

International Conference
on
**AGRICULTURE SCIENCE AND TECHNOLOGY:
CHALLENGES AND PROSPECTS (AST-2022)**

6-8 May, 2022

**Rani Lakshmi Bai Central Agricultural University
Jhansi, U.P.**

Organized jointly by



Rani Lakshmi Bai
Central Agricultural University
Jhansi, UP



National Environmental
Science Academy (NESA)
New Delhi



ICAR-Indian Grassland and
Fodder Research Institute
Jhansi, UP



ICAR-Central Agroforestry
Research Institute
Jhansi, U.P.

Souvenir & Abstracts

In Association with



Bundelkhand University
Jhansi



Central Ayurveda
Research Institute
Jhansi



Indian Society of
Agroforestry
Jhansi, U.P.



U.P. Council of
Agricultural Research
Lucknow



Range Management
Society of India
Jhansi, U.P.



ICAR-National Agricultural
Higher Education Project
Delhi



The Society for Science of
Climate Change and
Sustainable Environment | SSCE, Delhi



Society for Plant and
Agricultural Sciences
Pune



Jan Parivartan Sansthan
Gwalior

Sponsored by



India lives in its villages

- Mahatma Gandhi



“ Powering rural India,
Empowering the masses ”



Development Bank of the Nation for Fostering Rural Prosperity

www.nabard.org



/nabardonline

नरेन्द्र सिंह तोमर
NARENDRA SINGH TOMAR



कृषि एवं किसान कल्याण मंत्री
भारत सरकार
कृषि भवन, नई दिल्ली
MINISTER OF AGRICULTURE & FARMERS WELFARE
GOVERNMENT OF INDIA
KRISHI BHAWAN, NEW DELHI

D.O. No...../AM/R/2022

दिनांक..... / 04 / 2022

Message



यह जानकर बहुत खुशी हो रही है कि राष्ट्रीय पर्यावरण विज्ञान अकादमी (एनईएसए) नई दिल्ली और रानी लक्ष्मी बाई केन्द्रीय कृषि विश्वविद्यालय, झाँसी द्वारा संयुक्त रूप से एक अंतराष्ट्रीय सम्मेलन Agriculture Science and Technology: Challenges and Prospects (AST-2022) को 6 मई से 8 मई, 2022 तक आयोजित किया जा रहा है। आयोजित करने में भाकृअनुप-भारतीय चरागाह और चारा अनुसंधान संस्थान झाँसी, भाकृअनुप-केन्द्रीय कृषि वानिकी अनुसंधान संस्थान झाँसी, बुन्देलखण्ड विश्वविद्यालय झाँसी और केन्द्रीय आयुर्वेद अनुसंधान संस्थान झाँसी भी शामिल हैं।

मुझे विश्वास है कि सम्मेलन विशेष रूप से बुन्देलखण्ड क्षेत्र के लिए एकीकृत तरीके से कृषि अनुसंधान, शिक्षा और विस्तार को बढ़ावा देने के लिए उपयुक्त सिफारिशें लाएगा। इस अवसर पर मैं सम्मेलन के आयोजकों को बधाई देता हूँ, एवं कार्यक्रम के सफलता के लिए शुभकानाएं देता हूँ।

(नरेन्द्र सिंह तोमर)



डॉ अरविन्द कुमार
कुलपति
Dr Arvind Kumar
Vice-Chancellor

रानी लक्ष्मी बाई केन्द्रीय कृषि विश्वविद्यालय
ग्वालियर रोड, झांसी 284 003 (उत्तर प्रदेश) भारत
Rani Lakshmi Bai Central Agricultural University
Gwalior Road, Jhansi 284 003 (U.P.) India

Phone : 0510-2730777
E-mail : vcrlbcau@gmail.com
Website : www.rlbcau.ac.in

F.No.:- 98/RLBCAU(VC)/2022

Dated:- 04/05/2022

Message



I am pleased to share that an International Conference on “**Agriculture Science and Technology: Challenges and Prospects (AST-2022)**” is being jointly organized by National Environmental Science Academy (NESA), New Delhi, Rani Lakshmi Bai Central Agricultural University, Jhansi, ICAR-Indian Grassland and Fodder Research Institute, ICAR-Central Agroforestry Research Institute, Bundelkhand University, Jhansi and Central Ayurveda Research Institute, Jhansi from 6-8th May, 2022 at RLBCAU, Jhansi, Uttar Pradesh.

It will create a suitable forum to the eminent scholars to discuss, interact and give impetus to research and extension activities in Bundelkhand Region. In this event, key issues will be discussed which are directly associated with the current trends in agriculture science and technology dealing with challenges and prospects for food security and climate resilient agriculture prevailing in the country.

I hereby convey my heart-felt greetings to the organizers of the conference and a grand success of the function.

(Arvind Kumar)



Message



MESSAGE FROM THE DESK OF VICE CHANCELLOR

It is a matter of pride that National Environmental Science Academy is organizing International Conference on Agriculture Science and Technology : Challenges and Prospects (AST-2022) in collaboration with Bundelkhand University, Jhansi during 6 - 8 May, 2022.

Agriculture has been the soul and basis of human existence since emancipation of mankind. Especially India which lives in its villages and fields. In view of the current trends and challenges being faced by the country due to mounting pressures on natural resources and climate change such type of activities and discussions can contribute to more efficient resource use and better performance by agriculture sector.

There is an emergent need for transformative change in agriculture to address the key challenges and make agriculture systems more sustainable. The challenges are uneven demographic expansion, the threats posed by climate change, the intensification of natural disasters and upsurges in transboundary pests and diseases, and the need to adjust to major changes taking place at global level.

The challenges can be resolved by the integration of all suitable techniques, from sowing to harvesting, packaging, transportation, and advanced technologies available for farmers throughout the cropping system.

We hope the conference shall provide a strong and wide platform for chalking out essential tools for sustainable agriculture and sustainable development.

My best wishes for the grand success of the Conference !


20/4/22
Prof. Mukesh Pandey



राजमाता विजयाराजे सिंधिया कृषि विश्वविद्यालय
राजा पंचम सिंह मार्ग, ग्वालियर (म.प्र.) – 474002
Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya,
Raja Pancham Singh Marg, Gwalior (M.P.) – 474 002
(An ISO Certified 9001:2008)

प्रो. एस. के. राव
कुलपति
Prof. S. K. Rao
Vice-Chancellor

Tel: 0751 – 2970502, Fax: 0751 – 2970504, E-mail: vcervsaugwa@mp.gov.in/vcervskvvgwl@gmail.com

No./VC/2022/182
Date: 04/05/2022

Message



I am pleased to know that an International Conference on “**Agriculture Science and Technology: Challenges and Prospects (AST-2022)**” is being jointly organized by National Environmental Science Academy (NESA), New Delhi, Rani Lakshmi Bai Central Agricultural University, Jhansi, ICAR-Indian Grassland and Fodder Research Institute, ICAR-Central Agroforestry Research Institute, Bundelkhand University, Jhansi and Central Ayurveda Research Institute, Jhansi from 6-8th May, 2022 at RLBCAU, Jhansi, Uttar Pradesh.

It is the need of hour that eminent scholars from diverse background come on a single platform to discuss developmental activities in Bundelkhand Region. In this event, important points will be discussed which are directly associated with the current trends in agriculture science and technology dealing with challenges and prospects for food security and climate resilient agriculture prevailing in the country.

I convey my best wishes to the organizers of the event for a grand success.

S. K. Rao
(S. K. Rao)



प्रो.(वैद्य) रबिनारायण आचार्य
महानिदेशक
Prof.(Vaidya) Rabinarayan Acharya
Director General

केन्द्रीय आयुर्वेदीय विज्ञान अनुसंधान परिषद्
आयुष मंत्रालय, भारत सरकार
CENTRAL COUNCIL FOR RESEARCH IN AYURVEDIC SCIENCES
Ministry of Ayush, Govt. of India

Date: 02.05.2022

Message



It is a matter of great satisfaction that the three day International conference on "Agriculture science and Technology: Challenges and Prospects (AST-2022) from 6-8 May 2022 is being organized at Jhansi. I am confident that the event will succeed to explore the immense possibilities in agriculture in present times. It will be a great platform for academicians, researchers, scholars, industry people and various stakeholders of agriculture field.

I am happy to learn that the event is being organized jointly by the Rani Laxmibai Central Agricultural University, Jhansi; National Environmental Science Academy (NESA), New Delhi; ICAR-Indian Grassland and Fodder research Institute, Jhansi; and ICAR-Central Agroforestry Research Institute, Jhansi. We are very excited to be associated with in this event along with these organizations.

I hope this international conference will prove to be a platform for thinkers with new and enthusiastic ideas. Furthermore, such events are critical to enhance the understanding of the community of multidisciplinary scientists and scholars about the current trends in Agriculture Science and Industry. It will surely motivate youngsters, researchers and academicians of our country with novel ideas and encourage them to come forward and do something for our Country.

I wish the organizing committee a grand success and I am confident that this program will help the participants and public to discover the sense of oneness with ourselves, the world and nature.

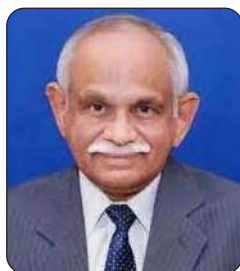
(Prof. Vd. Rabinarayan Acharya)



National Academy of Agricultural Sciences

Dr. A.K. Singh
Vice President

Message



I am happy to learn that an International Conference on “**Agriculture Science and Technology: Challenges and Prospects (AST-2022)**” is being jointly organized by National Environmental Science Academy (NESA), New Delhi, Rani Lakshmi Bai Central Agricultural University, Jhansi, ICAR-Indian Grassland and Fodder Research Institute, ICAR-Central Agroforestry Research Institute, Bundelkhand University, Jhansi and Central Ayurveda Research Institute, Jhansi from 6-8th May, 2022 at RLBCAU, Jhansi, Uttar Pradesh.

The Organizers have taken a very commendable initiative to bring policy makers, scientists, scholars and other stakeholders from diverse backgrounds on a single platform to deliberate, interact and provide their valuable inputs for research and extension activities that must be carried out in the foreseeable future. I hope that in this International Conference important issues concerned with current trends in agriculture and adoption of technologies to increase food, nutrition and environmental security and development of climate resilient crops will be discussed threadbare and an action plan prepared for the benefit of all concerned.

I convey my best wishes to the organizers of this conference for its grand success.

(Anil K. Singh)

डॉ. बी. आर. अम्बेडकर सामाजिक विज्ञान विश्वविद्यालय
Dr. B. R. Ambedkar University of Social Sciences
(State University, Government of M.P.)

प्रो. दिनेश शर्मा

कुलपति

Prof. Dinesh Sharma
Vice Chancellor



Phone (O) : 07324-273186
Fax : 07324-273645
E-mail : brauss2020@gmail.com
Website : www.brauss.in

Message



I am very glad to learn that National Environmental Science Academy (NESA) is organising an International Conference on **Agricultural Science and Technology: Challenges and Prospects (AST-2022)** during 6-7 May 2022 in collaboration with Rani Laxmi Bai Central Agricultural University, Jhansi, ICAR-Indian Grassland and Fodder Research Institute and ICAR-Central Agroforestry Research Institute, Jhansi.

A key challenge for the agriculture sector is to feed an increasing global population, while at the same time reducing the environmental impact and preserving natural resources for future generations. Agriculture can have significant impacts on the environment. While negative impacts are serious, and can include pollution and degradation of soil, water, and air, agriculture can also positively impact the environment, for instance by trapping greenhouse gases within crops and soils, or mitigating flood risks through the adoption of certain farming practices.

Such problems can be solved with the best use of agricultural land and resources, implementation of integrated agricultural policies for generating agricultural employment opportunities, reducing risk in agriculture, developing agricultural infrastructure and improving quality of rural life.

I hope that fruitful deliberations and discussions will be held during the International Conference to address the prevailing problems and challenges in the agricultural sector.

I wish grand success of the International Conference.

(Prof. D.K. Sharma)



केन्द्रीय कृषिवानिकी अनुसंधान संस्थान
पहुज बाँध के सामने, झाँसी-ग्वालियर मार्ग, झाँसी 284003 (उ० प्र०)
Central Agroforestry Research Institute
Opposite Pahuji Dam, Gwalior Road, Jhansi 284003, Uttar Pradesh



डा. अ. अरुणाचलम / Dr. A. Arunachalam

नादेशक / Director

Message



Indian agriculture has witnessed spectacular advances in production and productivity of food grains, oilseeds, commercial crops, fruit, vegetables, poultry, dairy, and fisheries. This could be possible only through developing appropriate management practices, besides the improved varieties. The benefits of this increment in agriculture and allied sectors are visible in form of buffer stocks of the country, better access to food and increasing per capita food availability and enhanced food and nutritional security. However, with the changing global scenario of trade and climate change on our resources, we need to consistently address the second-generation problems and find solution to achieve sustainable development in agriculture and allied sectors.

In this direction, the International Conference on Agriculture Science and Technology: Challenges and Prospects is a timely endeavor to carve out the futuristic solutions that are economically viable and farmers' friendly too. As also a partner in the organizing of this conference, we anticipate a declaration at the end of the conference that could be prescribed to the developmental agencies.

I wish the Conference a great success.

Place: Jhansi

Date: 4-5-2022

(A. Arunachalam)



भा.कृ.अनु.प.-भारतीय चरागाह एवं चारा अनुसंधान संस्थान ICAR-Indian Grassland and Fodder Research Institute

डॉ. अमरेश चन्द्रा एफएनएएएस
निदेशक

Dr. Amaresh Chandra FNAAS
Director

Message



I am happy to learn that an International Conference on “**Agriculture Science and Technology: Challenges and Prospects (AST-2022)**” is being jointly organized by National Environmental Science Academy (NESA), New Delhi, Rani Lakshmi Bai Central Agricultural University, Jhansi, ICAR-Indian Grassland and Fodder Research Institute, ICAR-Central Agroforestry Research Institute, Bundelkhand University, Jhansi and Central Ayurveda Research Institute, Jhansi from 6-8th May, 2022 at RLBCAU, Jhansi, Uttar Pradesh.

