIR)- Institute of Himalayan Bioresource Technology (IHBT), Post Box No 6, Palampur 176 061 (HP), India

2Academy of Scientific and Innovative Research (AcSIR), Ghaziabad- 201002, Uttar Pradesh, India

Abstract

Incarvillea emodi (Wallich ex Royle) Chatterjee, is an important wild ornamental medicinal plant belonging to Bignonaceae family. In this study, a novel and efficient method for in vitro propagation of Incarvillaeemodi using nodal explants has been devised. Meta-Topolin (mT) exhibited superior efficacy compared to other cytokinins such as Kinetin and 6-benzylaminopurine (BAP) in regenerating shoots from the nodal explant. The effects of benzyl adenine (BA), kinetin (Kin), mT, at different concentrations (0.5-1.5 mg L-1) were investigated individually or in combination with NAA (0.10-0.5) on in vitro shoot induction. Higher regeneration rates were obtained on MS medium supplemented with mT and NAA. The highest shoot regeneration rate (93.33± 0.88), average number of shoots (4.24± 0.76), and length (4.47 ± 0.84cm) were observed when using MS media supplemented with 1.0 mgL-1 mT + 0.25 mg L-1 NAA after 4 weeks of incubation. The enhanced shoot proliferation rate was obtained on multiplication medium comprised of MS medium supplemented with 1.0 mgL-1 mT + 0.30 mg L-1 NAA + 0.30 mg L-1 GA3 which yielded a higher of 14.45 ± 0.57 mean shoots with an average of 8.53 ± 1.78 cm shoot length. Shoots raised on the mT-rich multiplication medium were healthy and long enough and showed notable percent rooting (94.73 ± 0.37%) when cultured on a half-MS medium containing indole-3 acetic (IBA) at the concentration of 0.5 mg L-1 after 4 weeks of incubation. About 82.55% survival rate was recorded for in vitro raised plantlets under ex vitro conditions. Analysis of clonal fidelity of 21 in vitro regenerated plants was done using ISSR markers. Out of 16 primers, 10 primers showed clearly scorable monomorphic bands, thus displaying genetic uniformity among in vitro regenerated plantlets. Quantitative biochemical analysis of the micro propagated plants in comparison to the mother plant confirmed the enhanced content of photopigments, phenolics, flavonoids, and antioxidant properties in the in vitro raised plants derived from mT-rich medium multiplication medium. The in vitro propagation method offers a practical solution for producing a significant quantity of healthy Incarvillaeemodi plants that are genetically and phytochemically stable. This technology aims to boost the ornamental industry and can be used for the isolation of biologically active compounds from the in vitro raised plants to be utilized for medicinal purposes.

White Oyster Mushroom "*Pleurotus florida*" Cultivation

Priyanka Bhatt* and Jeet Ram

Faculty of Agriculture and Agroforestry, Kumaun University, Nainital, Uttarakhand ,

India

Corresponding author: e mail:bhattpriyanka18j@gmail.com

Abstract

Oyster mushroomsPleurotus florida commonly known as "Dhingri" mushrooms are rich sources of nutrients and minerals. Oyster mushroomsconstitute 30.4 % proteins, 2.2 % fats,57.6 % carbohydrates, 8.7% fibre, 9.8% ash, 90.8% water (on fresh weight basis) and produces 345kilo calories of energy.

China is the largest producer of mushroom in the world. India stands fifth. Oyster mushrooms are the second in production to button mushrooms. Dhingri mushroom cultivation was started on 17th October, 2023 at Agriculture and Agroforestry, Krishnapur, Nainital on wheat straw by three spawning methods: layer method, ring method and mix method with 4 bags of each method at temperature 18?C and relative humidity 52%. The spawn was obtained from the Horticulture and Food Processing Department Indo Dutch Mushroom Project, Jeolikote, Nainital,Uttarakhand. Due to cold weatherthe mycelium spread was very slow and the first pin heads in different methods were observed between 9th November and 13th November, 2023 at temperaturesbetween 18.7?C and 16.9?C respectively and relative humidity between 41% and 50%respectively. Green moldTrichoderma species was observed as the main disease in the oyster mushroom bags. The diseasewas treated with spot application of fungicide Bavistien.White oyster mushroom P.florida was harvested four times with a total production of 6.5kg. The department aims to further produce and popularize oyster mushroom farming among local farmers, rural women and youth.

Keywords: *Oyster Mushroom, Pleurotusflorida, Dhingri, White Oyster, Mushroom Farming*

Water relations of Quercus floribunda dominated forest in the Kumaun Himalayan region

[1]Prof. Ashish Tewari, Department of Forestry and Environmental Science, D.S.B Campus, Kumaun University, Nainital

[2]Dr. Ikramjeet Maan, Department of Forestry and Environmental Science, D.S.B Campus, Kumaun University, Nainital

[3]Yogesh Chandra Tripathi, Department of Forestry and Environmental Science, D.S.B Campus, Kumaun University, Nainital

Abstract

Quercus floribundaLindl. Ex A. Camus is an evergreen tree species (Family: Fagaceae) with approximately one year leaf life span and concentrated leaf drop during the spring season. It generally dominates a narrow altitudinal belt between 2000 to 2400 m. We studied the regeneration parameters and water relations of the species during the winter season at a site located at 2360 m. The site was on S-W aspect with a slope of 21°. The associated species were Quercus leucotrichophora and Rhododendron arboreum. The tree density of Q. floribunda at the site was 140 trees per hectare and total basal area 15.27 m2 h-1. The seedlings at the site were abundant. The soil water-potential at the site was 2.8 MPa at 10cm and 1.6 MPa at 30 cm depth. The average pre-dawn water-potential was -1.8 MPa and the pre dawn water potential of the seedlings was -2.2 MPa signifying that the stress was relatively severe in the young class individuals. The leaf conductance was close to 80 m mol/m2/per second in the morning which reduced by approximately 40% during the afternoon. From the observations carried out during the winter season it is evident that water stress in Q. floribunda can become severe which is sufficiently low to disrupt several physiological activities and even cause mortality in the newly recruited seedlings.

Key words: *water-potential, leaf-conductance, regeneration*

Horticulture- The Growth Engine of Farming Sector

Rajani[1] and Neha Joshi[2]

[1]Department of Horticulture, Faculty of Agriculture and Agroforestry, Kumaun University

[2]Department of Agronomy, Faculty of Agriculture and Agroforestry, Kumaun University

Email: rawat.rajni08@gmail.com

Abstract

Horticulture has emerged as main growth engine of Indian farming system in the last two decades (Dr. Harendra Raj Gautam and Rajesh Kaushal, 2017). Its focus to increase the production and productivity of various horticulture crops coupled with value chain development,marketing linkages to help the farming community for realization of remunerative prices.Horticulture mainly includes fruits, vegetables, flowers, spices and condiments, medicinal and aromatic plants, post-harvest management, value added product etc. Almost 55-60% of the total population relies on agriculture and allied activities to attain food sufficiency and maintain a livelihood. Moreover, Horticultural crops constitute almost 70-80% of the total agricultural produce in India. Further, they involve a broad crop area and add to India's GDP by almost 28%. Also, these crops account for 37% of India's total exports(Tractor Junction, 2023). So, horticulture play an important role in agriculture sector. More emphasis on cultivation of horticulture can increase and boost the agriculture economy in India.

Keywords: *Horticulture, Agriculture, Value Added Product, Farming*

Effect of Integrated Nutrient Management on Growth and Yield Parameter of Strawberry (*Fragaria* × *ananassa* Duch.) under Naturally Ventilated Polyhouse Condition

Waikhom Somorjit[1], RK Roshan[2], Khaidem Dinesh Singh[3] Irungbam Dilip[4] and Armstrong Kamei[5]

[1, 3, 4, 5]M.Sc (Horticulture) Scholar School of Horticulture, Pandit Deen Dayal Upadhyay Institute of Agricultural Sciences, Nongada Kameng Khunjao, Imphal East, Manipur

[2]SMS(Horticulture), ICAR KVK Tamenglong, ICAR RC Manipur Centre. email-***roshanrk940@gmail.com****

Abstract

The experiment entitled the "Effect of Integrated Nutrient Management on Growth and Yield Parameter of Strawberry (Fragaria x ananassa Duch.) under Naturally Ventilated Polyhouse Condition", was carried out in the Horticulture experimental field, School of Horticulture, Pandit Deen Dayal Upadhyay Institute of Agricultural Sciences, Nongada Kamang Khunjao, Imphal East, Manipur from September 2020 - April 2021. Strawberry variety "Sweet Charlie" was used for experiment. The experiment was set out in RBD consisting of three replications and seven treatments viz.,T0 : Control (100% RDF), T1: 100% RDF + VAM @10kg/ha + 0.4% Boron spray, T2: 100% RDF + VAM @10kg/ha + 0.5% ZnSO4 spray, T3 : 100% RDF + VAM @ 10kg/ha + 0.4% Boron spray + 0.5% ZnSO4 spray, T4 : 75% RDF + VAM @ 15kg/ha + 0.4% Boron spray, T5: 75% RDF + VAM @ 15kg/ha + 0.5 % ZnSO4 spray, T6 : 75%

RDF + VAM @ 15kg/ha + 0.4% Boron spray + 0.5% ZnSO4 spray. T3 (100% RDF + VAM @ 10kg/ha + 0.4% Boron spray + 0.5% ZnSO4 spray) was found to have significantly maximum growth and yield parameter like plant height (16.20cm), plant spread (25.25cm), number of leaves per plant (15.78), number of runners per plant (4.96), Floral parameter like days taken first flower (78.00), number of flowers per plant (27.33). Yield and yield attributes like fruit set percent (77.69%),number of fruit per plant (21.32),number of fruit per cluster (6.19),fruit length(3.75cm), fruit width (2.54cm),fruit weight (15.53g), fruit volume(20.94ml), yield per plant (331.10g) were also found maximum in the plants treated with 100% RDF + VAM @ 10kg/ha + 0.4% Boron spray + 0.5% ZnSO4 spray whereas, the lowest was recorded in the plants treated with T2 (75% RDF + VAM@ 15kg /ha+ 0.5% ZnSO4) spray only. Among all the treatments T3 (100% RDF + VAM @ 10kg/ha + 0.4% Boron spray + 0.5% ZnSO4 spray) was found to be the best treatment in terms of growth and yield parameters of Strawberry.

Key words: *Strawberry, VAM, Boron, ZnSO4, Growth and Yield*

Effect of Different Post-Harvest Coating on Shelf Life and Quality of Kachai Lemon

Irungbam Dilip[1], RK Roshan[2], Armstrong Kamei[3], Khaidem Dinesh Singh[4] and Waikhom Somorjit[5]

[1, 3, 4, 5]M.Sc (Horticulture) scholar School of Horticulture, Pandit Deen Dayal Upadhyay Institute of Agricultural Sciences, NongadaKamengKhunjao, Imphal East, Manipur

[2]SMS(Horticulture), ICAR KVK Tamenglong, ICAR RC Manipur Centre. email-

roshanrk940@gmail.com*

Abstract

Kachai Lemon (Citrus jambhiri Lush.) is an indigenous horticultural fruit of Manipur which has been accorded Geographical Indication (GI) registration tag and it belongs to the family Rutacaea. Popularly known as KachaiChampra (Lemon), it is widely grown in the Kachai village in Ukhrul District, Manipur. Instead of chemical we can use edible coating which is basically consumable films and is not harmful to our health and is environment friendly. The combined effect of alginate and different edible oils on reducing the postharvest loss of Kachai lemons may act as a potential tool for extending shelf life and retaining quality. With the view to find out a suitable coating combination for Kachai lemon, the present experiment was conducted at the School of Horticulture, Pandit Deen Dayal Upadhyay Institute of Agricultural Sciences, KamangKhunjao from October - November 2021. The experiment was laid out in CRD which consist of three replications and seven treatments viz., Control (T0), Bee wax (T1), Mustard oil + 1.5% Sodium alginate (T2), Soybean oil + 1.5% Sodium Alginate (T3), Groundnut oil + 1.5% Sodium Alginate (T4), Coconut oil + Sodium Alginate (T5) and only 1.5% Sodium Alginate (T6). The changes in physico-chemical attributes, sensory evaluation and shelf life were observed for 24 days of storage at 6 days interval.On the basis of the present study Coating of different edible oils (mustard oil, soybean oil, groundnut oil and coconut oil) in combination with 1.5% sodium alginate, bee wax and only 1.5% sodium alginate have significant effect on retaining the quality and extending the shelf life of Kachai lemon. Application of mustard oil + 1.5% sodium alginate (T2) was found to be the best compared to other treatments in all the parameters such as physiological loss in weight (10.80%),

juice content (41.91%), shrinkage (10.92%), spoilage (0.00%), total soluble solids (8.4obrix), acidity (4.90%), ascorbic acid (26.00mg), sensory evaluation hedonic score viz. color (6.7), flavour (7.5), texture (7.3) and overall acceptability (7.1) and shelf life (45 days).

Keywords: *Citrus jambhiri Lush., edible coating, shelf life, quality parameters, Ascorbic acid.*

Effect Of Bio Fertilizeron Growth and Yield Parameter of Strawberry (*Fragaria* × *ananassa* Duch.) Under Naturally Ventilated Polyhouse Condition of Manipur

Khaidem Dinesh Singh[1], RK Roshan[2], Waikhom Somorjit[3], Irungbam Dilip[4] and Armstrong Kamei[5]

[1, 3, 4, 5]M.Sc (Horticulture) scholar School of Horticulture, Pandit Deen Dayal Upadhyay Institute of Agricultural Sciences, NongadaKamengKhunjao, Imphal East, Manipur

[2]SMS(Horticulture), ICAR KVK Tamenglong, ICAR RC Manipur Centre.

email- roshanrk940@gmail.com*

Abstract

The experiment entitled the "Effect of Biofertilizer on Growth and Yield Parameter of Strawberry (Fragaria x ananassaDuch.) under naturally Ventilated Polyhouse condition of Manipur", was carried out in the Horticulture experimental field, School of Horticulture, Pandit Deen Dayal Upadhyay Institute of Agricultural Sciences, NongadaKamengKhunjao, Imphal East, Manipur from September 2020 - April 2021. Strawberry variety "Sweet Charlie" was used for experiment. The experiment was set out in RBD consisting of three replications and 10 treatments viz., T0 - Control (100 % RDF), T1 - 100% RDF + Azospirillum, T2 - 100% RDF + PSB, T3 - 100% RDF + Azospirillum+ PSB, T4 - 75% RDF + Azospirillum, T5 - 75% RDF + PSB, T6 - 75% RDF + Azospirillum+ PSB, T7 - 50% RDF + Azospirillum, T8 - 50% RDF + PSB, T9 - 50% RDF + Azospirillum+ PSB. Observation on Growth and yield parameter was taken. T3(100% RDF + Azospirillum+ PSB) was recorded to have maximum Plant height (16.22 cm), Plant spread (25.26 cm), Number of leave per plant (15.79), Number of runners per plant (4.92), Days taken to produce first flower (59.33), Number of flower per plant (28.33), per cent fruit set (77.72 %), number of fruits per plant (21.43), number of fruits per cluster (6.25), fruit volume (20.38 ml), fruit width (2.56 cm), yield per plant (304.52 g). Whereas, fruit weight (15.68 g) and fruit length (3.61cm) was recorded to be maximum with T6(75% RDF + Azospirillum+ PSB). Application of T3 (100 % RDF + Azospirillum+ PSB) has found to be best in terms of growth of strawberry var. Sweet Charlies. The studies emphasize the application of T6 (75% RDF + Azospirillum+ PSB) as the best treatment in terms of yield (301.68 g) and Benefit- cost ratio (3.94) of strawberry. It is worthy to note that using inorganic fertilizers at the rate of 75% recommended dose with bio-fertilizers and organic manure was at par with that of inorganic fertilizers at the rate of 100% recommended dose with bio-fertilizers and organic manure. Hence, it could be concluded that, by using bio-fertilizer can reduce 25% of the recommended dose of inorganic fertilizer application.

Key words: *Strawberry, Azospirillum, PSB, Biofertilizer, Growth and Yield*

Effect of Different Post-Harvest Coating on Shelf Life and Quality of Tamenglong Orange (*Citrus reticulata*)

Armstrong Kamei[1], RK Roshan[2], Irungbam Dilip[3], Khaidem Dinesh Singh[4] and Waikhom Somorjit[5]

[1, 3, 4, 5]M.Sc (Horticulture) scholar School of Horticulture, Pandit Deen Dayal Upadhyay Institute of Agricultural Sciences, NongadaKamengKhunjao, Imphal East, Manipur

[2]SMS(Horticulture), ICAR KVK Tamenglong, ICAR RC Manipur Centre. email-
roshanrk940@gmail.com*

Abstract

The experiment entitled "Effect of different post-harvest coating on shelf life and quality of Tamenglong orange (*Citrus reticulata*) was conducted at Horticulture Laboratory, School of Horticulture, Pandit Deen Dayal Upadhyay Institute of Agricultural Sciences during the Academic year 2021-22. The experiment was set out in Completely Randomized Design (CRD) consisting of three replications and seven treatments viz., Control (T?), Bee wax (T?), Mustard oil + 1.5% Sodium Alginate (T?), Soybean oil + 1.5% Sodium Alginate (T?), Groundnut oil + 1.5% Sodium Alginate (T?), Coconut oil + 1.5% Sodium Alginate (T?) and only 1.5% Sodium Alginate (T?). The changes of physico-chemical attributes like physiological loss in weight (%), shrinkage (%), juice content (%), spoilage percentage (%), sensory evaluation (Hedonic scale 1-9), shelf life (no. of days), total soluble solids (°Brix), acidity (%), TSS/TA ratio and ascorbic acid (mg/100 ml of juice) were observed for 24 days of storage. Application of Mustard oil + 1.5% sodium alginate (T?) showed the best results in all physical parameters at all interval of observation. At 24 DAS, the physiological loss in weight was recorded maximum at treatment T? (control) and the minimum was recorded in T? (Mustard oil + 1.5% sodium alginate) with 18.81% and 10.67% respectively. The maximum shrinkage 18.45% was exhibited by T? (control) and the minimum was recorded in T? (Mustard oil + 1.5% sodium alginate) with 10.41%. The maximum juice content was recorded by application of T? (Mustard oil + 1.5% sodium alginate) with 39.93% and was found significant with other treatment and minimum juice percentage (30.21%) was observed in control (T?). The maximum value in spoilage (13.2%) was recorded in T? (control) and minimum (0%) value was recorded in Mustard oil + 1.5% Sodium Alginate (T?). Mustard oil + 1.5% Sodium alginate (T?) secured the highest score 7.75, 7.56, 7.38 and 7.17 in case of colour, flavour, texture and overall acceptability whereas control treatment (T?) samples secured minimum scores 6.62, 6.45, 6.27 and 5.84 in sensory attributes. The maximum shelf life was recorded in T? (Mustard oil + 1.5% sodium alginate) with 45 days and minimum was recorded in T? (control) with 32 days. With regard to the chemical parameters, application of Mustard oil + 1.5% sodium alginate (T?) showed the best results at all interval of observation. At 24 DAS, the maximum TSS (15°Brix) was recorded in T? (control) and lowest by T? (Mustard oil + 1.5% sodium alginate) at 12°Brix. The maximum Acidity (0.9%) was recorded in T? (Mustard oil + 1.5% sodium alginate) and minimum was recorded in T? (control) at 0.61%. The highest TSS/TA ratio value was recorded in T? (control) with 24.6 and lowest was recorded in T? (Mustard oil + 1.5% sodium alginate) with 13.27. The maximum Ascorbic acid was recorded in T? (Mustard oil + 1.5% sodium alginate) with 20.49mg/100 ml and minimum were recorded in T? (control) with 13.85mg/100 ml.

Keywords: *Tamenglong orange, Sodium alginate, Shelf-life, coating, post-harvesting*

Analysis Of Acidic Soil Attributes and Lime Requirement in Imphal West District, Manipur

[1]*Robert Wayembam, [2]Kholen singh, [3]Vivek Kamble, [4]Princy Thakur, [5]Meraj Ahmed

[1,2,3]Research Scholar, [4&5]Assistant Professor, Department of Soil Science and Agricultural Chemistry, Lovely Professional University, Phagwara, Jalandhar, Punjab, India

Corresponding author: Robertwayembam123@gmail.com

Abstract

Research conducted in Manipur's regions, including Wangoi, Yumnam huidrom, Mayang Imphal, Samurou, and Mutum phibou, focused on analyzing soil acidity and key nutrient levels. Soil samples from these regions exhibited acidity levels with pH values ranging from 5.1 to 6.3, indicating moderate to slight acidity. The CEC for examined surface area showed the value ? 21.12 Cmol(p+) kg-1 for mutum phibou is highest as compared to ? wangoi ? mayang Imphal ? samurou ? yumnam Huidrom is exhibited lower value 8.65 Cmol(p+) kg-1.. Organic carbon (OC) content was examined, has shown the result highest organic carbon value is ? 2.29 % in yumnam huidrom's subsurface region as compare with other region having less organic carbon content observed ? samurou ? mayang Imphal ? wangoi and mutum phibou sites. The study further explored the levels of available phosphorus and potassium, essential nutrients for plant growth. Wangoi exhibited the highest level of available phosphorus ? 24.54 kg ha-1, as compared to ? mutum phibou ? Samurou ? mayang Imphal ? Yumnam Huidrom's subsurface region is recorded the lowest available phosphorous content ? 13.78 kg ha-1. The highest concentration of available potassium is observed in mutum phibou's surface area, the concentration of available potassium is ? 172.03 kg ha-1, whereas available potassium is less in ? samurou ? yumnam huidrom ? mayang Imphal and lowest in wangoi's subsurface area ? 123.09 kg ha-1. Textural analysis of soil revealed variation among the sand, silt, and clay content, wangoi is having sand ? 36.50% as compared to other region and lowest sand content is observed is ? 19.37% in yumnam huidrom, while samurou's subsurface region having highest silt content ? 35.07%, lowest in wangoi ? 22.88%, clay content is highest in mutum phibou subsurface ? 45.90% and low in yumnam huidrom ? 36.67%. Overall, the study provides valuable insights into the soil characteristics and nutrient profiles of Manipur's regions, which are crucial for effective agricultural management and sustainable crop production. Is found in higher conc.