It will be a platform to discuss and interact on research and extension activities in Bundelkhand Region by the researchers and scholars. The matters pertaining to agriculture science and technology which deal with challenges and prospects in food security will be discussed.

I hereby convey my best wishes to the organizers of the conference and a grand success of the function.

(Amaresh Chandra)

निकट पहूज बाँध, ग्वालियर मार्ग, झाँसी-284 003 (उत्तर प्रदेश) भारत/
Near Pahuj Dam, Gwalior Road, Jhansi-284 003 (Uttar Pradesh) India

Ph: +91-510-2730214; Fax: +91-510-2730364; Email: director.cafri@icar.gov.in; website: www.cafri.res.in
Facebook: @icarcafri.jhansi; Twitter: @ICARCAFRI; Instagram: @icar.cafri; LinkedIn: @ICAR-CAFRI JHANSI



National Environmental Science Academy

(Registered Under Society Act XXI of 1860)

206, Raj Tower - I, Alaknanda Community Centre, New Delhi-110 019
Phone: 011-2602 3614 (O) • E-mail: infonesa88@gmail.com; nesapublications@gmail.com

Prof. Javed Ahmad

President

NATIONAL ENVIRONMENTAL SCIENCE ACADEMY

206, Raj Tower-I, Alaknanda Comm. Centre, New Delhi

Former Dean, Faculty of Science
Jamia Hamdard, New Delhi

Message



It is a great moment to inform that National Environmental Science Academy (NESA), New Delhi is jointly organizing an International Conference on **“Agriculture Science and Technology: Challenges and Prospects (AST-2022)”** with Rani Lakshmi Bai Central Agricultural University, Jhansi, ICAR-Indian Grassland and Fodder Research Institute, ICAR-Central Agroforestry Research Institute, Bundelkhand University, Jhansi and Central Ayurveda Research Institute, Jhansi from 6-8th May, 2022 at RLBCAU, Jhansi, Uttar Pradesh.

The academy is involved in such awareness programs round the year. This will bring think tank from diverse background on a single platform to discuss key issues associated with the current trends in agriculture science and technology. The research and extension activities will be discussed with respect to challenges and their solutions for food security in Bundelkhand Region.

I convey my best wishes and a grand success to the International Conference.

With best regards

(Javed Ahmad)

Organizing Committee

Chief Patron

Dr. T. Mohapatra, Secretary DARE & DG ICAR, New Delhi, India

Patron

Dr. Arvind Kumar, Vice Chancellor, RLBCAU, Jhansi

Dr. Mukesh Pandey, Vice Chancellor, Bundelkhand University, Jhansi

Dr. Rabinarayan Acharya, DG, CCRAS, New Delhi

Dr. A. Arunachalam, Director, ICAR-CAFRI, Jhansi

Dr. A. Chandra, Director, ICAR-IGFRI, Jhansi

Dr. Javed Ahmad, President, NESI, New Delhi

National Speakers

Dr. S. K. Chaudhari

Dr. K. V. Prabhu

Dr. R. C. Agarwal

Dr. N. K. Singh

Dr. Rajeev Varshney

Dr. K. C. Bansal

Dr. A. K. Joshi

Dr. A. K. Singh

Dr. Prabhat Kumar

Dr. Ashok K. Singh

Dr. G. P. Singh

Dr. Anil K. Singh

Dr. Ashutosh Sarkar

Dr. V. S. Tomar

Dr. S. K. Rao

Dr. Sanjay Singh

Dr. D. K. Yadav

Dr. R. P. Singh

Dr. Ch. Srinivasa Rao

Dr. S. S. Singh

Dr. R.K. Singh

Dr. A. K. Pandey

Dr. S. K. Chaturvedi

Dr. A.K. Roy

Dr. P. M. Gaur

Dr. Sanjay Kumar

Dr. H. Pathak

Dr. M.C. Sharma

Dr. Anil Kumar

Dr. J.P. Mishra

Dr. V.K. Singh

Dr. Sharad Tiwari

Dr. Shailesh Tripathi

Dr Swarup K. Parida

Dr. Bhupinder Singh

Dr. G. Babu

International Speakers

Dr. Henry Nguyen, Missouri University, USA

Dr. K. Siddique, The University of Western Australia, Australia

Dr. Francois, Laval University, Canada

Dr. Umesh Kumar Reddy, West Virginia State University, USA

Dr. T. Bunyamin, University of Saskatchewan, Canada

Dr. Lee Hickey, The University of Queensland, Brisbane, Australia

Dr. Gunwant Patil, Texas University, USA

Dr. Sayantan Mitra, California, USA

Dr. S. K. Basu, Letherberg, Canada

Dr. Jitesh Kumar, University of Minnesota, USA

Scientific Committee

Dr. Inder Dev, ICAR-CAFRI, Jhansi

Dr. A. K. Handa, ICAR-CAFRI, Jhansi

Dr. Sunil Kumar Tiwari, ICAR-IGFRI, Jhansi

Dr. Ishwar Singh, Krishi Bhawan, New Delhi

Dr Putan Singh, ICAR-IVRI, Izatnagar

Dr. Ashok Ahuja, Retd. Scientist F, CSIR-IIIM, Jammu

Dr. V. K. Yadav, ICAR-IGFRI, Jhansi

Dr. R. V. Kumar, ICAR-IGFRI, Jhansi

Dr. C. Bhardwaj, ICAR-IARI, New Delhi

Dr. A. Talukdar, ICAR-IARI, New Delhi

Dr. S. V. Saiprasad, IIRR, Hyderabad

Dr. Vandana Rai, ICAR-NIPB, Pusa Campus, New Delhi

Dr. S. L. Krishnamurthy, ICAR-CSSRI, Karnal

Dr. S. R. Kantwa, ICAR-IGFRI, Jhansi

Dr. M. J. Dobriyal, RLBCAU, Jhansi

Dr. Yogeshwar Singh, RLBCAU, Jhansi

Dr. P. P. Jambhulkar, RLBCAU, Jhansi
Dr. Gaurav Sharma, RLBCAU, Jhansi
Dr. R. P. Yadav, RLBCAU, Jhansi
Dr. Rishi Saxena, Bundelkhand University, Jhansi
Dr. Sandip Kumar Bera, ICAR-DGR, Junagarh, Gujarat
Dr. Tarun Kumar Thakur, IGNTU, Amarkantak, M.P.
Dr. M. K. Tripathi, RVSKVV, Gwalior
Dr. Sushma Tiwari, RVSKVV, Gwalior
Dr. Shailendra Sinha, ICAR-IGFRI, Jhansi
Dr. Rupesh Deshmukh, NABI, Mohali
Dr. Bhojaraja Naik K., Reg. Center of ICAR-IISSR, GKVK Campus, Bangalore
Dr. Gaurav Saxena, Shoolini University, Solan, H.P.
Dr. R.K. Maheshwari, Jaipur, Rajasthan
Dr. Lalit Mohan, Dayalbagh Educational Institute (Deemed University) Dayalbagh, Agra (UP)

Convener

Dr. Syed Shabih Hassan, GADVASU, PAU Campus, Ludhiana, Punjab

Organizing Secretary

Dr. Shakeel Ahmad Khan, ICAR-IARI, New Delhi

Co-Organizing Secretary

Dr. R.S. Tomar, RLBCAU, Jhansi, U.P.

Coordination

Dr. Mukesh Srivastava, RLBCAU, Jhansi

**INTERNATIONAL CONFERENCE
6-8 MAY, 2022 (AST2022_JHANSI)**

1	Technical Program	Dr AK Handa (CAFRI) 9415179658	Dr Rishi Saxena (Bundelkhand Univ.)
		Dr Inder dev (CAFRI)	Dr Yogeshwar Singh (RLBCAU)
		Dr Vijay Yadav (IGFRI)	Dr Meenakshi (RLBCAU)
		Dr M. J. Dobriyal (RLBCAU)	Dr KK Dwivedi (IGFRI)
		Dr P.P. Jambhulkar (RLBCAU)	Dr RS Tomar(RLBCAU)
2	Publication	Dr SR Kantwa (IGFRI) 7985298681	Dr Gaurav Sharma (RLBCAU)
		Dr Maharishi Tomar (IGFRI)	Dr RP Yadav (RLBCAU)
		Dr Reetu Verma (IGFRI)	Dr Maneet Rana (IGFRI)
		Dr Prabha Singh (IGFRI)	Dr RS Tomar (RLBCAU)
3	Transport	Dr CS Sahai (IGFRI) 9415945695	Dr Govind Vishwakarma (RLBCAU)
		Dr Anshuman Singh (RLBCAU)	Dr Pankaj Lavania (RLBCAU)
		Dr Ashok Kumar Yadav (CAFRI)	Dr Rajiv Nandan (RLBCAU)
		Dr Susheel Kumar (CAFRI)	Dr Pramod Soni (RLBCAU)
4	Accommodation	Dr Avinash Chandra (IGFRI) 9454863146	Dr Ajay Pandey (CAFRI)
		Mr Akhand (RLBCAU)	Dr Gunjan Guleria (RLBCAU)
		Mr Aay (RLBCAU)	Dr Vaibhav Singh (RLBCAU)
		Mr Shailendra (RLBCAU)	Mr Narender(RLBCAU)
5	Food & Logistics	Dr Susheel Singh (RLBCAU) 9451716185	Dr Arjun Ola (RLBCAU)
		Dr Ashutosh Singh (RLBCAU)	Shri Birender Tomar (CAFRI)
		Dr Vinod (RLBCAU)	Mr Rajveer(RLBCAU)
		Mr Shrawan Kumar Ola	Mr Prince(RLBCAU)

6	Stage Decoration/ Hall Management	Shri P. K. Karpe (IGFRI) 9451168756 Dr J. B. Singh (IGFRI)	Dr Asaram(CAFRI) (CAFRI) Mr Rajesh Shrivastav (CAFRI)
		Dr Ravi Praksh Saini (IGFRI)	Dr Alka Jain(RLBCAU)
		Dr HS Mahesha (IGFRI)	Dr Garima (RLBCAU)
		Dr Pawan Kumar(RLBCAU)	Dr Y. Bijilaxmi
		Dr Shubha Trivedi (RLBCAU)	Dr Priyanka Sharma (RLBCAU)
		Ms. Sakshi Jain(RLBCAU)	Dr Priyanka (RLBCAU)
7	Publicity and Extension	Dr Purshottam Sharma (IGFRI) 8299085947 Dr Ashutosh Sharma (RLBCAU)	Shri Arvind Chaturvedi Dr Sanjeev Kumar (RLBCAU)
8	Registration Committee	Dr Umesh Pankaj (RLBCAU) 7905052295 Dr Shashi kumar (IGFRI) Mrs Girija Chaudhary (RLBCAU) Mrs Ritu Gaur(RLBCAU) Mr Bharath (RLBCAU) Ms Muskan (BU)	Dr Hirdayesh Anuragi(CAFRI) Mr Shubham (RLBCAU) Mrs Priyanshi (RLBCAU) Mr Shubham Jha (BU) Mr Neeraj (RLBCAU) Mr Shubham (BU)
9	Awards/Memento	Shri Shailendra Sinha (IGFRI) 9696483625 Mr Gyan Kashyap (NESA)	Dr Ashutosh Kumar (RLBCAU) Mr Rakesh Kumar (NESA)
10	Online facility	Dr Tanuj Mishra (RLBCAU) 7275278801	Dr Shailendra Kumar (RLBCAU)
11	Co-ordination	Dr Mukesh Shrivastav (RLBCAU) 9839818899 Dr SR Kantwa (IGFRI) Dr Avinash Chandra (IGFRI) Dr RS Tomar (RLBCAU) 8588971128 Shri Shailendra Sinha (IGFRI)	Dr AK Handa (CAFRI) Dr CS Sahai (IGFRI) Dr JB Singh (IGFRI) Dr Shakeel Khan(NESA) Shri Gian Kashyap (NESA)

**International Conference
on
AGRICULTURE SCIENCE AND TECHNOLOGY:
CHALLENGES AND PROSPECTS (AST-2022)**

**6-8 May, 2022
ICAR-IGFRI, Jhansi**

Contents

Sl. No.	Title & Author of the Abstract	Page No.
1.	A COMPARATIVE ASSESSMENT OF POLLUTION PREVALENT IN HOLY RIVERS (GANGA, YAMUNA) OF NORTH INDIA Manisha Kumari	1
2.	A COMPARATIVE EVALUATION OF DISTINCT VERTICAL FLOW CONSTRUCTED WETLANDS WITH INTERMITTENT AND NO AERATION STRATEGY TO REDUCE THE INCREASING COD/N LOAD Naveen Chand, Surindra Suthar and Kapil Kumar	2
3.	A CRITICAL REVIEW ON COMMON MEDICINAL PLANTS HELPFUL IN MANAGING DISEASE BURDEN OF UTTAR PRADESH Deepa Sharma, Smt. Sapna Avinash Kondalkar, G. Babu and Rabinarayan Acharya	3
4.	A SURVEY ON WILD VEGETABLE PLANTS USED IN THE SOUTHERN EASTERN GHAT Manojkumar, S., R.P. Gunaga, M.S. Sankanur, S.K. Sinha, H.T. Hegde, A.A. Mehta and L.K. Behera	4
5.	A TIME-HONORED MEDICINAL PLANT- CASSIA AURICULATA WITH RESOURCE CONSERVATION TECHNIQUES UNDER NON-ARABLE LANDS OF SEMI-ARID REGIONS S. Kala, H. R. Meena, I. Rashmi, Shakir Ali, Ashok Kumar and Anita Kumawat	5
6.	AGROFORESTRY SUSTAINING THE PAPER INDUSTRY IN DISTRICT SAHARANPUR Isha katariya	6
7.	AGROFORESTRY SYSTEMS: AN OVERVIEW - INDIAN PERSPECTIVE A.K. Handa, Chhavi Sirohi, A. Arunachalam and Suresh Ramanan S.	7
8.	AGROFORESTRY: A WAY TO IMPROVE SOIL HEALTH Anand Singh, Prashant Deo Singh, Prashant Kumar, S. K. Singh, Safik Ahamad, Praveen Kumar, Avijit Ghos and Amit Kumar Singh	8
9.	AGROFORESTRY: A SATISFACTORY ACTION OF IMPROVE SOIL HEALTH AND ENSURES THE CONSERVATION OF SOIL & WATER Payal Choudhary and Pankaj Kumar	9
10.	AGRO-MORPHOMETRIC GENETIC VARIABILITY AND DIVERSITY FOR YIELD RELATED TRAITS IN CHICKPEA KABULI GENOTYPES (CICER ARIETINUM L.) Umashankar, C. Bharadwaj, Neeraj Kumar, Tapan Kumar, Yogesh Tiwari, Biswajit Mondal, Inderjit Singh, Shayla Bindra, P. K. Sharma and Shiv Kumar	10