Keyword: *Liming, Acid Soil, NPK*

Role of Dairy Farming in Livelihood security

Samreen Kaur

Student (Roll No. 81) of B.V.Sc. 2nd year at Khalsa College of Veterinary and Animal Sciences, Amritsar.

Abstract

Livestock rearing in Indiahas a great contribution to enhance the rural economy of the country. Dairy

Industry contributes more than 4% of India's gross domestic product (GDP) and 20 % of agricultural production.Dairy farming as an entrepreneurship for livelihood has been adopted by number of agri-entrepreneurs including small landholders, landless workers and women. Dairy farming provides subsistence to millions of households involved in dairy farming and also ensures supply of quality milk and its products in rural and urban areas. This entrepreneurship endows more than 80 million rural households. Dairy farming is flourishing in the country with the advantages of nutrition, more income and productive family labour employment especially for women. Increase of profit margins further depends upon the milk yield, breed of milch animals, dairy management, and demand supply gaps. India with 24% of world milk production is the largest milk producing country and also having world's largest dairy herd. As India gives importance to both buffaloes and cattle milk, which makes Indian dairy industry different from other countries.In terms of import export of dairy products, India is not counted as an active importeror an exporter. India's export special dairy products are like casein for food processing or pharmaceuticals.Keeping in view the importance of dairy products in food and nutritional security, the Government of India should continue to focus for its persistent growth through significant infrastructure investment in processing, chilling, cattle feed, logistics etc. Govt. of India is also providing financial support to Dairy entrepreneurs under Animal Husbandry Infrastructure Development Fund (AHIDF).

Keywords: *Dairy Farming, Livelihood, Food and Nutritional Security, Gross Domestic Product (GDP)*

Unique Musk Deer And Its Conservation Issues

Ira Tewari

Department of Forestry and Environmental Science, DSB Campus, KumaunUniversity, Nainital-263001, Uttarakhand, India

E-mail:iratewari@yahoo.com

Abstract

Musk deer, a highly endangered species, is one of the most prized assets of the globe. It is also declared as the state animal of Uttarakhand. The male musk deer possesses the precious musk pod containing the valuable musk, which is highly revered due to its medicinal and aromatic properties.This prized possession of the male deer, it has sounded its own death knell. This timid, shy little deer belongs to the family-Cervidae. The musk deer is heading towards extinction in the wild specifically in the Himalayan region. The Insitu and Exsitu conservation of the musk deer is the only solution for its survival. In insitu conservation, community participation for awareness to conserve this animal will go along way in curbing the poaching, done for quick illegal commercial gains. This results in the vast depletion of the population of the deer. Inexsituconservation, the structuring of the musk deer farms, with meticulous efforts is the need of the hour. There are a lot of problems faced while structuring, maintenance and smooth functioning of the farms. The major problems faced are selection of the elevation and site. Acquisition of fodder from wild is challengeable due to thinning of the relished fodder. This aspect can be met with structuring of fodder farms and or involvement of village community. In exsitu, inbreeding leads to loss of vigor and thus is a major threat which can be overcome by the introduction of new musk deer from the wild, to check the successive inbreeding. In farms there should be specialized scientific

veterinary structure and staff set-up to control the water borne, soil borne and fodder borne diseases etc.

The conservation of the precious musk deer shall on one hand save the animal from extinction and on the other shall boost the economy of the remote local population of the region.

Keywords: *Musk deer, Insitu, Exsitu, Endangered, Fodder, Conservation*

Phenological response of two under canopy tree species to climate change in Kumaun Himalayan Region

Shruti Shah*[1] & Ashish Tewari[2]

Faculty of Agriculture and Agroforestry[1]
Department of Forestry & Environmental Science[2]
Kumaun University, Nainital

**** Corresponding Author email: shrutisah23@gmail.com***

Abstract

The preliminary studies on climate change in Himalayan region indicate that in Himalaya warming is more than the global average rate. The object of present study was to study the effect of climate change on certain phenological parameters like flowering, fruit initiation and seed maturation on two different under canopy species Myrica esculenta, Buch-Ham. Ex. D.Don and Rhododendron arboreum Wall. of Kumaun Central Himalaya over a gap of one decade (2008 & 2018). The study site is situated in Nainital forest division and lies between 29°24´- 29°38´ N latitude and 79°27´- 79°37´ E longitude. The climatic data of two years of the study years show no significant difference. However the mean maximum temperature has increased by (0.05°C) and mean minimum temperature by 1.3°C. The comparison of the phenological events between the two species highlights contrasting result. On one hand M.esculenta shows no significant shifts in timing of its phenological events over a gap of ten years whereas R.arboreum shows large variations in the timing of flowering initiation and capsule/ seed maturation. In comparison to 2008 data R. arboreum flowering was three weeks earlier in year 2018 and capsule maturation was also one month earlier. It was apparent from the study that every species will respond differently and have its own adaptation strategy against changing climate. Generalizing, that all species will show variations in their phenophases due to climate change may not be apparent.

Key Word: *Climate Change, Phenophases, Seed/ Capsule Maturation.*

Phenological response of two under canopy tree species to climate change in Kumaun Himalayan Region

Shruti Shah*[1], Ashish Tewari[2] & Lalit M. Tewari[3]

Faculty of Agriculture and Agroforestry[1]
Department of Forestry & Environmental Science[2]
Department of Botany[3]
Kumaun University, Nainital

**** Corresponding Author email: shrutisah23@gmail.com***

Abstract

The preliminary studies on climate change in Himalayan region indicate that in Himalaya warming is more than the global average rate. The object of present study was to study the effect of climate change on certain phenological parameters like flowering, fruit initiation and seed maturation on two different under canopy species Myrica esculenta, Buch-Ham. Ex. D.Don and Rhododendron arboreum Wall. of Kumaun Central Himalaya over a gap of one decade (2008 & 2018). The study site is situated in Nainital forest division and lies between 29°24´- 29°38´ N latitude and 79°27´- 79°37´ E longitude. The climatic data of two years of the study years show no significant difference. However the mean maximum temperature has increased by (0.05°C) and mean minimum temperature by 1.3°C. The comparison of the phenological events between the two species highlights contrasting result. On one hand M.esculenta shows no significant shifts in timing of its phenological events over a gap of ten years whereas R.arboreum shows large variations in the timing of flowering initiation and capsule/ seed maturation. In comparison to 2008 data R. arboreum flowering was three weeks earlier in year 2018 and capsule maturation was also one month earlier. It was apparent from the study that every species will respond differently and have its own adaptation strategy against changing climate. Generalizing, that all species will show variations in their phenophases due to climate change may not be apparent.

Key Word: *Climate Change, Phenophases, Seed/ Capsule Maturation.*

Effect of different doses of nitrogen on growth, yield and economics of Wheat (*Triticum aestivum* L.)

Shweta Bisht

Faculty Of Agriculture and Agro-forestry, Kumaun University, Nainital, Uttrakhand 263002

Corresponding author e-mail: Shwetabisht777@gmail.com

Abstract

The effect of different doses of nitrogen on growth, yield and economics of wheat (Triticum aestivum L.) was evaluated in a field experiment, conducted at Haldwani under Faculty of agriculture and agroforestry, Nainital during 2022-2023. The experiment was laid out in Randomized block design (RBD) with seven treatment of nitrogen applied @ 0, 60, 90, 120,180 and 210 kg N ha-1 was applied in respective plots in the form of urea. Various growth, yield and economic parameters of the crop were influenced differently by various nitrogen levels. Result reveled that various doses of Nitrogen showed significant impact on all the parameter under study and showed significantly higher plant height was obtain at (210 kg N ha-1), no. of tillers and dry matter accumulation were significantly higher at under (180 kg N ha-1). All the growth parameter was found to be at par at (150 kg N ha-1) with highest treatment. However, the highest No. of grain per spike, 1000-grain weight, grain yield and harvest index recorded significantly higher at (180 Kg N ha-1) Straw yield and biological yield were recorded significantly higher in (210 kg N ha-1). All the yield parameters were found to be at par at (150 kg N ha-

1) with the highest treatment. The highest cost of cultivation (Rs. 46810 ha-1) recorded in 210 kg N ha-1 and highest gross return and net return was (Rs.141200 ha-1 and Rs. 95020 ha-1, respectively) was recorded in (150 Kg N ha-1). Highest benefit: cost ratio (2.0) was obtained from (180 Kg N ha-1) which was similar to (150 Kg N ha-1). Therefore, application of 150 kg N ha-1 and 180 Kg N ha-1 could be an option to improve the wheat yield and growth parameter.

Key words: *(Triticum aestivum L.), Spikes, Grain, Biological yield, Harvest index, Wheat, Randomized block design*

The effect of dates of sowing and varieties on growth, yield and economics of wheat

Subham Srivastava[1], Neha Joshi[2], Rinkey Arya[3]

Department of Agriculture and Agroforestry, Kumaun University, Nainital, Uttarakhand, India

Corresponding author e-mail: subhamanku1995@gmail.com

Abstract

A field experiment was conducted during the Rabi season of 2021-22 at the Agriculture Farm of Chunakhan, Ramnagar, Dist-Nainital,Uttarkhand to find out the effect of dates of sowing and varieties on growth, yield and economics of wheat. The experiment consisted of 16 treatment combinations comprised of four dates of sowing and four varieties, tested in split plot design with three replications.The observation on different grow than dyield parameters were recorded andanaly zedstatistically. There sults indicated that different dates of sowing and varieties significantly influenced the growth and yield ofwheat. Among thevariousdatesofsowing,D2(November28)recorded significantly higher plant height, number of tillersm-2, dry matter accumulation, number of spikes m-2, length of spike,grains spike-1, yield and economics. The similar trend was observed with varietyV4(DBW-187)comparedtoV1(HD-2967),V3(UP-2425)andV2(UP-262).

Keywords- *Dates of Sowing, Varieties, Wheat, Growth, Yield and Economics*

Principal Component Analysis and Cluster analysis in rice [*Oryza sativa* L.] genotypes

Sudhir Deepak M[1] and Monika S[2]

[1]Department of Plant Breeding and Genetics, Agricultural College and Research Institute, TNAU, Madurai

[2]Department of Genetics and Plant Breeding, Anbil Dharmalingam Agricultural College and Research Institute, TNAU, Tiruchirappalli

Abstract

Rice serves as the primary staple crop worldwide, with numerous breeding initiatives aimed at developing novel varieties to address the needs of a growing population. The success of these breeding programs relies on exploiting the existing diversity within the crop, as variation is essential for progress. This particular study was conducted to assess diversity among various rice genotypes, a crucial step in

understanding the extent of variability and facilitating the selection of suitable genotypes for future breeding efforts. The study, conducted at the Plant Breeding farm of the Faculty of Agriculture, Annamalai University, involved forty rice genotypes and an evaluation of nine yield attributes. Principal Component Analysis (PCA) was utilized to examine trait relationships and genotype grouping, aiding in future parent selection for breeding programs. PCA revealed nine components, with three exhibiting eigenvalues greater than one, indicating significant contributions to variance. Notably, traits such as the number of panicles per plant, number of grains per panicle, number of tillers per plant, and grain yield per plant displayed considerable variability. The genotypes were subsequently categorized into six clusters, with cluster II being the largest, housing 22 genotypes, followed by cluster I. Significantly diverse clusters, such as V and VI, exhibited substantial inter-cluster distances, suggesting high potential for heterosis in hybrids between genotypes from distinct clusters, yielding valuable segregants. Moreover, future genetic studies may benefit from selecting one or two types from different clusters using methods like diallele or LxT analysis.

Keywords: *Rice, Diversity, Clusters, Principal Component Analysis*

Variations In Hematological Parameters of Fresh Water Carps of Taraii Region Across Different Seasons

Swati Joshi*, Uzma siddiqui and Harish Chandra Singh Bisht

Department Of Zoology, D.S.B. campus, Kumaun University
Nainital - 263139, Uttarakhand, India

Email: swatijoshi865@gmail.com

Abstract

The investigation of seasonal variations in hematological parameters of freshwater carps is of considerable scientific significance. Understanding the hematological dynamics of these fishes across different seasons is crucial for optimal management and health assessment. The present study aimed to investigate the seasonal variation in hematological parameters of the Indian major Fresh water carps, namely Catlacatla (catla), Labeorohita (rohu), and Cirrhinusmrigala (mrigal). By elucidating their physiological responses to environmental changes, this study aimed to provide valuable insights into the hematological dynamics of freshwater carps across seasons, which can inform fisheries management strategies, stock assessment, and health monitoring protocols. Twenty-five blood samples of each freshwater carp species were collected from reservoirs of tarai regions over a period of different seasons. Hematological parameters, including Total Erythrocyte Count (TEC), Hemoglobin Concentration (Hb), Packed Cell Volume (PCV), Mean Corpuscular Volume (MCV), Mean Corpuscular Hemoglobin (MCH), Mean Corpuscular Hemoglobin Concentration (MCHC), White Blood Cell Count (WBC), and differential leukocyte counts, were analyzed using standard techniques. The results of the study indicate that there are significant seasonal variations in hematological parameters among freshwater carps. Hemoglobin (Hb) levels were found to be highest during summer, indicating the activeness of the fish. Total Erythrocyte Count (TEC) & Packed Cell Volume (PCV) were found higher in males than in females, and the higher value was noted in summer and lower in winter. Females possessed a higher number of Total Leukocyte Count (TLC) than males, particularly in summer, while in the rainy and winter seasons, the number was lower.

No significant difference in MCV was found in male and female carps, but it was higher in the late rainy season. A difference was found in MCH values, where females had higher values than males in Catlacatla&Cirrhinusmrigala, but the value of MCH was higher in the rainy season and lower in winter season for both male and female. In Labeorohita, higher values of MCH were found in late winters and lower at early rainy season. MCHC values in all the carps - Catla, Rohu, Mrigal - were slightly higher in females than males and were observed more in the rainy season and lower in winter season. It was observed that there were slight variations and differences between sexes of the three carps across different seasons. In conclusion, this study provides valuable insights into the hematological dynamics of freshwater carps across seasons. These findings can be used to inform fisheries management strategies, stock assessment, and health monitoring protocols. Understanding the seasonal variations in hematological parameters is crucial for maintaining the sustainability of freshwater carp populations and optimizing aquaculture practices in diverse environmental conditions. Further analyses are warranted to explore the underlying mechanisms driving these hematological variations and their implications for the overall health and resilience of freshwater carp populations.

Keywords:- *Hematology, Hematological parameters, Labeorohita, Catlacatla, Cirrhinusmrigala , Variations*

Insecticidal and Antifeedant activity of Gibberellic acid and Abscisic acid against *Poekilocerus pictus* (Orthoptera: Acrididae)

Priyanka Gupta[1] & Versha Sharma*

[1]Entomology laboratory, Department of Zoology, Dr. Harisingh Gour Vishwavidyalaya Sagar 470003, Madhya Pradesh, India

*Department of Zoology, Dr. Harisingh Gour Vishwavidyalaya Sagar 470003, Madhya Pradesh, India

Corresponding author e-mail: vsharma@dhsgsu.edu.in

Abstract

This study examined the harmful effects of Gibberellic acid (GA3) and Abscisic acid (ABA),plant growth regulators, on Poekilocerus pictus (Aak grasshoppers) nymphs in their fifthdevelopmental stage. The nymphs were exposed to varying amounts of GA3 (10-90?g/ml) and ABA(10-70 ?g/ml) orally through their esophagus. A notable mortality in the P. pictus was observed indicating the toxicity ofGA3 and ABA in a dose dependent manner. Both GA3 and ABA drastically reduced the foodintake of nymph, resulting in their weight loss and organ atrophy as the doses increases. Asubsequent microscopic examination of the proventriculus and gastric caeca revealed GA3'scytotoxic effects. The destruction of epithelial cells and severe disruption to cellular structureof these organs were observed at higher dose of GA3 (90?g/ml). Oral ingestion of differentconcentrations of ABA and GA3 led to a remarkable decrease in the number of circulatinghemocytes at all time intervals. Among both the test compound GA3 and ABA, theadministration of Gibberellic acid treatment was more pronounced. These findings suggest that GA3 and ABA have insecticidal and antifeedant effects offering management option for sustainable crop production inAgriculture.

Keywords: *Abscisic acid, Gibberellic acid, Antifeedant activity, Insecticidal activity, P. pictus, Insect pest management, Sustainable crop production.*

Improved soil moisture conservation techniques in the view of Climate change

Vinay[1], Mutyalu Sheshu[1]

Department of Soil Science and Agricultural Chemistry, Naini Agriculture Institute, Sam Higginbottom University of Agriculture Technology and Sciences.

Abstract

The fundamental goal of soil moisture conservation is to reduce the quantity of water lost from the soil through evapotranspiration, which is the combined term for evaporation and transpiration. Evaporation is the loss of water directly from the soil. Maintaining soil moisture is a crucial way to keep the water needed for agricultural production and reduce the need to irrigate crops. This is particularly crucial in regions where groundwater supplies for irrigation are becoming increasingly scarce or limited as a result of climate change or other factors. According to this review, which was conducted both on-site and online using several Scopus publications, the adaptation of management practises such as mulching, conservation tillage, crop rotation, green manuring, deep tillage, mixed cropping, and intercropping. Technologies that manage the irrigation water schedule, such as placing soil moisture sensors and probes in the field and using frequency domain reflectometry Similar to this, data from soil moisture sensor APIs may be used by API developers to enhance their products as they work on IT solutions for the agro-industrial sector.

Exploring soil fertility dynamics in Kapurthala-Phagwara (Punjab)

[1]*Vivek Kamble, [2]Vasanthapu Mahesh, [3]Robert Wayembam, [4]Princy Thakur, [5]Meraj Ahmed

[1,2,3]Research Scholar, [4&5]Assistant Professor, Department of Soil Science and Agricultural Chemistry, Lovely Professional University, Phagwara, Jalandhar, Punjab, India

Corresponding author: kamblevivek635@gmail.com

Abstract

The Punjab region of India holds significant agricultural importance, earning the moniker "Granary of India" for its substantial wheat production, ranking as the country's second-largest producer. Its geographical location, bordered by the Himalayan range to the north and the Thar Desert to the south and southwest, profoundly influences its climate and agricultural practices. An overview of Punjab's soil composition reveals distinct characteristics across its different regions. In the eastern part, soils tend to be loamy to clayey in texture, offering favorable conditions for cultivation. Conversely, southwestern Punjab is dominated by calcareous soil types, including desert and sierozem soils, grey, red desert soils, calsisol soils, regosolsoils, and alluvial soils. Meanwhile, central Punjab exhibits a range of soil types from sandy loam to clay, with pH levels spanning from 7.6 to 8.7, presenting challenges related to alkalinity and salinity. Examining specific districts such as Kapurthala and Phagwara, soil pH levels vary between 6.34 to 8.24, with the majority maintaining a neutral pH. This variation underscores

the diverse soil profiles within the region, each influencing agricultural productivity differently. A critical aspect of Punjab's soil health is its organic carbon content, which plays a vital role in supporting crop growth. Organic carbon levels range from 0.44% to 1.22%, with an average of 0.71%. While a considerable portion of the region, approximately 7.43%, exhibits low carbon content, about 35.03% falls within moderate levels. This distribution highlights the importance of soil management practices to enhance organic carbon content and improve overall soil fertility. In conclusion, Punjab's agricultural landscape is shaped by its diverse soil composition and climatic conditions. Despite challenges such as alkalinity, salinity, and varying organic carbon levels, the region remains a key contributor to India's agricultural output, particularly in wheat production. Understanding the nuances of Punjab's soils is essential for sustainable agricultural practices and ensuring continued productivity in the "Granary of India."

Keyword: *Soil Fertility, NPK, Soil Types and Climatic Condition*

Growth Analysis of Macro Fertilizer Nutrients- Nitrogen (N), Phosphorus (P), Potassium (K) Consumption, Production and Imports in India.