Sl. No.	Title & Author of the Abstract	Page No.
11.	AN ECONOMIC ANALYSIS OF MARKETING AND PROCESSING OF PAPAYA IN JAIPUR CITY OF RAJASTHAN Suman Chaudhary and S.S. Jheeba	11
12.	AN INTRODUCTION TO IDEOTYPE BREEDING Rohitash Sharma, Deepak Gupta, Babulal Dhaka, Gopi Krishan Gaur, Harshit Chaturvedi and Shivashish Verma	12
13.	AN OVERVIEW: APPLICATIONS OF NANOTECHNOLOGY IN THE FOOD & AGRICULTURE SECTORS TO NURTURE NATURE Darshita Rawat and Kumud Dubey	13
14.	ANTIOXIDANT AND ANTIMICROBIAL STUDY OF SCHEFFLERA VINOSA LEAVES CRUDE EXTRACTS AGAINST RICE PATHOGENS Nitesh Singh and Anirudh Kumar	14
15.	ANTIOXIDANT AND ANTI-INFLAMMATORY ACTIVITY OF GREEN SYNTHESIZED SILVER NANOPARTICLES USING TRIFOLIUM ALEXANDRINUM LEAVES EXTRACT Oshin Verma, Smrati Sharma, Tejveer Singh, Radhakrishna Auji and Ramesh Kumar	15
16.	ANTIOXIDANT RESPONSE DURING AGEING IN OAT SEEDS Reetu Verma, Bhumika Khare and Maharishi Tomar	16
17.	ANTI-TRANSPIRANT SPRAYS CAN IMPROVE CALCIUM CONTENT OF APPLE FRUIT Tashi Angmo, M. U. Rehman and Safina Kosser	17
18.	PROSPECT OF INTEGRATED NUTRIENT MANAGEMENT THROUGH PELLETING TECHNIQUE Manish Kumar Sharma and Rajveer Singh Yadav	18
19.	APPLICATION OF DSSAT CERES-MAIZE MODEL: INTER COMPARISON OF FUNCTIONS FOR PHENOLOGICAL RESPONSES TO TEMPERATURE M. Swetha Sree	19
20.	APPLICATION OF REMOTE SENSING IN AGRICULTURE Hansa Baradwal and Avijit Ghosh	20
21.	APPLICATION OF SOIL ENZYMATIC DYNAMICS FOR EVALUATION OF BIOREMEDIATION OF CHLORPYRIFOS CONTAMINATED SOIL BY BIOCHAR AIDED PELARGONIUM GRAVEOLENS L. VEGETATION Ranu Yadav and Puja Khare	21
22.	APPLICATIONS OF CRISPR CAS9 IN CROP IMPROVEMENT Shubham	22
23.	ARTIFICIAL INTELLIGENCE IN AGRICULTURE Suman Kantwa and Mamta Choudhary	23
24.	ASHWAGANDHA (WITHANIA SOMNIFERA): A MEDICINAL HERB Preeti Basser, Sheetal Gupta and Rohitash Sharma	24
25.	ASSESSMENT OF GENETIC DIVERSITY AND ASSOCIATED CHARACTERS ANALYSIS FOR YIELD AND IT'S COMPONENT TRAITS IN KODO MILLET (PASPALUM SCROBICULATUM L.) K K Sharma and Ruchi Bishnoi	25

Sl. No.	Title & Author of the Abstract	Page No.
26.	ASSESSING IMPACT OF ECO-FRIENDLY IRON AND ZINC OXIDE NANOPARTICLES FABRICATED VIA GREEN SYNTHESIS ON GRAPEVINE CV. THOMPSON SEEDLESS Yukti Verma and Ajay Kumar Upadhyay	26
27.	ASSESSING THE IMPACT OF ELEVATED OZONE AND OZONE PROTECTANTS ON RHIZOSPHERIC ENZYMES OF GARLIC (ALLIUM SATIVUM) Gayathri J, Boomiraj K. and Avudainayagam S.	27
28.	ASSESSMENT OF ABOVE GROUND BIOMASS, CARBON ACCUMULATION OF DENDROCALAMUS STRICTUS AND THYRSOSTACHYS OLIVERI Neha Devi, Ajay Thakur and Hukum Singh	28
29.	ASSESSMENT OF CUTTING SIZE AND EXOGENOUS HORMONE TREATMENT ON SPROUTING AND ROOTING POTENTIAL IN THE INDO-PACIFIC MULTIPURPOSE LEGUME TREE-PARKIA TIMORIANA (DC.) MERR. Manish Kumar Singh, Papori Borpuzari and Priyanka Saikia	29
30.	NATURAL FARMING : A VISION TOWARDS A HEALTHY NATION Priyanka Kantwa and Gunjan Guleria	30
31.	ASSESSMENT OF GENETIC VARIABILITY IN CHICKPEA GENOTYPES AGAINST TEMPERATURE EXTREMITIES Somsole Bharath, Neeraj Kumar, R.V. Charitha Reddy, Amita Singh, Anshuman Singh, Meenakshi Arya, Rumana Khan and S.K. Chaturvedi	31
32.	ASSESSMENT OF GENETIC VARIABILITY PARAMETERS IN CLUSTER BEAN (CYAMOPSIS TETRAGONOLOBA(L.) TAUB.) Mahendra Kumar Ghasolia and Ashok Kumar Meena	32
33.	ASSESSMENT OF POST EMERGENCE HERBICIDE TOLERANCE (IMAZETHAPYR) FOR COWPEA Priyanshi Garg, Ayushi Jaiswal, Anshuman Singh, Meenakshi Arya, M. K. Singh and S.K. Chaturvedi	33
34.	BADRI COW KAMDHENU FOR HILLS (A CONCEPT PAPER) Mansi Arya and Satpal Singh Bisht	34
35.	BIODIVERSITY AND CONSERVATION OF PLANT SPECIES Anchal Singh, Ashutosh Kumar and Milind Sagar	35
36.	BIODIVERSITY CONSERVATION: A GLOBAL ISSUE Darshita Rawat and Kumud Dubey	36
37.	BIODIVERSITY; THREATS, CONCEPTS AND CONSERVATION IN WORLD Pratyushamani Awasthi and Arjun Lal Yadav	37
38.	BIODIVERSITY /ETHNO-MEDICINAL STUDY OF CENTRAL UNIVERSITY OF RAJASTHAN, AJMER (RAJASTHAN) AND THEIR TRADITIONAL HUMAN USE B. Sharma and R. B. Sharma	38
39.	BIODRAINAGE POTENTIAL OF TREE SPECIES IN RECLAIMING WATERLOGGED WASTELAND THROUGH AGROFORESTRY Jatin Kumar, D.R. Bhardwaj and Saurabh Kumar	39

Sl. No.	Title & Author of the Abstract	Page No.
40.	BIOINTENSIVE MANAGEMENT OF WILT DISEASE COMPLEX (MELOIDOGYNE INCOGNITA-FUSARIUM UDUM) INFESTING RED GRAM Rizwan Ali Ansari	40
41.	BIOLOGY AND BIOTIC POTENTIAL OF TOBACCO CUTWORM, SPODOPTERA LITURA (F.) ON DIFFERENT HOSTS AND MERIDIC DIET Hemant Kumar, Sagar, D. and Keerthi M. C.	41
42.	BIOMASS PRODUCTION AND CARBON BUDGETING OF FOREST COMMUNITIES IN COL. SHER JUNG NATIONAL PARK, HIMACHAL PRADESH, INDIA Sourav Ranjan Mohapatra, S. Balaji Naik and Umakanta Dash	42
43.	BIOMASS PRODUCTION CAPACITY OF AGERATINA ADENOPHORA AND ITS IMPACT ON ASSOCIATED HERB SPECIES IN BANJ OAK AND CHIR PINE FOREST OF KUMAUN HIMALAYA Bhawna Negi, Kavita Khatri, S.S. Bargali and Kiran Bargali	43
44.	BIOSYSTEMATIC STUDIES ON SUBFAMILY OLETHREUTINAE (TORTRICIDAE: LEPIDOPTERA) OF SOUTHERN KARNATAKA Karthik Reddy M.	44
45.	BROWN MANURING PRACTICES IN RICE FIELD Ravi Verma, A.K. Singh, Shivanand Maurya Rahul Verma	45
46.	CHALLENGES OF HILL AGRICULTURAL SYSTEMS IN ALMORA DISTRICT, UTTARAKHAND Latika Pandey, A. Arunachalam, Namita Joshi, Maneesh Yadav, Abbas Mehdi, A.K. Handa and Suresh Ramanan, S.	46
47.	CHANGES IN EARTHWORM DIVERSITY INDICES IN TWO ECOTYPES OF KUMAUN HIMALAYA WITH REFERENCE TO DENSITY, BIOMASS AND PHYSICOCHEMICAL PARAMETERS Shikha Bora and Satpal Singh Bisht	47
48.	CHARACTERIZATION OF RHIZOBIUM ISOLATED FROM ROOT NODULES OF TRIFOLIUM ALEXANDRINUM Narendra Kumar Bairwa and P. P. Jambhulkar, Muskan Yadav, Rishi Saxena and A. Radhakrishna	48
49.	CLASSICAL VIEWS OF COLLECTION PRACTICES IN AYURVEDIC LITERATURE AND CURRENT GUIDELINES IN GOOD COLLECTION PRACTICES OF MEDICINAL PLANTS Vaibhav Charde and G. Babu	49
50.	CLIMATE RESILIENT AGRICULTURE: INDIAN PERSPECTIVE V. K. Singh	50
51.	COMMON AYURVEDIC PREPARATION USED BY INDIAN POPULATION Diksha Pandey, Kalpana Verma, Lavkush Dwivedi	51
52.	COMPARATIVE ASSESSMENT AMONG HYPERGLYCEMIC PANCREATIC MORPHOMETRY OF ISLETS OF LANGERHANS (F0), F1 GENERATION AND SYZIGIUM CUMUNI TREATED OFFSPRINGS (F1-T) Kumari Rekha	52
53.	COMPARATIVE COST - BENEFIT ANALYSIS IN BOTANICALS IN COMBINATION WITH IMIDACLOPRID AGAINST CHILLI THRIPS [SCIRTOTHRIPS DORASLIS (HOOD)] ON CHILLI (CAPSICUM ANNUUM L.) Lekhraj Yadav and Anoorag R. Tayde	53

Sl. No.	Title & Author of the Abstract	Page No.
54.	COMPRESSED COMPLETE FEED BLOCKS: APPLICATIONS AND ISSUES IN INDIA Putan Singh, A.K. Patil, D. Gopinath and Gauri Jairath	54
55.	COMPUTATIONAL EVALUATION OF PHYTOCHEMICAL CONSTITUENTS FROM MALUS PUMILA (APPLE) FOR BREAST CANCER TREATMENT Suneetha Yeguvapalli and Durga Rathikota	55
56.	COMPUTATIONAL EVALUATION OF PHYTOCHEMICAL CONSTITUENTS FROM MALUS PUMILA (APPLE) FOR BREAST CANCER TREATMENT Durga Rathikota and Suneetha Yeguvapalli	56
57.	CONSERVATION AND IMPROVEMENT OF BUNDELKHANDI GOATS Deepak Upadhyay, B.P. Kushwaha, Pooja Tamboli and K. K. Singh	57
58.	CONSERVATION OF MEDICINAL PLANTS-NEED OF HOUR (A REVIEW) Singh Neelam Kumari Mahesh	58
59.	CONTAINING AND PREVENTING THE SPREAD OF EMERGING TRANSBOUNDARY DISEASE IN SUB-SAHARAN AFRICA – MAIZE LETHAL NECROSIS Suresh L.M.,Yoseph Beyene, Manje Gowda, Michael Olsen, Dan Makumbi, Walter Chivasa, and B.M. Prasanna	59
60.	CORRELATION STUDIES IN GOMPHRENA Devarailava Kumar, Balaji S. Kulkarni, Pavan Kumar P., Dadapeer A. Peerajade and Andrekha B. Chittapur	60
61.	CULTIVATION AND VALUE ADDITION PRACTICES OF ASHWAGANDHA (WITHANIA SOMNIFERA) IN INDIA: A REVIEW Y.Y. Sumthane, Vinita Bisht and Annu	61
62.	CURRENT TECHNIQUES USED IN SOIL CONSERVATION Pankaj Kumar, Payal Choudhary and Ravi Kalash	62
63.	DEGRADATION AND REMOVAL OF PAHS USING BIOREMEDIATION TECHNIQUES FROM AGRICULTURAL SOIL-A REVIEW PAPER Shreya Singh and Ningombam Linthoingambi Devi	63
64.	DEHYDROGENASE ACTIVITY, ALKALINE PHOSPHATASE, MICROBIAL BIOMASS CARBON AND NITROGEN, UNDER A. PROCERA BASED AGROFORESTRY SYSTEM OF BUNDELKHAND Garima Gupta, R.S. Yadav and Deepak Maurya	64
65.	DEVELOPMENT OF BIO-FERTILIZER USING EICHHORNIA CRASSIPES AS A STARTING MATERIAL Vijay Pratap Singh	65
66.	DEVELOPMENT OF SINGLE EYEBUD TECHNOLOGY (SEBT) FOR RAPID MULTIPLICATION OF QUALITY PLANTING MATERIALS IN BN HYBRID Hanamant M. Halli, V. K. Wasnik, Sanjay Kumar, Ravi Prakash Saini, Prabha Singh and V. K. Yadav	66