Arvind[1], V. David Chella Basker[2], Sugam Sharma[3], Rittika Raj Dewal[4], S.P. Singh[5] and Anil Bhat[6]

[1,3]Ph.D. Scholar (Agricultural Economics), Division of Agricultural Economics & ABM,Sher-e-Kashmir University of Agricultural Sciences & Technology of Jammu,Main Campus, Chatha, Jammu (J&K)-180009

[2]Assistant Professor (Agricultural Economics), College of Agriculture, Rani Lakshmi Bai Central Agricultural University (An Institute of National Importance), NH-75, Gwalior Road Near Pahuj Dam, Jhansi- Uttar Pradesh (284128)

[4]M.B.A. (ABM) Scholar, Division of Agricultural Economics & ABM,Sher-e-Kashmir University of Agricultural Sciences & Technology of Jammu, Main Campus, Chatha, Jammu (J&K)-180009

[5]Associate Professor (Agricultural Economics),Division of Agricultural Economics & ABM,Sher-e-Kashmir University of Agricultural Sciences & Technology of Jammu, Main Campus, Chatha, Jammu (J&K)-180009

[6]Assistant Professor (Agricultural Economics),Division of Agricultural Economics & ABM,Sher-e-Kashmir University of Agricultural Sciences & Technology of Jammu, Main Campus, Chatha, Jammu (J&K)-180009

****Corresponding author e-mail: arvindsangwanbadal@gmail.com***

Contact No.: 9596225410, 8264226510 (M)

Abstract

Fertilizers are one of the major significant input in agriculture sector all over the world. Even after Green Revolution in India, the government main focus comes towards providing the fertilizer nutrients availability to farmers to meet the nutrients requirements. Government of India also implemented Nutrient Based Subsidy (NBS) scheme since 2010 to provide fertilizer nutrients Nitrogen (N), Phosphorus (P), Potassium (K) and Sulphur (S) at reliable prices to the farmers. The Compound Annual Growth rate

(CAGR) of 3.96 percent, 3.75 percent and 3.89 percent were found respectively, forconsumption, production and imports of fertilizer nutrients (N, P,K) in India over past 41 years from 1981-82 to 2021-22. In India, Nitrogen consumption, production and imports increased with 3.89 percent CAGR, 3.68percent CAGR and 4.05percent CAGR respectively, over past 41 years from 1981-82 to 2021-22. In India, Phosphorus consumption, production and imports increased with 4.43 percent CAGR, 3.99 percent CAGR and 5.24 percent CAGR respectively, over past 41 years from 1981-82 to 2021-22. In India, Potassium consumption, production and imports increased with 3.28 percent CAGR, 0 percent CAGR and 2.29 percent CAGR respectively, over past 41 years from 1981-82 to 2021-22.

Keywords: *CAGR, Nitrogen, Phosphorus, Potassium, Consumption, Production, Imports.*

Barnyard Millet vs Rice: based on physicochemical properties

[1]Bhumika Kabdal*, Department of Food Science and Nutrition, G BPant University of Agriculture and Technology, Pantnagar

[2]Archana Kushwaha, Department of Food Science and Nutrition, G B Pant University of Agriculture and Technology, Pantnagar

[3]Anuradha Dutta, Department of Food Science and Nutrition, G B Pant University of Agriculture and Technology, Pantnagar

[4]Satish Kumar Sharma, Department of Food Science and Technology, G B Pant University of Agriculture and Technology, Pantnagar

[5]Umesh Chandra Lohani, Department of Post-Harvest Process and Food Engineering, G B Pant University of Agriculture and Technology, Pantnagar

[6]Navin Chandra Shahi, Department of Post-Harvest Process and Food Engineering, G B Pant University of Agriculture and Technology, Pantnagar

E-mail: bhumikabdwal@gmail.com

Abstract

Rice (Oryza sativa) is one of the most consumed cereals in India and it is categorized under food with high glycaemic index (GI). With increasing prevalence of Diabetes mellitus there is a demand of foods that can substitute food with high GI, specifically rice. Barnyard millet (Echinochloa species) has become one of the most important minor millet crops, showing a firm upsurge in world production. The genus Echinochloa comprises of two major species, Echinochloa esculenta and Echinochloa frumentacea, which are predominantly cultivated for human consumption and livestock feed. Uttarakhand is a contributes maximum to the production and yield of Echinochloa esculentaacross India. Barnyard millet is a crop with low GI.In order to see the suitability of barnyard millet as a replacement of rice, both the grains were compared for their physicochemical properties. They were compared based on their seed weight, seed volume, soaked weight, soaked volume, seed density, sweeling capacity, swelling index, hydration capacity, hydration index, and cooking time using statistical tools.There was significant difference in their seed weight, seed volume, soaked weight, soaked volume, seed density, sweeling capacity, swelling index, hydration capacity, and cooking time. The value for hydration Index was not

comparable. Even though the seed weigh and volumeweredifferent the cooking time was higher for barnyard millet and the swelling capacity was less.In conclusion we can say that barnyard millet can be a substitute for rice based on physicochemical properties but will take more time for cooking. Further preference of consumers can be studied to reach to a conclusion.

Banded leaf and sheath blight: A dreaded disease of maize

Santosh Kumar*, Vinit Pratap Singh and Dhirendra Kumar Singh

College of Agriculture, Kotwa, Azamgarh-276001(ANDUA&T, Kumarganj, Ayodhya)

**** Corresponding author: santosh35433@gmail.com***

Lead lecture

Abstract

Maize or corn (Zea mays L.) is the most important cereal crop in the economy of agricultural across the world, but widely grown in South and Southeast asia.The production of maize is inclined by copious biotic stresses, which obstacle to gaining high yield in maize. Banded leaf and sheath blight (BLSB) incited by Rhizoctonia solani(teleomorph: Thanatephorussasakii) is recognized as a most serious disease for reducing maize production in almost all maize growing areas especially in South and Southeast Asia(Singh & Shahi 2012).Losses occur due to this disease may go up to a 100%, when conditions are favourable (Anonymous, 2017; Devi and Thakur, 2018).As per report of Ahuja and Payak, 1982, maximum loss can be seen, when the infection reach to ears.

Symptoms of this disease appear on all part of the plant viz., leaf, leaf sheaths, stalks and ears but are more common on sheaths than the other part. Initially the symptoms appear on first and second leaf sheath, just above the ground as water soaked discolourd concentric bands, often brown, tan and grey in colour. Rhizoctonia solani being a soil-borne pathogen, is the most dreaded, and adaptable pathogen that can be found almost anywhere in the globe (Divya Rani et al. 2013). The primary source of inoculums is the sclerotia that are present in the soil. Secondary spread through the mycelium of infected leaves or sheaths. Relative humidity up to 90%, temperature 28 to 30°C, and rain fall during the initial infection significantly conducive for the progress and development of disease. Sharma, 2005 found that progress and development of disease is slow, if the relative humidity goes below 70%.

At present, most of the promising varieties mostly hybrid have been found susceptible against this disease.Although the use of resistant varieties is preferred as an eco-friendly and cheapest approach to disease management, but the restricted source of resistance to BLSB is a major bottleneck for an effective resistance breeding program. Therefore, management of this disease through cultural, biological and chemical means so as to minimize the crop losses (Singh and Shahi, 2012). Adoption of integrated disease management (IDM) practices is essential for economical and effective control. IDM comprises the use of pathogen free seed, sanitation and destruction and removal of infected plant debris, crop rotation and deep summer ploughing. Crop rotation, mix/intercropping helps in controlling the disease to a greater extent as break the infection cycle and disturb the food chain. Treating the seeds with carbendazim @ 2 g/kg or with Trichoderma viride@ 8 g/kg and foliar application with carbendazim @ 2 g/litre or propiconazole @ @ 1 g/litre of water along with cultural practices are highly suitable for the

management of this disease. Seed treatment with bavistin @ 2 g/kg of seed before sowing and twice spraying of SAAF @ 3 g/l of water during knee height stage at 15 days interval followed by leaf stripping technique were effective to control banded leaf and sheath blight disease. Some studies proved that none of disease management tactics is completely effective against this disease. Hence, immediate care is required for identification of newer biorational and climate resilient components so as to integrate them together with proper combination.

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Health Benefits and Nutritional Importance of Underutilized Fruits

Mahesh S S N Mokhamatla, Viswanath M and NarayanaRuthwek M

Dr.YSRHU- COH,Venkataramannnagudem, Andhra Pradesh, India.

Corresponding author E-mail: Mahesh9491016811@gmail.com

Abstract

Nutrient-dense fruits are much sought these days to support human metabolic and nutritional wellness. Commercial fruit crop production is increasingly reliant on inputs to offset losses from biotic and abiotic stressors. Mostly grown, sold, and consumed locally are a vast range of underutilized crops that are neither widely traded nor commercially farmed. Actually, for the people who live in villages, these fruits are their sole source of protective food that may satisfy their demand for vitamins and minerals. Since ancient times, Ayurvedic and Unani treatments have utilized these fruits due to their healing qualities. A few underappreciated fruits have great flavor and eye-catching color in addition to their nutritional and therapeutic benefits. They are mostly grown in the wild and their cultivation is quite limited. Underutilized crops, which can withstand the harsh climate and require less inputs, should be taken into consideration for integration into the current farming system in these locations. About twenty plant species like Kair (Capparis decidua), Iasora(Cordia myxa), Jharber (Ziziphus nummularia), Pilu (Salvadoraoleoides), Khejri (Prosopis cineraria), Phalsa (Grewia subinaequalis), Bael (Aegle marmelos), Karonda (Carissa carandas), Fig (Ficus carica), and Prickly Pear (Opuntia ficus-indica) are among the thirty plant species in the arid zone that are known for edible purposes.Due to their easy-to-grow qualities,

resilience, and good yield even in harsh weather, these underappreciated fruits have several advantages. Because the indigenous population is aware of these crops' nutritional and therapeutic benefits, they have a long history of consumption.

Keywords: *Nutrition, Fruits, Health*

Synergistic eco-physiological response of biochar and Paenibacillus lentimorbus application on chickpea growth and soil under drought stress

Mohd Mogees Ansari a,b,, Nikita Bisht a, Tanya Singh a,b, Puneet Singh Chauhan a,b*

a CSIR-National Botanical Research Institute (CSIR-NBRI), Rana Pratap Marg,

b Academy of Scientific and Innovative Research(AcSIR), Ghaziabad, India

Corresponding author:puneet@nbri.res.in, puneetnbri@gmail.com (P.S. Chauhan).

Abstract

This study aims to develop an eco-compatible soil amendment employing maize-stalk-derived biochar inconjunction with plant-beneficial rhizobacteria, Paenibacilluslentimorbus (B-30488) to improve soil propertiesand chickpea growth under drought conditions. Our results unveiled significant alterations in soil physicochemical properties, enzyme activities, and culturable microbial diversity on the application of B-30488+Biochar treatment. Scanning electron microscopy confirmed the porous structure of biochar, facilitatingefficient colonization by B-30488. Under drought conditions, the synergistic application of biochar and B-30488substantially enhanced chickpea growth as indicated by improved biochemical and physiological status, rootarchitecture, and anatomy. Additionally, phytohormone [Indole acetic acid (IAA), cytokinin (CK), jasmonic acid(JA), and salicylic acid (SA)] and gene expression [glutathione S-transferase (GST), ascorbate peroxidase (APX),catalase (CAT) and ACC oxidase (ACO)] analyses affirmed their regulatory role in maintaining cellular homeo-stasis during drought stress. These findings underscore the multifaceted role of the synergistic application of B-30488 and Biochar, offering a sustainable strategy for agriculture and stress resilience.

Keywords: *Soil-Plant interactions, Biochar, Resilience, Gene expression, Phytohormones*

Assessment of night soil compost and inorganic fertilizers for improving crop productivity in dry temperate soils of Himachal Pradesh.

Pooja Kumari[1], Dr.NarenderK.Sankhyan[2], Gaytri Hetta[3], Anshumali[4], Monika Patel[5] and Dr. Monica Jyoti Kujur[6]

Department of Soil Science, CSK Himachal Pradesh Krishi Vishwavidyalaya Palampur (HP)176062

* Pooja Kumari

Abstract

The annual production of sanitary waste by the human population could be as high as 55.1 kg perpersonperyear,orabout 385 million tonnesannually for the entire world's population. This waste is

extremely highinnitrogen,phosphorous,and potassium.Accordingtoastatement,Human excreta are consider edwaste and need to bere moved by water assoonas possible.Human waste is turnedin to water pollution during waste water treatment, and weartificially addnutrient stosoils that are deficient,which eventually lead stosoilex ploitation. So, the utilizationof human excreta by composting (Nightsoilcompost) enhances soil productivity and its additional so improvessoil health.Forcomposting,domesticwasteismixedasco-compostingmateria lwhichcanimprov ethefertilizingqualityofwastebyalteringthecomposthumidity. Mostharmfu lbacteriaandworme ggsinthenightsoilarekilledwhenthec omposttemperaturerises.InI ndia,nightsoilcom posthashistoricallybeenaddedfr omlongperiodtotheso ilinanumberofmethodstoincrease thesoil'sfertility.Thisisthenaturalcyclebywhichthematerialstaken bybioticcomponentsfroman abioticcomponento ftheearthareреturned tobacktotheearth makingit richtos upportthesoil'sbiologicalpropertiesfurther. Compost made from night soilisabund antinnitrogen,phosphate,andpotassium.Ithasanaverageof5.5percentN,4.0percentP2O5,and2.0percent K2O on an oven-dry basis. Consequently, its use protects non-renewable resources also.Keywords-Night soil compost, Soilhealth, Population, Fertilizers

Biotechnological approaches for sugarcane improvement

Narayana Ruthwek M*, Mahesh S S N M and R.S. Sengar

Department of Agriculture Biotechnology, College of Agriculture

S.V.P. University of Agriculture & Technology, Meerut-250110, Uttar Pradesh, India

E-mail: narayanaruthwek@gmail.com

Abstract

Sugarcane (saccharum spp.) is one the most important cash crop contributing more than 75% of world sugar production. It has been cultivated and improved from ancient times by following natural selection and conventional breeding andmore recently by using several modern tools of genetic engineering and biotechnological approaches. The complex genome and susceptibility to biotic and abiotic stresses make it more difficult for crop improvement. Considering the interest in rapidly improving sugarcane tolerance to various stress conditions under the current climate change scenario, conventional breeding programs are ineffective and time-consuming. Recent advancements in biotechnology provide a better scope for improving sugarcane to overcome such problems within a short period. Techniques such as Recombinant DNA technologyhave greater potential in incorporating one or more specific genes via genetic engineering, Genome editing by usingZNFs, TALENs, CRISPER/Cas9 system.Molecular markers help in identifying various stress-tolerant genes/QTLs in the sugarcane gene pool. Omics technologies like genomics, transcriptomics, proteomics and metabolomics show intricate connections between metabolites, proteins, and genes, which could aidin knowing the genetic regulation and molecular mechanisms improve both yield and stress resistance.In summary, contemporary biotechnologies have the potential to expeditiously produce genetically enhanced cultivators possessing superior physiological and morphological characteristics, as well as enhanced field performance in diverse environmental conditions.

Key Words: *Sugarcane, Biotechnology, Stress, Crop Improvement*

Evaluating the Anticancer activity of Cladonia furcate Lichens against Leukemia Cells: A Promising Source of Natural Therapeutics

Neetha Raj M[1], Chandan Dharmashekar[2], Gopinath S M[1]*, Chandan Shivamallu[2]*

Department of Studies in Biotechnology, Davangere University, Davangere, Karnataka, India.

Department of Biotechnology and Bioinformatics, JSS Academy of Higher Education& Research, Mysuru, India.

Abstract

Background: Lichens are symbiotic organisms composed of a fungal partner and a photosynthetic partner, often exhibiting unique chemical compositions with potential pharmacological properties. This study explores the antimicrobial, antioxidant, and anticancer potential of Cladonia furcate lichens, focusing on their impact on leukemia cancer cells.

Aim/s: This study aims to evaluate the anticancer efficacy of Cladonia furcate lichens against leukemia cells, elucidating bioactive compounds and mechanisms of action for potential natural therapeutic development.

Methods:Cladonia furcate lichens were collected from the Western Ghats region and subjected to extraction processes to obtain bioactive compounds. Further, the compounds were isolated and characterized, and the obtained specific bioactive compounds were evaluated for antimicrobial activity using standard microbial strains, while the antioxidant potential was assessed through established assays, including DPPH radical scavenging and ferric-reducing antioxidant power (FRAP). The anticancer activity against leukemia cells was examined through cytotoxicity assays, employing leukemia K-562 cell lines and normal cells as controls.

Results:The antimicrobial screening revealed significant inhibitory effects against virulent pathogens, highlighting the lichens' potential as antimicrobial agents. In terms of antioxidant activity, Cladonia furcate exhibited notable DPPH scavenging capacity and FRAP values, indicating strong antioxidant potential. The anticancer evaluation demonstrated a dose-dependent cytotoxic effect against leukemia cells, with 91.90 IC50 values suggesting a selective impact on cancerous cells compared to normal cells.

Conclusion:Cladonia furcate lichens showcase promising antimicrobial, antioxidant, and anticancer properties. The observed antimicrobial activity suggests potential applications in infectious disease management, while the antioxidant capacity implies a role in combating oxidative stress-related disorders. The selective anticancer activity against leukemia cells underscores the lichens' potential as a source of novel therapeutic agents in cancer treatment. In future endeavors, in vivo studies should be prioritized to validate these findings and provide a more comprehensive understanding of the lichens' therapeutic potential.

Molecular characterization of theki (made from Boehmeria rugulosa Wedd. Tree) associated micro flora responsible for the natural fermentation of milk and its application in the development of functional food

Priyanka Arya*[1], Devina Vaidya[1], Sunita Devi[2], Manisha Kaushal[1]

[1]Department of Food Science and Technology, Dr. Yashwant Singh Parmar University of Horticulture and Forestry,Nauni, Solan, Himachal Pradesh

[21]Department of Basic Sciences, Dr. Yashwant Singh Parmar University of Horticulture and Forestry,Nauni, Solan, Himachal Pradesh

Corresponding author: arya.priyanka32@gmail.com

Abstract

The evergreen tree Boehmeria rugulosa Wedd., belongs to the family Urticaceae that contains phytochemicals possessing antimicrobial, antioxidant properties which significantly affects taste and flavor of fermented foods. Various solvents concentration (water, ethanol, methanol and acetone), the highest wood extract yield (%) was observed in 70 per cent aqueous ethanol containing total phenols (229.3 mg GAE/g), total flavonoids (67.13 mg QE/g) while, GC-MS analysis identified 63 volatile compounds. The extract in-vitro antibacterial activity was evaluated against Staphylococcus aureus ATCC 12600 (18.45 mm) followed by Bacillus cereusATCC 6633 (15.88 mm) and, Escherichia coliATCC 8739(12.35 mm). Traditionally, the wood of B. rugulosa utilized in the production of theki, a closed-neck wooden vessel, wherein milk poured into wooden vessel and fermentation occurred without backslopping. However, microbiological analyses revealed that potential microflora were responsible for the natural fermentation of milk occurring within the wooden vessel "theki". A total of 33 isolates (13 from B. rugulosawood and 20 from Thekidahi) indicating 19 bacterial strains and 14 yeast strains. The molecular characterization (16S rRNA ribotyping), strains were identified as LeuconostocflakenbergenesisMBR1C, Leuconostocpseudomesenteroids MBR3C, Bacillus paramycoidesMBR5C, LeuconostocmesenteroidsMBR4W and NaganishiaadeliensisYBR6C assigned with NCBI GenBank assession no. as OR272008, OR272010, OR272007, OR272009 and OR272011, respectively. This study sheds light on the scientific basis of traditional practices but also offers valuable insights for the development of functional and probiotic-rich fermented foods, paving the way for future advancements in food science and technology.

Keywords: *Probiotic, Lactic acid bacteria, GC-MS, dahi, Acid tolerance test, Antibiotic*

Assessment of Genetic Diversity and Trait Associations in Brassica Juncea var. rugosa Landraces from the North-Western Himalayas.

Rahul Dev, NK Hedau, Lakshmi Kant

Crop Improvement Division, ICAR-Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora (U.K.)

Corresponding author email: Rahul.dev@icar.gov.in

Abstract

Thirty-four indigenous landraces were collected from various parts of the north-western Himalayas to assess the genetic diversity of Brassica rugosa. These collected germplasms were evaluated for 18 quantitative, qualitative, and antioxidant traits under field conditions in 2021 at the experimental farm in Hawalbagh, ICAR-VPKAS, Almora. Significant genetic diversity was observed for plant height, leaf length, leaf width, beak length, leaf yield per plant, total carotenoids, total chlorophyll, total polyphenols, total antioxidant activity, and DPPH (% inhibition). Using Ward's clustering method, the 34 accessions were classified into four major groups, in which the largest and smallest groupsrepresented 38.10% and 6.0% of the total germplasm, respectively.The relationship between variables was assessed using Pearson's correlation analysis. Biochemical traits showed a strong positive association with DDPH and Total Antioxidants Activities. At the same time, plant height exhibited positive associations with No. OfLeaf /plant, Fruit zone length, Total chlorophyll Content, and Total carotenoid content), and negative associations with most leaf traits (Leaf Length, Leaf Width, No. of leaves, and Leaf yield / Plant).Principal component analysis revealed that the first five principal components, with Eigenvalues >1.0, explained more than 75% of the total variation among genotypes. A biplot between PC-1 and PC-2 highlighted genotypes such as Gagrikhol, IC 298019, and IC 372259, which appeared distinct and promising for utilization as parents in leafy mustard improvement programs.

Keywords: *Brassica juncea var. rugosa, Genetic diversity, Principal component analysis, Northwest Himalayas.*

Exploring the Biodegradability Potential of Sporosarcina Bacterial Isolates from Municipal Waste Management for Sustainable Waste Treatment

Rajesh V M[1], Chandan Dharmashekar[1], Bhavana H H[2], Bhargav Shreevatsa K S[1], ChandanShivamallu[1]*

[1].Department of Biotechnology and Bioinformatics, JSS Academy of Higher Education &Research, Mysuru.

[2].Department of Microbiology, JSS Academy of Higher Education &Research, Mysuru.