Sl. No.	Title & Author of the Abstract	Page No.
67.	DIFFERENTIAL EXPRESSION ANALYSIS OF DEFENSE-RELATED CANDIDATE GENES ASSOCIATED WITH DOWNY MILDEW (SCLEROSPORA GRAMINICOLA) RESISTANCE IN PEARL MILLET Praveen Kumar Yadav, P. Shashikumara, M. Ashajyothi, Brijesh K. Mehta, H.S. Mahesha, Shahid Ahmed and S. Chandra Nayaka	67
68.	DIFFERENTIAL RESPONSE OF TWO ENDOPHYTIC BACTERIAL STRAINS INOCULATION IN AMELIORATION OF AS INDUCED STRESS OF BACOPA MONNIERI L. Pratibha Tripathi and Puja Khare	68
69.	DIVERSITY AND ABUNDANCE OF INSECT POLLINATORS IN TWO DIFFERENT AGRICULTURAL LANDS IN KUMAUN HIMALAYA, UTTARAKHAND, INDIA Deeksha Arya and Deepika Goswami	69
70.	DIVERSITY AND DISTRIBUTION OF ETHNOMEDICINAL PLANTS OF UTTARAKHAND HIMALAYA Sunil Joshi	70
71.	ECOSYSTEM MANAGEMENT AND SUSTAINABLE DEVELOPMENT Ram Prakash, Rajesh Kumar, Shivanand Maurya, Kaptan Baboo and Ravi Verma	71
72.	EFFECT OF CLIMATE CHANGE ON AGRICULTURAL PRODUCTION OF BUNDELKHAND REGION Priyanshi Garg and Vinit Kumar	72
73.	EFFECTS OF COMPOSTED AND UNCOMPOSTED LEAVES OF AGERATINA ADENOPHORA ON GERMINATION, GROWTH AND YIELD OF LENS CULINARIS (MEDIC.) Kavita Khatri, Bhawna Negi, Kiran Bargali and Surendra S. Bargali	73
74.	EFFECT OF CROP GEOMETRY AND NITROGEN DOSES ON GROWTH, YIELD, AND NUTRIENT CONTENT AND UPTAKE IN TRANSPLANTED RICE Brijesh Kumar, S. K. Prasad, Magan Singh and Deepak Kumar	74
75.	EFFECT OF CROP GEOMETRY AND NITROGEN MANAGEMENT ON YIELD AND PRODUCTIVITY OF PEARL MILLET (PENNISETUM GLAUCUM L.) UNDER GUAVA BASED AGRI-HORTI SYSTEM Srishti Dipriya Minz, S.K. Prasad and K.S. Pant	75
76.	EFFECT OF DIFFERENT LEVELS OF NPK AND VERMICOMPOST ON GROWTH OF OKRA [ABELMOSCHUS ESCULENTUS L.] VAR. KASHI KRANTI Sanwar Mal Yadav, Tarence Thomos, Lekhraj Yadav and Vinod Kumar Yadav	76
77.	EFFECT OF DIFFERENT LEVELS OF NPK AND S, ON GROWTH, YIELD OF SOYBEAN (GLYCINE MAX L. MERRILL.) UNDER GUAVA (PSIDIUM GUAJAVA L.) BASED AGRI-HORTI SYSTEM Ankit Pandey, Avijit Sen and Makhan Singh Karada	77
78.	EFFECT OF DIFFERENT ORGANIC MANURES ON YIELD OF CHILLI (CAPSICUM ANNUM L.) IN BUNDELKHAND REGION OF U.P. Safik Ahamad, Prashant Deo Singh, Anand Singh, Amit K Singh, Manjangouda S.S. Avijit Ghosh, Sunil Kumar, Prashant Kumar and Praveen Kumar Yadav	78

Sl. No.	Title & Author of the Abstract	Page No.
79.	EFFECT OF DIFFERENT PRIMING TREATMENTS ON QUALITY NURSERY PRODUCTION OF CHINA ASTER CVS 'POORNIMA' AND 'KAMINI'. Shabnam Pangtu, Puja Sharma, Prashant Sharma and Shilpa Kamal	79
80.	EFFECT OF DIFFERENT SILVI-HORTI-AGRICULTURAL SYSTEMS ON SOIL CHEMICAL PROPERTIES AND AVAILABLE NUTRIENTS UNDER RAINFED PLATEAU CONDITION OF JHARKHAND Kumari Beauty, Bikash Das, Sushanta Naik and Mahesh Kumar Dhakar	80
81.	EFFECT OF DIFFERENT NITROGEN LEVELS AND ROW SPACINGS ON GROWTH AND YIELD OF SESAMUM INDICUM L. (SESAME) UNDER AGELE MARMELOUS L. (BEAL) BASED AGRI- HORTI SYSTEM Kuwar Yeshvir Arya, V. K. Srivastava and S.K. Verma	81
82.	EFFECT OF EUCALYPTUS (EUCALYPTUS TERETICORNIS) TREE MANAGEMENT PRACTICES PRODUCTIVITY OF WHEAT Vinita Bisht, Y.Y. Sumthane, K.S. Bangarwa and Annu	82
83.	EFFECT OF EUCALYPTUS CLONES ON THE PRODUCTIVITY OF FODDER COWPEA UNDER AGRI-SILVICULTURE SYSTEM OF SEMI-ARID REGION OF HARYANA Ashish Kumar, R. S. Dhillon, Vishal Johar and Manish Kumar	83
84.	EFFECT OF FERTILIZERS AND BIOFERTILIZER ON YIELD ATTRIBUTES OF GREEN GRAM [VIGNA RADIATA (L.) WILCZEK] UNDER GUAVA (PSIDIUM GUAJAVA L.) BASED AGRI-HORTI SYSTEM IN VINDHYAN REGION OF EASTERN UTTAR PRADESH Rashav Chahal and Ajay Kumar Baheliya	84
85.	EFFECT OF GROWING MEDIA ON SEED GERMINATION AND GROWTH PARAMETERS OF SANTALUM ALBUM SEEDLINGS Pankaj Lavania, A.S. Kale, Prabhat Tiwari and K. Gullamani	85
86.	EFFECT OF INTEGRATED NUTRIENT MANAGEMENT ON SOIL HEALTH PARAMETERS OF SWEET ORANGE (CITRUS SINENSIS OSBECK) CV. MOSAMBI Komal Yadav and Shankar Lal Yadav	86
87.	EFFECT OF INTEGRATED NUTRIENT MANAGEMENT PRACTICES ON GROWTH, YIELD AND QUALITY OF BARLEY Sandeep Kumar and Meena Sewhag	87
88.	EFFECT OF INTEGRATED NUTRIENT MANAGEMENT ON SEEDLING GROWTH AND BIOMASS OF SANDALWOOD (<i>Santalum album</i> L.) Govind, V.M. Prajapati and M.B. Tandel	88
89.	EFFECT OF OAT (AVENA SATIVA L.) AND EGYPTIAN CLOVER (TRIFOLIUM ALEXANDRINUM L.) INTERCROPPING AND ZINC MANAGEMENT ON FORAGE YIELD Muskan Porwal, Sita Ram Kantwa, Badal Verma, Singh SS, Prabhu Govindasamy, and Srinivasan Ramakrishnan	89
90.	EFFECT OF PACKAGING MATERIAL ON NUTRITIONAL QUALITY AND SHELF LIFE OF READY-TO-EAT FOODS Priyanka Prasad and Anita Kochhar	90

Sl. No.	Title & Author of the Abstract	Page No.
91.	EFFECT OF POLYPLOIDY ON EXPRESSION OF APOMIXIS IN GUINEA GRASS Girija Choudhary, K.K. Dwivedi, L.K. Dwivedi, Maneet Rana and Kalpana Verma	91
92.	EFFECT OF PRE-SOWING SEED TREATMENTS ON GERMINATION, GROWTH AND VIGOUR OF MELIADUBIA (CAV.). Alok Kumar Singh, J.K. Singh, Atul Gupta, K.S. Pant and Bipin Kumar Singh	92
93.	EFFECT OF PROBIOTIC TREATMENT ON EXPRESSION OF MRNA OF PROGLUCAGON IN GASTROINTESTINAL TRACT IN DIABETIC RATS Sumiran Srivastava	93
94.	EFFECT OF ROOTING MEDIA, IBA AND TRICHODERMA ON GROWTH, SUCCESS AND SURVIVABILITY OF STEM CUTTINGS OF POMEGRANATE (<i>PUNICA GRANATUM</i> L.) Ramesh Chand Kantwa, Priyamveda Sonkar, P.K.S. Gujar and J. Bhandari	94
95.	EFFECT OF SUPPLEMENTATION OF DIGESTIBLE THREONINE ON CARCASS CHARACTERISTICS OF COMMERCIAL BROILERS D. Rambabu, V. Ravinder Reddy, S.V. Rama Rao, J. Narasimha and M. Shashi Kumar	95
96.	EFFECT OF TREE SPACING AND FERTILIZER APPLICATION ON MARIGOLD UNDER MANGIFERA INDICA BASED AGROFORESTRY SYSTEM Sahil Chauhan, Rohit Kumar Vashishat, Ghanshyam Singh and Vipin Guleria	96
97.	EFFECT OF TROPOSPHERIC OZONE AND OZONE PROTECTANTS ON PLANT GROWTH, PHYSIOLOGY AND YIELD OF CAULIFLOWER (BRASSICA OLERACEA VAR. BOTRYTIS) AT HIGH ALTITUDE REGION OF WESTERN GHATS Boomiraj K., Sethupathi N., Sudhakaran M. and Jayabalakrishnan R. M.	97
98.	EFFECTS OF COMPOSTED AND UNCOMPOSTED LEAVES OF AGERATINA ADENOPHORA ON GERMINATION, GROWTH AND YIELD OF LENS CULINARIS (MEDIC.) Kavita Khatri, Bhawna Negi, Kiran Bargali and Surendra S. Bargali	98
99.	EFFECTS OF DIFFERENT WATER REGIMES ON MULTIPLICATION AND REPRODUCTION OF MELOIDOGYNE GRAMINICOLA IN RICE Rohit Kumar, Vinod Kumar, Anil Kumar and SS Mann	99
100.	EFFECTS OF PRE-SOWING SEED TREATMENTS ON GERMINATION AND GROWTH BEHAVIOUR OF TERMINALIA BELLIRICA (ROXB.) Shilpa, Vimal Chauhan and Umakanta Dash	100
101.	EFFICACY OF PRE AND POST EMERGENCE HERBICIDES IN WEED MANAGEMENT IN SOYBEAN Bharat Lal Meena and Gajendra Nagar, Harkesh Meena and Devendra Kumar	101
102.	EFFICIENT MANAGEMENT OF AVAILABLE NUTRIENT RESOURCES FOR IMPROVING PRODUCTIVITY OF CORIANDER (<i>CORIANDRUM SATIVUM</i> L.) Rahul Ojha	102
103.	ELUCIDATING FLORAL DEFORMITIES AND DETERMINING CYTOPLASM TYPES IN CAULIFLOWER: MAKING HYBRID BREEDING REMUNERATIVE Saurabh Singh, SS Dey, Raj Kumar, Arjun Ola, Maneesh Pandey and Devesh Tiwari	103

Sl. No.	Title & Author of the Abstract	Page No.
104.	EMPIRICAL ANALYSIS ON WILLINGNESS TO PAY FOR JHANSI FORT: AN EVIDENCE FROM UTTAR PRADESH V. David Chella Baskar, Kavitha, Sooraj, Sana and Sundar Pal	104
105.	ENHANCING ADOPTION OF AGRO FORESTRY IN THE NORTH WESTERN AGRO ECOLOGICAL ZONE OF TAMIL NADU R. Sangeetha, N. Suganthi and V. Karthick	105
106.	ENVIRONMENTAL MANAGEMENT PRACTICES FOR SUSTAINABLE DEVELOPMENT Sanjeeb Kumar Das	106
107.	ESTIMATES OF GENETIC VARIABILITY PARAMETERS IN LINSEED (LINUM USITATISSIMUM L.) GENOTYPES Ashok Kumar Meena, M. K. Ghasolia and Laxman Singh Saini	107
108.	ESTIMATION OF BIOMASS POTENTIAL AND CARBON SEQUESTRATION UNDER DIFFERENT AGROFORESTRY SYSTEMS IN VINDHYAN REGION Nasam Midhun Kumar, U. P. Singh, Alok Kumar Singh and Purumandla Vennela Reddy	108
109.	ESTIMATION OF CORRELATION AND PATH COEFFICIENT ANALYSIS IN RICE (ORYZA SATIVA L.) Ravi Kishan Soni and N. R. Koli	109
110.	ESTIMATION OF GENETIC DIVERGENCE IN MICRONUTRIENT RICH WHEAT (TRITICUM AESTIVUM L.) UTILISING D2- STATISTICS Ashish Sheera and Tuhina Dey	110
111.	ESTIMATION OF GENETIC DIVERGENCE IN PROMISING ADVANCE CHICKPEA LINES (CICER ARIETINUM) Niyati Jain and Anita Babbar	111
112.	EVALUATE GROWTH PARAMETERS OF DIFFERENT SPICES CROP UNDER POPLAR BASED AGRI - SILVICULTURE SYSTEM IN EASTERN UTTAR PRADESH Yogesh Kumar Agarwal, Hemant Kumar, Rajiv Umrao, Anubha Srivastav and Neelam Khare	112
113.	EVALUATION OF BIOLOGICAL FACTORS OF INDOOR PLANT SPECIES IN ARID REGION, INDIA Rajbala Soni, Rajesh Dhankar and Surender Verma	113
114.	EVALUATION OF CHICKPEA (CICER ARIETINUM) ITS NUTRITIONAL ASPECTS AND ITS PROCESSING Mamta Rathore and H.G. Prakash and D.P. Singh	114
115.	EVALUATION OF COWPEA GENOTYPES FOR AGRO-MORPHOLOGICAL TRAITS AND FORAGE NUTRITIONAL QUALITY Banwari Lal Yadav, Gitanjali Sahay, Reetu Verma, Brijesh Kumar Mehta, Nilamani Dikshit and K. Sridhar	115
116.	EVALUATION OF F7 PROGENIES OF BARLEY FOR FORAGE BIOMASS YIELD A.K. Singh, Reetu Verma and Mahesha, H.S.	116