Corresponding Author: Chandan S; chandans@jssuni.edu.in

Abstract

The thermophilic bacterial consortiums obtained from municipal waste treatment facilities were studied. Its core objectives were to evaluate its potential for environmental remediation and its ability to degrade specific components within municipal waste. Additionally, the research aimed to understand the biofilm formation mechanisms these bacterial groups employ on the surface of municipal waste, emphasizing the critical role of biofilms in enhancing bacterial resistance and biodegradation in Municipal Solid Waste (MSW) applications. Thermophilic bacterial consortia have gained recognition as effective bioremediation agents due to their capability to transform pollutants into non-toxic or less toxic compounds. The study primarily aimed at identifying and characterizing novel thermophilic bacterial consortia proficient in degrading specific components of medical waste while investigating their biofilm-forming abilities. Advanced genomic techniques like polymerase chain reaction (PCR) and DNA sequencing were utilized to identify and categorize the isolated bacterial species, revealing genetic

characteristics, phylogenetic linkages, and biofilm-forming abilities of thermophilic bacteria. The research highlighted the significance of thermophilic bacterial consortia in the biodegradation of hospital waste. Through careful selection, isolation, molecular characterization, and studying biofilm formation, the study unveiled the potential of these consortia in waste management. This research forms a foundational framework for creating sustainable waste treatment technologies by integrating biofilm formation with SDS-PAGE analysis, offering deeper insights into enzymatic activities and the prospective use of microbial-based waste management solutions.

Keywords: *Municipal waste, Biodegradability, Thermophilic bacteria, Bacterial consortia, Municipal waste management*

Morphological characterization of Oesophagostomum spp. from a goat intestine

Rashmi Mishra[1], Pashupathi M[2], Rajat Garg[1], Hira Ram[1]

[1]Division of Veterinary Parasitology, ICAR-Indian Veterinary Research Institute, Izatnagar, Uttar Pradesh-243122

[2]Division of Biochemistry, ICAR-Indian Veterinary Research Institute, Izatnagar, Uttar Pradesh-243122

E-mail: rashmi.mishra25996@gmail.com

Abstract

India's livestock sector is one of the largest in the world accounting for 26.40% goats and plays an important role in economy. The morbidity and mortality due to gastrointestinal nematodes in goats made them one of the most significant parasites in the world, causing huge economic loss for farmers.Oesophagostomosisis a neglected tropical zoonotic disease, which affects hundreds to millions of peoples worldwide. In the present study, an attempt was made to study the morphology of adult Oesophagostomumcolumbianum and O. asperumrecovered from large intestine of the goat in Bareilly, Uttar Pradesh. The intestinal sample was collected from a local slaughter housefor screening of gastrointestinal nematodes. Initially, the pathological lesions like nodules, cyst and haemorrhagic patches etc. were examined for the parasitic infection. The found worms that were attached to the intestinal mucosa and from the gut content were subjected for macroscopic and microscopic examination, and identified them as Oesophagostomum spp. based on length, breadth, buccal capsule with cephalic and cervical structures. Interestingly, two species of Oesophagostomumi.e. O. columbianum and O. asperum were found in the same sample. The male and female ofOesophagostomum species were also differentiated by examining the morphology of posterior ends,spicule and gubernacular length, position of the vulva and anus. This study reports the first caseof concurrent infection of O. columbianum and O. asperum in the Bareilly region of Uttar Pradesh.

Keywords: *Pimply gut; Oesophagostomum;faecal examination; spicule.*

Analysis Of Acidic Soil Attributes and Lime Requirement in Imphal West District,Manipur

[1]*Robert Wayembam, [2]Kholen singh, [3]Vivek Kamble, [4]Princy Thakur, [5]Meraj Ahmed

[1,2,3]Research Scholar, [4&5]Assistant Professor, Department of Soil Science and Agricultural Chemistry, Lovely Professional University, Phagwara, Jalandhar, Punjab, India

Corresponding author: Robertwayembam123@gmail.com

Abstract

Research conducted in Manipur's regions, including Wangoi, Yumnam huidrom, Mayang Imphal, Samurou, and Mutum phibou, focused on analyzing soil acidity and key nutrient levels. Soil samples from these regions exhibited acidity levels with pH values ranging from 5.1 to 6.3, indicating moderate to slight acidity. The CEC for examined surface area showed the value ? 21.12 Cmol(p+) kg-1 for mutum phibou is highest as compared to ? wangoi ? mayang Imphal ? samurou ? yumnam Huidrom is exhibited lower value 8.65 Cmol(p+) kg-1.. Organic carbon (OC) content was examined, has shown the result highest organic carbon value is ? 2.29 % in yumnam huidrom's subsurface region as compare with other region having less organic carbon content observed ? samurou ? mayang Imphal ? wangoi and mutum phibou sites. The study further explored the levels of available phosphorus and potassium, essential nutrients for plant growth. Wangoi exhibited the highest level of available phosphorus ? 24.54 kg ha-1, as compared to ? mutum phibou ? Samurou ? mayang Imphal ? Yumnam Huidrom's subsurface region is recorded the lowest available phosphorous content ? 13.78 kg ha-1. The highest concentration of available potassium is observed in mutum phibou's surface area, the concentration of available potassium is ? 172.03 kg ha-1, whereas available potassium is less in ? samurou ? yumnam huidrom ? mayang Imphal and lowest in wangoi's subsurface area ? 123.09 kg ha-1. Textural analysis of soil revealed variation among the sand, silt, and clay content, wangoi is having sand ? 36.50% as compared to other region and lowest sand content is observed is ? 19.37% in yumnam huidrom, while samurou's subsurface region having highest silt content ? 35.07%, lowest in wangoi ? 22.88%, clay content is highest in mutum phibou subsurface ? 45.90% and low in yumnam huidrom ? 36.67%. Overall, the study provides valuable insights into the soil characteristics and nutrient profiles of Manipur's regions, which are crucial for effective agricultural management and sustainable crop production. Is found in higher conc.

***Keyword**: Liming, Acid Soil, NPK*

Bio-Stimulants Derived from Medicinally and Nutritionally Important Plant Extracts Mitigate Drought Adversities in Zea mays through Enhanced Physiological, Biochemical, and Antioxidant Activities

Shiuly Bhowmick[1], Gauri Rai[1], Shashank Kumar Mishra[1], Nikita Bisht[1], Poonam C. Singh[1,2], Puneet Singh Chauhan[1,2]*

[1]CSIR-National Botanical Research Institute (CSIR-NBRI), Rana Pratap Marg, Lucknow, India

[2]Academy of Scientific and Innovative Research (AcSIR), Ghaziabad, India

Corresponding author: puneet@nbri.res.in; puneetnbri@gmail.com

Abstract

Maize crops face a significant challenge in the form of drought stress, a predominant abiotic factor that substantially impedes their growth, development, and overall yield. To overcome this problem, the focus is shifting towards utilization of organic plant growth ingredients aligns with the emphasis on eco-friendly farming practices. Therefore, the present study aimed to assess the influence of 30 botanical extracts on seed germination, seedling vigor, and subsequent maize plant growth under normal and water deficit conditions. Specifically, eight extracts showed significant enhancement in agronomical parameters (ranging from ?2%- ?183%) and photosynthetic pigments (ranging from ?21%- ?195%) of seedlings under drought condition. Extended tests on maize in a greenhouse setting confirmed that the application of six extracts viz Moringa oleifera leaf (MLE), bark (MBE), Terminalia arjuna leaf (ALE), bark (ABE), Aegel marmelos leaf (BLE), and Phyllanthus niruri leaf (AmLE) improved plant growth and drought tolerance, as evident in improved physio-biochemical parameters. GC-MS analysis of the selected extracts unveiled a total of 51 bioactive compounds, including sugars, sugar alcohols, organic acids, and amino acids, and might be playing pivotal roles in plant acclimatization to drought stress. In conclusion, MLE, MBE, BLE, and ABE extracts exhibit significant potential for enhancing seedling establishment and growth in maize under both normal and water deficit conditions.

Keywords: *Bio-stimulants; Abiotic stress; Plant growth promotion; Bioactive compounds; Biochemical activity.*

Exploring the Biodegradability Potential of Sporosarcina Bacterial Isolates from Municipal Waste Management for Sustainable Waste Treatment

Rajesh V M[1], Chandan Dharmashekar[1], Bhavana H H[2], Bhargav Shreevatsa K S[1], Chandan Shivamallu[1]*

[1].Department of Biotechnology and Bioinformatics, JSS Academy of Higher Education &Research, Mysuru.

[2].Department of Microbiology, JSS Academy of Higher Education &Research, Mysuru.

Corresponding Author: Chandan S; chandans@jssuni.edu.in

Abstract

The thermophilic bacterial consortiums obtained from municipal waste treatment facilities were studied. Its core objectives were to evaluate its potential for environmental remediation and its ability to degrade specific components within municipal waste. Additionally, the research aimed to understand the biofilm formation mechanisms these bacterial groups employ on the surface of municipal waste, emphasizing the critical role of biofilms in enhancing bacterial resistance and biodegradation in Municipal Solid Waste (MSW) applications. Thermophilic bacterial consortia have gained recognition as effective bioremediation agents due to their capability to transform pollutants into non-toxic or less toxic compounds. The study primarily aimed at identifying and characterizing novel thermophilic bacterial consortia proficient in degrading specific components of medical waste while investigating their biofilm-forming abilities. Advanced genomic techniques like polymerase chain reaction (PCR) and DNA sequencing were utilized to identify and categorize the isolated bacterial species, revealing genetic

characteristics, phylogenetic linkages, and biofilm-forming abilities of thermophilic bacteria. The research highlighted the significance of thermophilic bacterial consortia in the biodegradation of hospital waste. Through careful selection, isolation, molecular characterization, and studying biofilm formation, the study unveiled the potential of these consortia in waste management. This research forms a foundational framework for creating sustainable waste treatment technologies by integrating biofilm formation with SDS-PAGE analysis, offering deeper insights into enzymatic activities and the prospective use of microbial-based waste management solutions.

Keywords: *Municipal waste, Biodegradability, Thermophilic bacteria, Bacterialconsortia, Municipal waste management*

Occurrence of rust (Puccinia abrupta var. partheniicola)on Parthenium hysterophorusin Central plain zone of Uttar Pradesh, India

Siddharth Singh[1], Susmita Oraon[2], Dilip Kumar Chaurasiya[3, 4]

[1]Department of Plant Pathology, C. S. Azad University of Agriculture and Technology, Kanpur-208002, Uttar Pradesh, India.

[2]Department of Plant Pathology, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur- 741252, West Bengal, India.

[3]Faculty of Agriculture Sciences, Institute of Applied Science and Humanities, GLA University, Mathura- 281406, Uttar Pradesh, India.