Sl. No.	Title & Author of the Abstract	Page No.
117.	EVALUATION OF MICROBIAL AND SOIL ENZYMATIC SHIFT IN THIAMETHOXAM TREATED MANGO (MANGIFERA INDICA CV. AMRAPALI) RHIZOSPHERE Pradeep Kumar Shukla, Anup Kr. Bhattacharjee, Govind Kumar and Rishi Saxena	117
118.	EVALUATION OF PEARL MILLET GERMPLASM FOR FORAGE YIELD AND COMPONENT TRAITS Satyender Singh, Praveen Kumar Yadav, Brijesh K. Mehta, H.S. Mahesha, Shahid Ahmed and P. Shashikumara	118
119.	EVALUATION OF SOIL PHYSICAL PROPERTIES OF FARMERS FIELD OF JAIPUR DISTRICT, RAJASTHAN, INDIA Vinod Kumar Yadav, Tarence Thomas and Sanwar Mal Yadav	119
120.	E-WASTE IMPACT ON AGRICULTURAL CROPS IN BUNDELKHAND REGION Pallavi Kumari, Vinit Kumar, Anshu Dhaka and Amit Kumar	120
121.	EXPLOITING GENETIC DIVERSITY OF MULBERRY (MORUS SPECIES) FOR SUSTAINABLE LIVESTOCK PRODUCTION IN INDIA Kamini, Sheeraz Saleem Bhat, Maneet Rana, Anup Kumar, A K Handa and R P Nagar	121
122.	EXPLORING GEOMORPHIC PROCESSES AND MARTIAN GALE CRATER TOPOGRAPHY ON MARS USING CTX AND HIRISE EXPRESS IMAGE DATASET Pavan Kumar, Manmohan Dobriyal and A.K. Pandey	122
123.	FACTORS AFFECTING CARBON SEQUESTRATION IN QUERCUS LANUGINOSA FOREST OF ASKOT WILDLIFE SANCTUARY, WESTERN HIMALAYA Soni Bisht, K. Bargali, S. S. Bargali and Y. S. Rawat	123
124.	FINANCIAL ANALYSIS AND RISK BEARING CAPACITY OF ACACIA SENEGAL BASED MULTI-COMPONENT AGROFORESTRY MODEL FOR CLIMATIC RESILIENCE IN SEMI-ARID TROPICS Rajendra Prasad, B. Alam, A.K. Handa, A. Arunachalam, Vikas Kumar, Ashok Shukla and Prashant Singh	124
125.	FIRST MINERAL ANALYSIS FROM THE MEDICINAL PLANT HYMENAEA MARTIANA HAYNE (JATOBÁ) Layza Sá Rocha and Valter Aragão do Nascimento	125
126.	FOOD SECURITY IN INDIA: PROBLEMS AND PROSPECTS Shivanand Maurya, Rajesh Kumar, Ravi Verma and Kaptan Baboo	126
127.	FOREST GENETIC RESOURCES OF NON-TIMBER SPECIES IN ARID AND SEMI ARID REGION Swati Shedage	127
128.	FUSARIUM OXYSPORUM F.SP. LYCOPERSICI: CAUSAL AGENT OF FUSARIUM WILT OF TOMATO Nitisha Gahlot and R. N. Bunker	128
129.	GENETIC VARIABILITY AND IDENTIFICATION OF GERMPLASM ACCESSIONS FOR HIGH GRAIN YIELD AND POWDERY MILDEW RESISTANCE IN BLACK GRAM [VIGNA MUNGO (L.) HEPPER] Harshitha. M, Shanthala. J, A. Mohan Rao, D. L. Savithramma and K. Karuna	129

Sl. No.	Title & Author of the Abstract	Page No.
130.	GENETIC VARIABILITY, HERITABILITY AND GENETIC DIVERGENCE IN TOMATO (SOLANUM LYCOPERSICUM L.) Om Prakash, and Vijay Bahadur	130
131.	GENETICS OF HEAT TOLERANCE IN WHEAT (TRITICUM AESTIVUM L.) Shivani Upadhyay	131
132.	GEOGRAPHICAL DISTRIBUTION OF FISH DIVERSITY IN UPPER, MIDDLE AND LOWER STRETCHES OF THE RIVER GANGA Syed Shabih Hassan	132
133.	GERMINATION OF ALEXANDRINUM TRIFOLIUM L. CULTIVARS UNDER SALT STRESS Jyoti Khanduri, Vimlendu Bhushan Sinha, Indra Rautela and Manish Dev Sharma	133
134.	GOOD AGRICULTURAL AND COLLECTION PRACTICES FOR QUALITY HERBAL MEDICINAL PRODUCTS Yasmeen Shamsi	134
135.	GROWTH AND YIELD OF ASHWAGANDHA (WITHANIA SOMNIFERA L. DUNAL) UNDER MANDARIN BASED AGROFORESTRY SYSTEMS IN HADOTI REGION OF RAJASTHAN Prakash and Prahlad V. C.	135
136.	GUM EXUDATION IN ACACIA SENEGAL IN RELATION TO RAINFALL AND SOIL MOISTURE IN BUNDELKHAND REGION OF CENTRAL INDIA Rajendra Prasad, B. Alam, A.K. Handa, A. Arunachalam, Ashok Shukla and Prashant Singh	136
137.	HEAVY METALS RISK ASSESSMENT OF CONTAMINATED VEGETABLES AT SELECTED SITES IN DELHI NCR Sandeep Kumar, Shiv Prasad and Sunita Yadav	137
138.	ICE CONTENT DURING FREEZING OF KULFI – A MATHEMATICAL ANALYSIS Kiran Nagajjanavar and Rekha Menon Ravindra	138
139.	IDENTIFICATION AND QUANTIFICATION OF SOME NATURAL COMPOUNDS OF PINUS GERARDIANA LEAF EXTRACT AND ITS ANTIMICROBIAL AND ANTIOXIDANT ACTIVITIES Gajender Singh; Ruhi Pathania; Mohd. Azhar Khan; Rajiv K. Tonk; Deepak Kumar and Ashutosh K. Dash'	139
140.	IDENTIFICATION AND UTILIZATION OF GENES FOR ENHANCING NITROGEN USE EFFICIENCY IN RICE Pranab Kumar Mandal and Amitha Mithra Sevanthi	140
141.	IDENTIFICATION OF LONG NON-CODING RNAs IN PEARL MILLET (Pennisetum glaucum (L.)) Baibhav Kumar, Animesh Kumar, Sarika Jaiswal, Mir Asif Iqbal, U B Angadi, Rukam S Tomar, Anil Rai and Dinesh Kumar	141
142.	IMPACT OF ALUMINIUM TOLERANCE ON PROTEIN SYNTHESIS, CHLOROPHYLL CONTENT AND ALUMINIUM UPTAKE IN DOLICHOS BEAN SEEDLING Mohd Talha Ansari, A.K. Pandey, A.S. Mailappa, Siddhartha Singh	142
143.	IMPACT OF BIOFERTILIZERS APPLICATION ON GROWTH AND YIELD ATTRIBUTES OF TRIGONELLA FOENUM (CV. AJMER FENUGREEK-1) Umesh Pankaj, Arjun Lal Ola and A. K. Pandey	143

Sl. No.	Title & Author of the Abstract	Page No.
144.	IMPACT OF DRIP FERTIGATION WITH WATER-SOLUBLE FERTILIZER GRADES AND PRORISE PACKAGE ON NUTRITIONAL STATUS, FRUIT YIELD AND QUALITY OF POMEGRANATE Ashis Maity, R.A. Marathe, A. Jeyabal and Jyotsana Sharma	144
145.	IMPACT OF ENVIRONMENTAL POLLUTION AND CLIMATE CHANGE ON FISHERIES P. Ravi Sekhar and Y. Savithri	145
146.	IMPACT OF ICT TOOLS ON THE SUPPLY CHAIN PERFORMANCE OF APPLES IN UTTARAKHAND Aanchal Sharma Lamba, Ajay Sharma, Deepak Kholiya and Rahul Raj	146
147.	IMPACT OF IMPLEMENTATION OF INFORMATION COMMUNICATION & TECHNOLOGY TOOLS ON THE SUPPLY CHAIN PERFORMANCE OF APPLES IN UTTARAKHAND Aanchal Sharma Lamba, Ajay Sharma, Deepak Kholiya and Rahul Raj	147
148.	IMPACT OF LONG-TERM AGROFORESTRY PRACTICES ON SOIL BIOLOGICAL PROPERTIES IN SEMI-ARID CENTRAL INDIA Sovan Debnath, Suresh Ramanan S., Asha Ram, Inder Dev, Rajendra Prasad and A. Arunachalam	148
149.	IMPACT OF STONE MINING ON AGRICULTURE IN MIRZAPUR, INDIA Kumud Dubey and Vandita	149
150.	IMPACT OF STRAWBERRY CULTIVATION ON THE SOCIO-ECONOMIC STATUS OF FARMERS: A CASE STUDY OF MOTH BLOCK OF JHANSI DISTRICT IN UTTAR PRADESH Satyam Bansal, Ashok Yadav, Sandeep Garga, A. Arunachalam, Sushil Kumar, Badre Alam, Asha Ram and Inder Dev	150
151.	IMPACT OF USAGE OF AGROCHEMICALS AND OF PPE ON AGRICULTURAL WORKERS Deepak Kumar Pathak, Rajeev Ranjan Patel, Navneet Maurya and Pawan Kumar Gupta	151
152.	IN VITRO ANTIMICROBIAL AND ANTIOXIDANT ACTIVITY OF METHANOL EXTRACT OF SWERTIA CHIRATA Suniti Yadav and Ramesh Kumar	152
153.	IN VITRO PROPAGATION, CALLOGENESIS AND BIOMASS ACCUMULATION IN SAUSSUREA COSTUS (KUTH)-ENDANGERED MEDICINAL PLANT OF INDIAN HIMALAYAN REGION Rajnish Sharma, Kartik, Kamal Thakur and Bhupender Dutt	153
154.	INDIAN DURUM WHEAT – IMPORTANCE AND PROSPECTS FOR EXPORT SV Sai Prasad, D Ambati and MP Rahul	154
155.	INFLUENCE OF ZINC, BORON AND MOLYBDENUM ON YIELD ATTRIBUTING CHARACTERS AND SEED YIELD OF MUNG BEAN [VIGNA RADIATA (L.) WILCZEK] Rishabh Kumar Singh, C L Maurya, V K Chourasiya, Paras Kushwaha and Harshit Gupta	155
156.	INFORMATION AND COMMUNICATION TECHNOLOGIES (ICT) USED BY THE FARMERS IN FARMING SYSTEMS Rishi Kumar Singh, R. K. Doharey, Haresh Pratap Singh, N. R. Meena, Abhinav Singh, Virendra Pratap and Ritesh Singh	156

Sl. No.	Title & Author of the Abstract	Page No.
157.	INNOVATIVE EMERGING TECHNOLOGIES APPLIED IN THE EXTRACTION OF PHYTOCHEMICALS FROM NATURAL SOURCES B. Ramya Kuber	157
158.	INTEGRATED NUTRIENT MANAGEMENT (INM): MEANING, CONCEPT AND GOAL Prabhu Lal Kantwa, A. K. Dixit and Awanish Kumar	158
159.	INTEGRATED WEED MANAGEMENT OF MUNGBEAN (VIGNA RADIATA) UNDER BAEI (AEGLEMARMELOS) BASED AGRIHORTICULTURAL SYSTEM Saroj Amrit Priya and U.P. Singh	159
160.	INTERACTIVE EFFECT OF ELEVATED CARBON DIOXIDE AND TEMPERATURE ON PLANT NITROGEN IN SOYBEAN Shravani Sanyal, B. Chakrabarti, Radha Prasanna, A. Bhatia, S. Naresh Kumar, TJ Purakayastha, R Joshi, A Sharma	160
161.	INTER-LINKAGES OF NITROGEN SPECIES AND OTHER ESSENTIAL ELEMENTS IN MONSOON RAINWATER AT AN AGRICULTURAL SITE IN DELHI Sunaina and U. C. Kulshrestha	161
162.	INTERNET OF THINGS (IOT) IN AGRICULTURE AND ALLIED SECTOR Abhinav Singh, R.K Doharey, Virendra Pratap, Amritanshu Singh and Rishi Kumar Singh	162
163.	INVASIVE ALIEN PLANT SPECIES IN-AND-AROUND ICAR-CAFRI CAMPUS IN JHANSI Shailja Saraogi	163
164.	INVESTIGATING VEGETATION DYNAMICS FOR INDIA USING A MODELLED REMOTE SENSING DATABASE Nidhi Shukla	164
165.	LAND USE SYSTEMS EFFECTS ON SOIL PHYSICO-CHEMICAL PROPERTIES IN JHANSI DISTRICT OF CENTRAL INDIA Ravi Kalash, Pragati Sharma, Payal Chaudhary Pankaj Kumar and Awanish Kumar	165
166.	LITTER DYNAMICS IN TROPICAL PLANTATIONS Saurabh Kumar and Jatin kumar	166
167.	LONG TERM INFLUENCE OF PACLOBUTRAZOL ON MICROBIAL ACTIVITY AND NUTRITIONAL STATUS OF SOIL IN MANGO CV. DASHEHARI ORCHARD Pradeep K. Shukla, Govind Kumar, A K Bhattacharjee and V. K. Singh	167
168.	LONG-TERM (2001-2020) TREND ANALYSIS OF TEMPERATURE AND RAINFALL AND DROUGHT CHARACTERISTICS BY IN-SITU MEASUREMENTS AT A TROPICAL SEMI-ARID STATION (ANANTAPUR) OVER A PENINSULAR INDIA Lokeswara Reddy Thotli, Balakrishnaiah Gugamsetty, Raja Obul Reddy Kalluri Rama Gopal Kotalo, Bhavyasree Akkiraju, Siva Sankara Reddy Lingala	168
169.	MAIZE LETHAL NECROSIS (MLN): EFFORT TOWARDS CONTAINING THE SPREAD THE SPREAD AND IMPACT OF A DEVASTATING TRANS BOUNDARY DISEASE IN SUB-SAHARAN AFRICA Suresh LM,Yoseph Beyene, Manje Gowda, Michael Olsen, MacDonald Jumbo, Dan Makumbi, Mosisa Worku, Francis Mwatuni, and BM Prasanna	169

Sl. No.	Title & Author of the Abstract	Page No.
170.	MARINE BASED NUTRACEUTICALS FOR HEALTHY LIVING G. Rajitha	170
171.	MELATONIN REDUCES FLUORIDE UPTAKE AND TOXICITY IN RICE SEEDLINGS BY ALTERING PHYTOHORMONAL AND ANTIOXIDANT HOMEOSTASIS Aditya Banerjee	171
172.	MERA GAON - MERA GAURAV (MGMG): IMPACTING AGROFORESTRY INTERVENTIONS FOR INCREASING TREES OUTSIDE FORESTS IN THE VILLAGES OF BUNDELKHAND REGION OF CENTRAL INDIA R.P. Dwivedi, A. Arunachalam, Rajendra Prasad, A.K. Handa, Inder Dev, Badre Alam, Naresh Kumar, K. Rajarajan, Sushil Kumar, Asha Ram, Hirdayesh Anuragi, Ashok Yadav, Priyanka Singh, Suresh Ramanan S., Sovan Debnath, C.K. Bajpai, Rajendra Singh, R.K. Singh, SPS Yadav, Ajay Pandey and Rajesh Kumar Srivastava	172
173.	METABOLITE PROFILING OF LABDANE DITERPENOIDS IN DIFFERENT ACCESSIONS OF ANDROGRAPHIS PANICULATA LEAVES AT DIFFERENT LEAF AGES AND COLLECTION TIME Paurabi Das and Puja Khare	173
174.	METAGENOMIC ASSESSMENT OF SOIL MICROBIAL DIVERSITY OF CROPS AND CROPPING PATTERN OF MIDDLE GANGATIC PLAIN OF INDIA H. V. Singh, Sobit, Thapa, Udai. B. Singh and Deepti, Malviya	174
175.	METAGENOMIC CHARACTERIZATION OF MICROBIAL COMMUNITIES ON SOIL UNDER THE AMENDMENT OF FLY ASH, VERMICOMPOST AND FERTILIZER IN CHICKPEA CROP Devendra Mani Tripathi, Deepa Singh and Smriti Tripathi	175
176.	MITIGATION WEATHER RISKS THROUGH AGRO-METADVISORY SERVICES-FARMERS FEEDBACK Amrendra Yadav, V.K. Kanaujia, A.K. Singh, Raghvendra Singh and K.K. Singh	176
177.	MOLECULAR ANALYSIS AMONG FAGONIA SPECIES Piyush Panwar	177
178.	MOLECULAR DIFFERENTIATION AND CHARACTERIZATION OF SYZYGIUM CUMINI (MYRTACEAE) MEDICINAL TREE COLLECTED FROM DIFFERENT ECOLOGICALLY REGIONS OF INDIA RS Tomar, Ranjit Pal, Prabha Singh, Ravi Prakash Saini, Ashutosh Singh and Ajai K. Pandey	178
179.	MOLECULAR IDENTIFICATION AND BIOGEOGRAPHICAL DISTRIBUTION OF SPODOPTERA FRUGIPEDRA (LEPIDOPTERA: NOCTUIDAE) ACROSS KARNATAKA Karthik V Rao and Doddamane Manjulakumari	179
180.	MONITORING AND FORECASTING OF DISEASES IN ECONOMICALLY VALUABLE CROPS BY LEAF WETNESS DURATION (LWD) SOFTWARE Rajesh Kumar Pandey	180
181.	MULTI-LOCATION EVALUATION OF SPECIALTY AND BIOFORTIFIED MAIZE HYBRIDS FOR FORAGE - AND SILAGE- QUALITY Nikhil Kumar Chhipa, Brijesh K. Mehta, P. Shashikumara, Anup Kumar, Firoz Hossain, Vignesh Muthusamy, Rajkumar U. Zunjare, K. Sridhar, Rahul Ghajghate, H.S. Mahesha and Shahid Ahmed	181

Sl. No.	Title & Author of the Abstract	Page No.
182.	NON-DESTRUCTIVE QUANTIFICATION OF ANTINUTRITIONAL AND BIOACTIVE TRAITS IN PEARL MILLET USING NEAR-INFRARED SPECTROSCOPY (NIRS) BASED PREDICTION MODELS Maharishi Tomar, Reetu Verma, Archana Sachdev, Rakesh Bhardwaj, and Vijay Kumar Yadav	182
183.	NUTRIENTS CONTENT, UPTAKE AND SOIL BIOLOGICAL PROPERTIES AS INFLUENCED BY VARIOUS NUTRIENT MANAGEMENT PRACTICES UNDER FODDER PEARL MILLET CULTIVATION Rakesh Kumar, Hardev Ram, R.K. Meena, Anurag Saxena, Sandeep Kumar, Praveen B R and Brijesh Kumar	183
184.	NUTRITIONAL AND BIOCHEMICAL EVALUATION OF PIGEON PEA (CAJANUS CAJAN) Mamta Rathore, Ashish Srivastava and H.G. Prakash	184
185.	NUTRITIONAL AND PALATABILITY INDICES OF TEMPERATE GRASSES AND LEGUMES FOR LIVESTOCK FEEDING Sultan Singh, Tejveer Singh, Suheel Ahmad, Sheeraz Saleem Bhat and Nazim Hamid Mir	185
186.	OILSEED PRODUCTION: BOON IN BUNDELKHAND REGION Yogendra Pratap Singh, Asok Kumar, Deependra Singh and Kuber Singh Patel	186
187.	ONE DISTURBANCE: A THREAT TO MANY EXTINCTIONS Ankita, Preeti and Umakant Dash	187
188.	OPPORTUNITIES AND CHALLENGES OF CARBON SEQUESTRATION THROUGH AGROFORESTRY IN WASTELANDS Asha Ram, Ayyanadar Arunachalam, Inder Dev, Suresh Ramanan S. and Naresh Kumar	188
189.	OXBOW LAKES OF EAST CHAMPARAN DISTRICT, BIHAR (INDIA) HISTORY, CLASSIFICATION, ORIGIN, DISTRIBUTION AND DETERIORATION Kumari Priyanka	189
190.	PATH ANALYSIS STUDIES ON YIELD AND ITS COMPONENTS IN MUNGBEAN [VIGNA RADIATA (L.) WILCZEK] Gopi Krishan Gaur and A.K. Sharma	190
191.	PATHOGENICITY OF DIFFERENT INOCULUM LEVELS OF MELOIDOGYNE INCOGNITA INFECTING VIGNA RADIATA AND MANAGEMENT BY FLY ASH APPLICATION Abbasi and Hisamuddin	191
192.	PHENOTYPING OF LENTIL (LENS CULINARIS MEDIK.) GERMPLASM AGAINST HIGH TEMPERATURE STRESS Neeraj Kumar, R.V. Charitha Reddy, Somsole Bharath, Amita Singh, Anshuman Singh, Meenakshi Arya, Rakesh Choudhary, Rumana Khan and S.K. Chaturvedi	192
193.	PHENOTYPING OF SESAME GENOTYPES FOR WATERLOGGING TOLERANCE UNDER CONTROLLED CONDITIONS Ashutosh Kumar, Artika Singh, Rakesh Choudhary and S. K. Chaturvedi	193
194.	PHYTOBIOME ENGINEERING AND ITS IMPLICATIONS IN SUSTAINABLE AGRICULTURE Nisha Prajapati and Subha Narayan Das	194

Sl. No.	Title & Author of the Abstract	Page No.
195.	PHYTOCHEMICAL SCREENING AND ANTIMICROBIAL ACTIVITIES OF GUIZOTIA ABYSSINICA L. LEAF AND FLOWER EXTRACTS Priyanka Prasad, Aadil Mansoori, Anirudh Kumar and Subha Narayan Das	195
196.	PHYTONUTRIENT MEDIATED SYNTHESIS AND STABILIZATION OF SILVER NANOPARTICLES FROM THE LEAF EXTRACT OF JASMINUM TORTUOSUM AND STUDIES OF THEIR ANTIBACTERIAL EFFECTS M. P. Somashekarappa	196
197.	POLICIES AND STRATEGIES FOR ORGANIC FARMING IN BUNDELKHAND REGION Abhilasha, Santosh Panday and Pawan Kumar Gupta	197
198.	PRELIMINARY PHYTOCHEMICAL SCREENING OF SOLVENT EXTRACTS OF BACOPA MONNIERI Chhaya Singh	198
199.	PRODUCTIVITY, QUALITY AND PROFITABILITY OF SCENTED RICE AS INFLUENCED BY PLANTING GEOMETRY AND NITROGEN LEVEL Praveen B. R., O. P. Lathwal, Sandeep Kumar and Rakesh Kumar	199
200.	PROSPECT OF INTEGRATED NUTRIENT MANAGEMENT THROUGH PELLETING TECHNIQUE Manish Kumar Sharma and Rajveer Singh Yadav	200
201.	PROSPECTS OF ARTIFICIAL INTELLIGENCE IN AGRICULTURE Deepak Kumar Pathak, Rajeev Ranjan Patel Navneet Maurya and Manoj Kumar	201
202.	QUADRATIC MODEL FOR PREDICTING PEAK YIELD OF CURCUMA LONGA IN RESPONSE TO OPTIMUM DOSE OF NITROGEN FERTILIZER Umakanta Dash, Shilpa, Sourav Ranjan Mohapatra and Ankita Bhardwaj	202
203.	QUALITATIVE ASSESSMENT OF TREATED WASTEWATER BY CONSTRUCTED WETLAND FOR IRRIGATION PURPOSE. Shubham Kumar	203
204.	QUANTIFICATION OF POLLINATION ECOSYSTEM SERVICES OF INDIAN MUSTARD FROM THE IMPACTS OF TROPOSPHERIC OZONE AND ELEVATED CARBON DIOXIDE INTERACTION Gayathri J., D.K. Sharma, Arti Bhatia, Manjunath Prasad C.T., Sudhir Kumar, Sachin Suresh Suroshe and Naresh Kumar S.	204
205.	RADIAL AND LONGITUDINAL SWELLING BEHAVIOUR IN MELIA DUBIA CAV. Toshika Karmakar, Amey Kale, Vinod Kumar, Jahangeer A. Bhat and Manmohan J. Dobriyal	205
206.	RECLAMATION OF PESTICIDES CONTAMINATED SOIL AND WATER USING BIOCHAR: A REVIEW ON ADSORPTION POTENTIAL OF BIOCHAR Akriti Ashesh and Ningombam Linthoingambi Devi	206
207.	REMOTE SENSING AND GIS ANALYSIS FOR LAND COVER CHANGE ASSESSMENT Kiran Doodhawal, R.H. Meena, Hansa Baradwal and Jitendra Singh Bamboriya	207
208.	RESIDUES OF PESTICIDE IN HINDON RIVER FLOWING THROUGH URBAN RICE CROPPING AREA T. Jindal and S. Thakur	208

Sl. No.	Title & Author of the Abstract	Page No.
209.	RESPONSES IN PHOTOSYSTEM PROTECTION AND CELLULAR ANTIOXIDANT DEFENSE SYSTEM IN PONGAMIA PINNATA (L.) PIERRE Badre Alam, Sukumar Taria, Sushil Kumar and A.K. Handa	209
210.	REVIEW ON PLANT TISSUE CULTURE : A SOURCE OF PHYTO-PHARMACEUTICALS Harjeet Singh, Gagandeep Singh, Charul Anand and G. Babu	210
211.	ROLE OF ADVANCED TOOLS AND TECHNIQUES LIKE INFORMATION TECHNOLOGY, BIG DATA ANALYSIS AND ARTIFICIAL INTELLIGENCE IN AGRICULTURE Kandi Laxmi Prasanna	211
212.	ROLE OF ENDOPHYTIC MICROBES IN BIOTIC AND ABIOTIC STRESS TOLERANCE Rohitash Sharma, Deepak Gupta, Basant Kumar Dadarwal, Preeti Basser Harshit Chaturvedi, Gopi Krishan Gour and Mahendra Kumar Ghasoliya	212
213.	ROLE OF ICT (INFORMATION COMMUNICATION & TECHNOLOGY) IN SUSTAINABLE DEVELOPMENT OF AGRICULTURE Abhinav Singh and Virendra Pratap	213
214.	ROLE OF LEGUMES IN SUSTAINABLE CROP PRODUCTION AND MAINTAIN SOIL FERTILITY Anil Jakhar, Sarita Choudhary and Preeti Chahar	214
215.	CHARACTERIZATION OF ELITE COTTON (GOSSYPIUM HIRSUTUM L. AND GOSSYPIUM ARBOREUM L.) GENOTYPES UNDER ORGANIC CONDITION Pardeep Beniwal	215
216.	ROLE OF REMOTE SENSING IN AGRICULTURE Kaptan Baboo, Vishuddha Nand, Shivanand Maurya	216
217.	ROLE OF TREES IN ECOSYSTEM SERVICES: A STUDY OF A GREEN CAMPUS, NEW DELHI Mayank Tiwari and Shakeel Ahmad Khan	217
218.	ROLE OF VALUE-CHAIN ANALYSIS OF HORTICULTURAL CROPS: A BOON FOR LIVELIHOOD SECURITY OF FARMERS IN BUNDELKHAND REGION OF UTTAR PRADESH Pawan Kumar Gupta, Dheeraj Mishra, Rajeev Ranjan Patel and Deepak Kumar Pathak	218
219.	ROLE OF WRKY GENE IN THE DEVELOPMENT OF DROUGHT TO LERANT TOMATO VARIETIES Pratibha Pandey, S.P. Mishra, Major Singh and A.K. Pandey	219
220.	SCREENING OF NUTRITIONAL RICH WHEAT (<i>TRITICUM AESTIVUM</i> L.) VARIETY FOR CENTRAL PLAIN ZONE OF U.P. A.K. Srivastava, Deepu, Mamta Rathore and H.G. Prakash	220
221.	SCREENING STRATEGY FOR HIGH TEMPERATURE TOLERANCE IN GARDEN PEA Janani, R and Shri Dhar	221
222.	SEASONAL FLUCTUATION IN SPINY EEL CATCH VARIETY IN THE RIVER GANGA NEAR PATNA Syed Shabih Hassan	222
223.	SEASONAL FLUCTUATIONS IN THE POPULATION OF PHYTONEMATODES ASSOCIATED WITH KINNOW IN HARYANA Sujata, R.S. Kanwar and Anil Kumar	223