****Corresponding Author: siddharthsinghbckv@gmail.com***

Abstract

Partheniumhysterophorusis an exotic invasive weed that originated in South America, has been accidentally introduced into several countries including India, Pakistan, Nepal, etc.This weed has gained prominence due to its negative effects not only on agriculture and the environment but its harm to human health via airborne pollen and animal health primarily through ingestion. In the year 2023,this weed was found naturally infected with rust fungi in different location, including roadsides, wastelands and agricultural fields of Kanpurand Raebareli district of Uttar Pradesh. It commonly known as winter rust caused by Puccinia abrupta var. partheniicola, which is a macrocyclic and autoecious species. The fungus produces numerous brown pustules (Uredinia)full of uredosporeson upper surface of leaves and on stem.Uredosporeswere brown, thick walled,cuneate shaped and echinulate. Telial stages was not observed. In advanced stage the infected leaves become twisted and dried up causing burning appearance of severely infected plants. The disease can limit vegetative growth in young plants, as well as seed production in mature plants.Therefore, the rust has the potential to reduce the growth and development of P. hysterophorus and can be used as part of integrated management of Parthenium weed by introducing to other areas.

Keywords: *Noxious invasive weed, Fungi, Plant pathogen, Biological control*

Study Of Hematological Profile of Three Schizothorax Species Found In Himalayan Streams

Siddiqui U[1]*, Rani A[2], Bisht H.C.S.[1], Pandey N.N.[3]

[1].D.S.B campus Kumaun University, Nainital, Uttarakhand-263001

[2].Faculty of Fishery Sciences, West Bengal University of Animal and Fishery Sciences, Kolkata-700094

[3].ICAR- Directorate of Coldwater Fisheries Research, Bhimtal, Uttarakhand -263136

Email: dr.uzmas17@gmail.com

Abstract

Assessing hematological parameters offers a comprehensive evaluation of thehealth condition of fish. The present study evaluated the variations in hematological parameters, including total erythrocyte count (TEC), total leukocyte count (TLC), hemoglobin (Hb), hematocrit (Hct), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), and mean corpuscular hemoglobin concentration (MCHC), in three species of Schizothorax fish (S.richardsonii, S. plagiostomus, and S. progastus). The hematocrict values of the three species differed significantly (S. richardsonii 25.5±2.3 has the lowest hematocrit value compared to S.progastus 27.5±2.6 and S. plagiostomus 29±4.6). S. plagiostomus had considerably greater hemoglobin (Hb) and red blood cell count (RBC) levels compared to S. richardsonii and S.progastus. The results revealed significant (P<0.05) variations among the three species. The MCHC value ranged between 34.1%, 35.0%, and 35.9% indicating an insignificant (P > 0.05) difference. Therefore, the baseline data produced during this study can be efficiently utilised to monitor the health condition of coldwater fishes in order to preserve them sustainably in aquatic systems under the scenario of climate change.

Keywords: *Coldwater fishes, S. richardsonii, S. plagiostomus, S. progastus, Health status, Hematological parameters*

Evaluation of different insecticide molecules against wireworm under both greenhouse and field condition in Sugarcane

T. Anandmurthy[1]*, P.S. Tippannavar[2], C.P. Mallapur[3] and Divyashree H.J.,[4]

[1]Senior research fellow, Department of Agricultural Entomology,

College of Agriculture, UAS, Bengaluru (Karnataka), India.

[2]Professor (Entomology), MARS, UAS, Dharwad, (Karnataka), India.

[3]Professor (Entomology), Department of Agricultural. Entomology, UAS, Dharwad (Karnataka), India.

[4]Block technology manager, Department of Agriculture (ATMA) Mysuru (Karnataka), India.

(Corresponding author: T. Anandmurthy*)

(email: anandmurthyt28@gmail.com)

Abstract

An investigation was conducted to evaluate the efficacy of different insecticide molecules against wireworm in sugarcane ecosystem. Among the various insecticide molecules tested under greenhouse conditions, Imidacloprid 40% + Fipronil 40% WG, Chlorantraniliprole 0.4 GR, Fipronil 0.3 GR, and Fipronil 5 SC exhibited 100 per cent mortality of wireworms and suppressed grub population, resulting in germination of all setts. This indicating their promise in controlling the wireworm infestations. Similarly, Field trials in sugarcane fields further confirmed the effectiveness of Imidacloprid 40% + Fipronil 40% WG was superior to other treatments, resulting in the highest percentage of germination, the lowest number of infested seedlings, and the fewest grubs per plot. The next best treatments were Chlorantraniliprole 0.4 GR and Fipronil 0.3 GR, which were statistically on par with each other.

Keywords: *Wireworm, sugarcane, percentage of germination and infested seedlings*

Paenibacilluslentimorbus modulates root system architecture, auxin signalling, and metabolic pathways for nutrient stress management in Zea mays

Tanya Singh[1,2], Puneet Singh Chauhan[1,2]*

[1]CSIR-National Botanical Research Institute (CSIR-NBRI), Rana Pratap Marg, Lucknow-226001, India

[2]Academy of Scientific and Innovative Research (AcSIR), Ghaziabad-201002, India

Corresponding author email: puneet@nbri.res.in; puneetnbri@gmail.com

Abstract

The global arable land is currently facing a shortage of essential nutrients, resulting in diminished crop productivity. We conducted a study to test the efficacy of plant growth-promoting rhizobacteria (PGPR), specifically Pseudomonas putida, Paenibacilluslentimorbus, and their consortium, in promoting the growth of maize (Zea mays) under nutrient-deficient conditions. The inoculation of PGPR enhanced the overall health of plants grown in nutrient-deficient conditions. The inoculation has led to significant improvements in the root system architecture and induced changes in root cortical aerenchyma. Out of all the inoculated bacteria strains, P. lentimorbus inoculated plants performed the best in terms of plant growth and physiological parameters, when compared to P. putida, consortium, and uninoculated control. Expression of auxin signaling genes and root hair development genes improved nutrient acquisition and tolerance to nutrient-deficient conditions in P. lentimorbus inoculated maize plants. In addition, the results from GC-MS analysis have shown that the interaction between maize roots and P. lentimorbus under nutrient-deficient conditions involves metabolites such as carbohydrates and organic acids. These findings confirm that P. lentimorbus can improve overall plant growth by regulating the root system of maize, thus providing increased tolerance to nutrient-deficient conditions.

Keywords: *Nutrient deficiency, GC-MS, Root structure, Gene expression*

Impact of Climate and Land Use/Land Cover Change on the Ecosystem Services: A Case Study of Dimbhe Reservoir Ecosystem

Dave Chandani Prakashbhai[1],Vinod Kumar Yadav[1]*, Liton Paul[1], Arpita Sharma[1], G. Kantharajan[2], Ranadheer Mandadi[3]

[1].Fisheries Economics, Extension & Statistics Division (FEESD), ICAR-Central Institute of Fisheries Education, Mumbai-400061

[2]. ICAR-NBFGR, Lucknow

[3]. Asian Institute of Technology(AIT), Thailand

corresponding author- vinodkumar@cife.edu.in

Abstract

"Ecosystem" is a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit. It consists of flows of materials, energy, and information from natural capital stocks which combine with manufactured and human capital services to produce human welfare. Climate change and changes in local land use land cover are two of the most important drivers that are affecting ecosystem services. To assess the environmental cost and benefits of the LULCC and Climate change, it is necessary to measure the impact of same on various ecosystem.The study has been conducted to understand the impact of climate and land use/land cover change on the Dimbhe reservoir ecosystem. To understand the pattern of the future changes in climate trend in selected important climatic variables has been assessed and processed using Ferret software under the two RCP scenarios, i.e., RCP 4.5 and RCP 8.5. Past 21 years Landsat images has been selected from 2002 to 2022 to estimate the temporal land use/land cover change in Dimbhe reservoir ecosystem. Supervised classification was carried out using the Random Forest (RF),SVM(Support Vector Machine) and Classification and regression Tree(CART) model using Google earth engine, while ArcGIS desktop software was used for mapping to evaluate theLULC changes.To estimate the impact of climate change and land use/land cover on ecosystem services the correlation between five climatic variables with each ecosystem service has been assessed. The valuation of the ecosystem services has been done based on the benefit transfer method. There were strong correlations between ecosystem valuation and fluctuations in important climatic parameters like temperature and precipitation. Also the Integrated Valuation of Ecosystem Services Tradeoffs (InVEST) model were used to estimate the sediment delivery ratio for Dimbhe Reservoir Ecosystem to understand the changes in soil retention capacity which is one of the most important regularity services. From the trend analysis it was found that mean maximum and minimum temperatures had increased and will increase with the significant trend in future also. Precipitation, Wind speed and humidity has not shown any significant trend in any of the future scenarios.Study has conformed significant increase in agriculture, settlement and Dense Forest, whereas barren land and open forest has declined. Waterbody has shown very less change. Total Ecosystem Services valuation has shown increase of three percentage in 2022 compare with 2002.

Keywords: *Dimbhe Reservoir, climate change, Land use change, Ecosystem services*

Exploring soil fertility dynamics in Kapurthala- Phagwara (Punjab)

[1]*Vivek Kamble, [2]Vasanthapu Mahesh, [3]Robert Wayembam, [4]Princy Thakur, [5]Meraj Ahmed

[1,2,3]Research Scholar, [4&5]Assistant Professor, Department of Soil Science and Agricultural Chemistry, Lovely Professional University, Phagwara, Jalandhar, Punjab, India

Corresponding author: kamblevivek635@gmail.com

Abstract

The Punjab region of India holds significant agricultural importance, earning the moniker "Granary of India" for its substantial wheat production, ranking as the country's second-largest producer. Its geographical location, bordered by the Himalayan range to the north and the Thar Desert to the south and southwest, profoundly influences its climate and agricultural practices. An overview of Punjab's soil composition reveals distinct characteristics across its different regions. In the eastern part, soils tend to be loamy to clayey in texture, offering favorable conditions for cultivation. Conversely, southwestern Punjab is dominated by calcareous soil types, including desert and sierozem soils, grey, red desert soils, calsisol soils, regosolsoils, and alluvial soils. Meanwhile, central Punjab exhibits a range of soil types from sandy loam to clay, with pH levels spanning from 7.6 to 8.7, presenting challenges related to alkalinity and salinity. Examining specific districts such as Kapurthala and Phagwara, soil pH levels vary between 6.34 to 8.24, with the majority maintaining a neutral pH. This variation underscores the diverse soil profiles within the region, each influencing agricultural productivity differently. A critical aspect of Punjab's soil health is its organic carbon content, which plays a vital role in supporting crop growth. Organic carbon levels range from 0.44% to 1.22%, with an average of 0.71%. While a considerable portion of the region, approximately 7.43%, exhibits low carbon content, about 35.03% falls within moderate levels. This distribution highlights the importance of soil management practices to enhance organic carbon content and improve overall soil fertility. In conclusion, Punjab's agricultural landscape is shaped by its diverse soil composition and climatic conditions. Despite challenges such as alkalinity, salinity, and varying organic carbon levels, the region remains a key contributor to India's agricultural output, particularly in wheat production. Understanding the nuances of Punjab's soils is essential for sustainable agricultural practices and ensuring continued productivity in the "Granary of India."

Keyword: *Soil fertility, NPK, Soil types and Climatic condition*

Faculty of Agriculture & Agroforestry, Kumaun University,
Nainital Uttarakhand, India
(www.kunainital.ac.in)

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