Sl. No.	Title & Author of the Abstract	Page No.
224.	SIGNIFICANCE ON PHYTO-DIVERSITY AND DEVELOPMENT OF REHABILITATION TECHNIQUES FOR MANAGEMENT OF STONE MINE SPOIL AREAS IN SOUTH-EASTERN RAJASTHAN, INDIA S. Kala, B.L. Mina, Ashok Kumar, H.R. Meena, Shakir Ali, I. Rashmi, Gulshan Kumar Sharma and Anita Kumawat	224
225.	SOIL BIOLOGICAL HEALTH IN RELATION TO TREE DENSITY OF HARDWICKIA BINATA ROXB IN AGROFORESTRY SYSTEMS OF SEMI-ARID REGION Rajendra Prasad, A. Arunachalam, S. Debnath, Ashok Shukla and Prashant Singh	225
226.	SOIL HEALTH CARD Mamta Choudhary and Suman Kantwa	226
227.	SOIL HEALTH MANAGEMENT THROUGH INTEGRATED NUTRIENT MANAGEMENT Rajveer Singh Yadav and Manish Kumar Sharma	227
228.	SPATIAL-TEMPORAL ANALYSIS OF AGROFORESTRY AREA IN BUNDELKHAND REGION USING GOOGLE EARTH ENGINE Maneesh Yadav, Abbas Mehdi, A.K. Handa, S. Ramanan, Latika Pandey and A. Arunachalam	228
229.	STATUS OF MEDICINAL PLANTS SECTOR IN INDIA–POTENTIAL, OPPORTUNITIES AND CHALLENGES Saroj Arora	229
230.	STRUCTURAL OPTIMIZATION OF NOVEL INHIBITORS OF MALARIAL ASPARTIC PROTEASES PLASMEPS IN - I & II Amit Kumar Gautam and B. Rupini	230
231.	STUDIES ON COMBINING ABILITY FOR YIELD AND ITS COMPONENTS IN FIELD PEA (PISUM SATIVUM VAR. ARVENSE) Syed Kulsoom Fatima Jafri, Geeta Rai, Devesh Yadav	231
232.	STUDIES ON COMPARATIVE EFFICACY OF DIFFERENT ORGANIC MANURES AND FERTILIZERS ON GROWTH AND YIELD OF SPILANTHES ACMEILLA MURR. Manisha Lakhanpal, and Meenu Sood	232
233.	STUDIES ON FUELWOOD CHARACTERIZATION OF SOME IMPORTANT TREES AND SHRUBS OF SEMI-ARID REGION OF CENTRAL INDIA Vivek Dube, Naresh Kumar, Pankaj Lavania, Asha Ram, Shayma Parveen and A. Arunachalam	233
234.	STUDIES ON GENETIC VARIABILITY, HERITABILITY AND GENETIC ADVANCE FOR YIELD AND YIELD ATTRIBUTES IN BITTER GOURD (MOMORDICA CHARANTIA L.) GENOTYPES Manjulapur Sampath Reddy, P. Prashanth, D. Laxminarayana and P. Saidaiah	234
235.	STUDIES ON NATURAL REGENERATION STATUS OF DEODAR (CEDRUS DEODARA ROXB.) FOREST IN KULLU DISTRICT OF HIMACHAL PRADESH Ghanshyam Singh and Vimal Chauhan	235
236.	STUDIES ON SELECTION PARAMETERS IN INDIAN MUSTARD (BRASSICA JUNCEA (L.) CZERN AND COSS} Devesh Yadav, Lokendra Singh, Syed Kulsoom Fatima Jafri	236

Sl. No.	Title & Author of the Abstract	Page No.
237.	STUDIES ON THE EFFICACY OF BIO-PESTICIDES IN THE MANAGEMENT OF TEAK DEFOLIATOR HYBLEA PUERA (LEPIDOPTERA: HYBLAEDAE) IN SEMI-ARID REGION OF CENTRAL INDIA Sitaram Seervi, B. Gangwar, Pradeep Kumar and Mukesh Kumar	237
238.	STUDY OF THE MORTALITY RATE OF BRINJAL SHOOT AND FRUIT BORER LARVAE (LEUCINODES ORBONALIS) IN LAB CONDITION. Raj Veer Yadav and Anoorag R. Tayde	238
239.	STUDY ON EFFECT OF MASS MEDIA FOR CHANGING FARMER'S SOCIO-ECONOMIC STATUS IN VARANASI DISTRICT OF UTTAR PRADESH Amritanshu Singh, R.K. Doharey, N.R. Meena and Abhinav Singh	239
240.	STUDY ON GENETIC VARIABILITY ESTIMATES OF JACKFRUIT [ARTOCARPUS HETEROPHYLLUS LAM.] GENOTYPES LOCALLY AVAILABLE AT NORTHERN REGIONS OF TRIPURA STATE Abhijit Debnath, Prahlad Deb, Goutam Mandal and Snehasish Chakravorty	240
241.	SUITABILITY OF MULTIPURPOSE TREES AS AN AGROFORESTRY SPECIES IN JHARKHAND Kushmita Dhan and Anil Kumar	241
242.	SURVEY, COLLECTION, CHARACTERIZATION AND NUTRACEUTICAL PROFILING OF MANILLA TAMARIND ACCESSIONS UNDER SEMI-ARID CONDITIONS OF JHANSI DISTRICT OF UTTAR PRADESH Ashok Yadav, A. Arunachalam, Sandeep Garg, Satyam Bansal, Sushil Kumar, A.K. Handa, Inder Deva and Badre Alam	242
243.	SUSTAINABLE ENERGY PRODUCTION FROM ALGAE-A GREEN SOLUTION Anwesha Khanra, Monika Prakash Rai and Shakeel Ahmed Khan	243
244.	SUSTAINABLE FORAGE PRODUCTION IN MELIA AZEDARACH BASED SILVOPASTORAL SYSTEM Firoz Ahmad and M.S. Malik	244
245.	TAXONOMIC APPROACHES FOR THE IDENTIFICATION OF PHYTONEMATODES Chandramani Waghmare and Archana U Singh	245
246.	THE COMPARATIVE STUDY OF DIFFERENT VARIETIES AND SOIL FERTILITY LEVEL ON GROWTH AND YIELD OF TURMERIC CROP (CURCUMA LONGA L.) Satyavir Singh and Guru Dayal	246
247.	THE EFFECT OF BA ON ESTABLISHMENT, SHOOT PROLIFERATION AND GENETIC STABILITY OF GERBERA JAMESONII IN THE IN VITRO CULTURES Satish Kumar, S.K. Sehrawat and Shikha Yashveer	247
248.	TO STUDY THE PROBLEMS FACED BY THE FARMERS OF USING THE MOBILE PHONES IN BALRAMPUR DISTRICT UTTAR-PRADESH Virendra Pratap, Abhinav Singh and Amritanshu Singh	248
249.	TRANSCRIPTOME ANALYSIS TO IDENTIFY CANDIDATE GENES INVOLVED IN NITROGEN USE EFFICIENCY IN MAIZE (ZEA MAYS L.) Prabha Singh, Krishan Kumar, Abhishek Kumar Jha, Pranjal Yadava, Madan Pal, Sujay Rakshit and Ishwar Singh	249

Sl. No.	Title & Author of the Abstract	Page No.
250.	TYPES AND STRUCTURE OF THE SPIDER WEBS IN DIFFERENT HABITATS OF THE TUMAKURU, KARNATAKA, INDIA Parimala B.	250
251.	UTILITY OF AQUACULTURE TECHNOLOGY FOR CROCODILE CONSERVATION R J Rao	251
252.	VARIABILITY AND CHARACTER ASSOCIATION IN M3 GENERATION IN URDBEAN [<i>VIGNA MUNGO</i> (L.) HEPPER] Harshit Chaturvedi and S.S. Punia	252
253.	VARIABILITY IN PHYTHOPHTHORA DRESHLERI F.SP CAJANI ISOLATES CAUSING STEM BLIGHT IN PIGEONPEA FROM BUNDELKHAND REGION Monika Mishra and Ranjana Bhati	253
254.	VECTOR SNAILS AND THEIR CONTROL BY THE USE OF NATURAL PRODUCTS Pradeep Kumar	254
255.	WHOLE GENOME-BASED IDENTIFICATION OF CYTOKININ DEHYDROGENASE GENE FAMILY IN WHEAT (TRITICUM AESTIVUM L.) Priyanka Jain, Ankita Singh, Mir Asif Iquebal, Sarika Jaiswal, Anil Rai, Sundeep Kumar and Dinesh Kumar	255
256.	WHY IS THE GULF OF MANNAR A BIOLOGICAL PARADISE FOR MARINE LIFE? Jyothibabu Retnamma	256
257.	WOOL BASED ENVIRONMENT FRIENDLY SAPLING BAGS FOR HORTICULTURE CROP Vinod Kadam, Nilimesh Mridha, D B Shakyawar, Ajay Kumar, Sekhar Das and Arun Kumar Tomar	257
258.	β-MANNANASE PRODUCTION BY SOLID STATE FERMENTATION USING AGRICULTURAL WASTE (COPRA MEAL AS SUBSTRATE) Hemant Soni* and G. Babu	258
259.	OSMOTIC ADJUSTMENT AND OXIDATIVE STRESS RESPONSES OF INDIAN MUSTARD (BRASSICA JUNCEA L.) VARIETIES UNDER DELAYED SOWING ENVIRONMENT Jyoti Chauhan and J.P. Srivastava	259
260.	ASSESSMENT OF ROOT TRAIT VARIABILITY IN DIVERSE OAT GENOTYPES FOR NITROGEN USE EFFICIENCY Bhayyalal Aanjna, Neeraj Kumar, Richa Patel, Devesh Borban, Rajesh Kumar Singhal, Maneet Rana, Indu, and Shahid Ahmed	260
261.	EXCISED ROOT CULTURES OF COLEUS FORSKOHLII AS AN ALTERNATIVE AND NON-INVASIVE SYSTEM FOR FORSKOLIN PRODUCTION Mohini Sharma, Kiran Devi, Nisha Dhiman, Prakash N. Tiwari, Dinesh Kumar and Amita Bhattacharya	261
262.	ROLE OF MOLECULAR MARKERS FOR GENETIC DIVERSITY ANALYSIS OF COTTON IN MODERN ERA OF SCIENCE: A REVIEW Pardeep Beniwal, D K Shrivastava, Tanay Joshi, Sushma Tiwari and M K Tripathi	262
263.	MOLECULAR CHARACTERIZATION OF PEARL MILLET GERMPLASM LINES AGAINST BLAST DISEASE EMPLOYING SSR MOLECULAR MARKERS Poonam Rajpoot, M K Tripathi, Sushma Tiwari and Ravindra Solanki	263

Sl. No.	Title & Author of the Abstract	Page No.
264.	SCREENING OF WHEAT GENOTYPES FOR RUST RESISTANCE USING MOLECULAR BREEDING APPROACHES Vinay Kumar Hardaha, Pradeep Kumar Yadav, Sushma Tiwari and M.K. Tripathi	264
265.	MORPHO-PHYSIOLOGICAL CHARACTERIZATION OF MAIZE (ZEA MAYS L.) GENOTYPES UNDERWATER STRESS CONDITION Pramod Kumar Yadav, A. K. Singh, M. K. Tripathi and Sushma Tiwari	265
266.	BIOCHEMICAL ANALYSIS OF GROUNDNUT GERMPLASMS FOR YIELD ATTRIBUTING CHARACTERS Praveen Kumar Prajapati, R.S. Sikarwar, Sushma Tiwari, M.K. Tripathi and S.S. Bimal	266
267.	IN VITRO MORPHOGENESIS STUDIES IN POMEGRANATE (PUNICA GRANATUM L.) Ramawatar Choudhary, PKS Gurjar, MK Tripathi, Sushma Tiwari, Mohini Sharma, Shashank Bhargava and Yashi Singh Tomar	267
268.	STANDARDIZATION OF IN VITRO MASS PROPOGATION PROTOCOL FOR BLACK TURMERIC (CURCUMA CAESIA ROXB.) Shashank Bhargava, M.K. Tripathi, Sushma Tiwari and Mohini Sharma	268
269.	GENETICS OF HEAT TOLERANCE IN BREAD WHEAT (TRITICUM AESTIVUM L.) Shivani Upadhyay, Sushma Tiwari, M K Tripathi and Uttam Kumar	269
270.	GENOTYPING BY SEQUENCING APPROACHES FOR CROP IMPROVEMENT Sushma Tiwari, M K Tripathi, R S Tomar, Neha Gupta and Sangeeta Singh	270
271.	GENETIC STUDY OF YIELD ATTRIBUTING TRAITS AND RUST RESISTANCE GENES USING GENE-BASED MARKERS IN BREAD WHEAT (TRITICUM AESTIVUM L.) Vinay Kumar Hardaha, Pradeep Kumar Yadav, Sushma Tiwari, Ravindra Solanki and M.K. Tripathi	271
272.	CLUSTER ANALYSIS FOR GENETIC ASSESSMENT IN GROUNDNUT BY USING D² STATISTICS Yashi Singh Tomar, Sushma Tiwari, M K Tripathi, Shailja Chauhan and Ravindra Singh Solanki	272
273.	SCREENING OF INDIAN MUSTARD (BRASSICA JUNCEA L.) GENOTYPE (S) AGAINST FUNGAL DISEASES BASED ON DISEASE INDEXING AND MOLECULAR MARKERS Aditi Shrivastava, M. K. Tripathi, Sushma Tiwari, Rajitha Sistu, Purnima Singh and Ravindra Singh Solanki	273
274.	APOPTOSIS INDUCING ACTIVITY OF WILD LECTIN AGAINST ENDOMETRIAL CANCER CELLS Neha Gupta and Sameer S Bhagyawant	274
275.	ASSESSMENT OF GENETIC DIVERSITY USING MOLECULAR BREEDING AND BIOCHEMICAL APPROACHES IN KODO MILLET (PASPALUM SCROBICULATUM L.) Ayushi Soni, Sushma Tiwari, M K Tripathi, Ravindra Singh Solanki and Shailja Chouhan	275
276.	STANDARDIZATION OF AN EFFICIENT IN VITRO PLANT REGENERATION PROTOCOL IN POTATO Rahul Sharde, Deepa Bhatt, M. K. Tripathi and Sushma Tiwari	276
277.	SCREENING OF CHICKPEA GENOTYPES AGAINST FUSARIUM WILT USING GENE BASED SSR MARKERS Manisha Mihoariya, Sushma Tiwari, M K Tripathi and Rajitha Sistu	277
278.	IDENTIFICATION OF STABLE WHEAT GENOTYPES USING AMMI MODEL AND DIVERSITY ASSESSMENT FOR RUST RESISTANCE USING MARKER ASSISTED SELECTION Pradeep Kumar Yadav, Vinay Kumar Hardaha, R.S. Sikarwar, Sushma Tiwari and M.K. Tripathi	278

Sl. No.	Title & Author of the Abstract	Page No.
279.	GENETIC DIVERSITY ANALYSIS IN CHICKPEA USING SSR MARKERS Rajesh Ningwal, M.K. Tripathi, Sushma Tiwari, Rakesh Kumar Yadav and Ruchi Asati	279
280.	MOLECULAR, MORPHO-PHYSIOLOGICAL AND BIOCHEMICAL CHARACTERIZATION FOR DROUGHT IN CHICKPEA GENOTYPES Rajitha Sistu, Sushma Tiwari, M.K. Tripathi, Aditi Shrivastava and Manisha Mihoariya	280
281.	EVALUATION OF BIOLOGICAL FACTORS OF INDOOR PLANT SPECIES IN ARID REGION, INDIA Rajbala Soni, Rajesh Dhankar and Surender Verma	281
282.	NON-JUDICIOUS USE OF ANTIBIOTICS IN THE FIELD OF AGRICULTURE AND ANIMAL HUSBANDRY IS EXACERBATING THE PROBLEM OF ANTIMICROBIAL RESISTANCE IN ENVIRONMENTAL SOURCES Asghar Ali and Qazi Mohd. Rizwanul Haq	282
283.	PRESENCE OF CERTAIN PLANT PARASITIC NEMATODES IN LYCOPERSICON ESCULENTUM (TOMATO) IN JHANSI DISTRICT Manvendra Sengar, Abha Sachan and Rajesh Pandey	283
284.	ROLE OF BAMBOO RESOURCES IN SOCIO-ECONOMIC DEVELOPMENT IN TRIBAL COMMUNITIES Ragni Bhargava and G.S Chouhan	284
285.	BIOCHEMICAL STUDY ON SEED PROTEIN PROFILING OF MUNG BEAN GENOTYPES Jayant Nayak, R.S. Sikarwar, M.K. Tripathi, Sushma Tiwari, Neha Gupta, Vimal Sujan and Shailja Chauhan	285
286.	STUDIES ON EFFECT OF DIFFERENT EDIBLE OIL COATINGS ON SHELF LIFE OF GUAVA (PSIDIUM GUAJAVA L.) DURING STORAGE Jyoti Sengar, Praveen Kumar Singh Gurjar, Sushma Tiwari and M.K. Tripathi	286
287.	TRANSCRIPTOME, PROTEOME ANALYSIS AND GENETIC DIVERSITY ASSESSMENT OF FOXTAIL MILLET GERMPLASM FOR DROUGHT AND BLAST STRESS Kiran Makwana, Sushma Tiwari and M K Tripathi	287
288.	STANDARDIZATION OF AN EFFICIENT IN VITRO PLANT REGENERATION PROTOCOL IN POTATO Rahul Sharde, Deepa Bhatt, M. K. Tripathi and Sushma Tiwari	288
289.	ENHANCEMENT OF CHICKPEA AGAINST FUSARIUM WILT EMPLOYING GENETIC, BIOCHEMICAL, MOLECULAR AND IN VITRO SELECTION APPROACHES Rakesh Kumar Yadav, Manoj Kumar Tripathi and Sushma Tiwari	289
290.	EFFECT OF INTEGRATED NUTRIENT MANAGEMENT ON GROWTH, YIELD AND QUALITY OF GARDEN PEA (PISUMSATIVUM VAR. HORTENSE) UNDER GIRD AGRO-CLIMATIC ZONE OF MADHYA PRADESH Renu Jayant, Janmejaya Sharma, D.S. Sasode, Sushma Tiwari and M.K. Tripathi	290
291.	ENHANCEMENT OF CHICKPEA AGAINST DROUGHT EMPLOYING GENETIC, BIOCHEMICAL, MOLECULAR AND IN VITRO SELECTION APPROACHES Ruchi Asati, Manoj Kumar Tripathi and Sushma Tiwari	291
292.	MAPPING QTLS AND GENES FOR FERTILITY RESTORATION IN PEARL MILLET (PENNISITUM GLUCUML) Vinod Patel, M. K. Tripathi, R K Srivastava, Sushma Tiwari and Shailja Chouhan	292

Sl. No.	Title & Author of the Abstract	Page No.
293.	INTEGRATED NUTRIENT MANAGEMENT (INM): MEANING, CONCEPT AND GOAL Prabhu Lal Kantwa, A. K. Dixit and Awanish Kumar	293
294.	MARKER ASSISTED FOREGROUND SELECTION THROUGH MICROSATELLITE MARKERS FOR IDENTIFICATION OF LATE LEAF SPOT DISEASE RESISTANT IN TWO BACKCROSS INDIVIDUALS IN GROUNDNUT (<i>ARACHIS HYPOGAEAL</i>.) Shailja Chauhan, D. L. Savithramma, Manoj Tripathi and Sushma Tiwari	294
295.	BIOPLASTICS - PLANT BASED PLASTICS SUSTAINABILITY FOR ALL Deepa Dhatwalia	295
296.	GERMINATION AND EARLY SEEDLING GROWTH ASSESSMENT OF THIRTY <i>MORINGA OLEIFERA</i> LAM. GERMPLASM COLLECTED FROM BUNDELKHAND REGION Hirdayesh Anuragi, K. Rajarajan, A. K. Handa, and A. Arunachalam	296
297.	NANOTECHNOLOGY AND PLANT PATHOGENS: AN EMERGING DISEASE MANAGEMENT APPROACH Satya Narayan Saini, Suman Choudhary, Meenakshi Arya, P.P. Jambhulkar, Shubha Trivedi, Maharshi Tomar, Shailendra Singh, Ruchira Bajpai and S.K. Chaturvedi	297
298.	NON-JUDICIOUS USE OF ANTIBIOTICS IN THE FIELD OF AGRICULTURE AND ANIMAL HUSBANDRY IS EXACERBATING THE PROBLEM OF ANTIMICROBIAL RESISTANCE IN ENVIRONMENTAL SOURCES Asghar Ali, Qazi Mohd. and Rizwanul Haq	298



abstracts

A COMPARATIVE ASSESSMENT OF POLLUTION PREVALENT IN HOLY RIVERS (GANGA, YAMUNA) OF NORTH INDIA

Manisha Kumari

Amity Institute of Environmental Sciences
Amity University, Noida

ABSTRACT

In India, all the rivers are suffering from colossal pollutant levels. This article focuses on water pollution in north India's Holy rivers (Ganga and Yamuna). It covers information about the source, various pollutants, the effect of contaminants on flora and fauna, and the progress of projects such as GAP, YAP, and Namani Gange Mission made for water pollution control in both the rivers. The present work collects data from the published literature on surface water. This article lists various parameters such as pH, DO, COD, BOD, TDS, EC, and TC for both rivers from different locations. The concentration of trace metals like Zn, Pb, Fe, Ni, Cd, and Cr was also collected from secondary data. In the Yamuna river, DO was Zero at Delhi (Okhla Barrage, Nizamuddin), but in the Ganga river, DO was not Zero at any location. Comparative analysis of heavy metals and physicochemical parameters showed that the Yamuna river is more polluted than the Ganga river. The primary source of pollutants is Domestic sewage and industrial effluents. The presence of heavy metals in river water causes various health issues in living organisms. The present study suggests a dire need for water resource management involving environmental education, awareness, and strict govt policies, participation of residents, students, stakeholders, research institutions, the corporate sector, non-governmental organizations, and local people via water quality monitoring, pollution source identification, pollution control, abatement, and rehabilitation programs.

**A COMPARATIVE EVALUATION OF DISTINCT VERTICAL FLOW
CONSTRUCTED WETLANDS WITH INTERMITTENT AND NO AERATION
STRATEGY TO REDUCE THE INCREASING COD/N LOAD**

Naveen Chand¹, Surindra Suthar² and Kapil Kumar¹

¹Environmental Engineering Research Group,
National Institute of Technology Delhi, New Delhi, India

²School of Environment & Natural Resources,
Doon University, Dehradun, Uttarakhand, India

ABSTRACT

The strength of wastewater is a major factor in determining how it is treated using various procedures. The goal of this study was to determine how increasing COD strength in synthetic wastewater (i.e. COD/N ratios of 1:1, 3:1, 5:1, 8:1, and 10:1) affected the results. The study looked at the efficacy distinct vertical flow constructed wetlands VFCWs ((i.e., SP: a substrate + *Colocasia esculenta*; SB: substrate + BC; SBP: substrate + BC + *Colocasia esculenta*) in combination with intermittent aeration and no aeration to examine how the treatment configurations differed. The setups were created with and without airflow at a rate of $1.0 \pm 0.6 \text{ L min}^{-1}$ for 6 hours d^{-1} . In the wetland treatment reactors, the study reveals that biochar, intermittent aeration, and plant stand (*Colocasia esculenta*) are important for achieving maximum reduction efficacy for COD, $\text{NH}_4 + \text{-N}$, $\text{NO}_3\text{-N}$, TN, and TP (total phosphorous was 99.0, 97.0, 81.0, and 89.0%, significantly higher ($p < 0.05$) than nonaerated VFCW setups as 91.3, 70.9, 86.97 and 64.4%, respectively. As a result, the current study's findings could be really be helpful for conceptualizing constructed wetland as an ecofriendly treatment method for the small settlements, remote, peri-urban areas where high end technology can't end installed. Keywords: Biochar, Constructed wetland, COD, *Colocasia esculenta*, Nitrification, Denitrification, Intermittent aeration.

A CRITICAL REVIEW ON COMMON MEDICINAL PLANTS HELPFUL IN MANAGING DISEASE BURDEN OF UTTAR PRADESH

¹Deepa Sharma, ²Smt. Sapna Avinash Kondalkar
³G. Babu and ⁴Rabinarayan Acharya

^{1,3,4}Central Ayurveda Research Institute, Jhansi, U.P.

²Regional Ayurveda Research Institute, Gwalior, M.P.

⁴Central Council for Research in Ayurvedic Sciences, New Delhi

ABSTRACT

Uttar Pradesh is the fifth largest state by land area and most populous state of India which is located in the north-central part of the country. The disease burden of Uttar Pradesh shows proportion of total disease burden to be from Communicable, maternal, neonatal, and nutritional diseases (CMNNDs) to be 40.5%, non-communicable diseases (NCDs) to be 47.9% and from Injuries to be 11.6% [India: Health of the Nation's States — The India State-Level Disease Burden Initiative. New Delhi: ICMR, PHFI, and IHME; 2017. ISBN 978-0-9976462-1-4.]. Most prevalent diseases being COPD, Diarrhoeal diseases, Ischaemic heart disease, Lower respiratory infections, Tuberculosis etc. Uttar Pradesh has plenty of natural resources too and exhibits a wide range of flora as well. The prices of medicines and pharmaceuticals are difficult to afford for most of the population of developing countries. This study summarizes the prevalent diseases of Uttar Pradesh and explores the medicinal use of local plants which can be beneficial to combat this disease burden based on the reported pharmacological actions. The role of native vegetation in the management of diseases which occur prevalently in that region could be explored in order to provide an effective, yet affordable alternative. Agricultural techniques may also be utilised and communicated to prime cultivators in identified areas to promote cultivation for healthy society and economic benefits.

A SURVEY ON WILD VEGETABLE PLANTS USED IN THE SOUTHERN EASTERN GHAT

**Manojkumar, S., R.P. Gunaga, M.S. Sankanur, S.K. Sinha
H.T. Hegde, A.A. Mehta and L.K. Behera**

ICAR-Central Agroforestry Research Institute
Jhansi, Uttar Pradesh

ABSTRACT

Wild plants refer to those plants that grow without being cultivated; however, they grow naturally in the forests, grasslands and other landscapes. Several wild plants are being utilized by the local communities around the world for food, medicine, fodder, etc. The present investigation, as a part of PG research work of NAHEP-CAAST project, NAU, Navsari, was carried out in the year 2020-21 to identify and document the different wild vegetable plant species used and their pattern of utilization by the local people in the fringe villages of Cauvery wildlife sanctuary situated in the Hanur taluk, Chamaraja Nagara district, situated in the southern eastern Ghats of Karnataka, India. A total of 23 different plant species belonged to 16 families and 21 genera were recorded to be wild vegetables used by the local people. Interestingly, herbs alone contributed 44 per cent of total plants recorded as wild-edibles. Plant leaves (leafy vegetables) were the most used part of a plant in that area. Of the plants used, nine plant species were very most commonly used, eight species were commonly used and six species were rarely used. Further, local people gathered a maximum number of plants from the agriculture fields. Maximum number of edible plants in the study area was available in the rainy season. Moreover, only nine species of wild vegetables were available in the local market. Many of the recorded plants are still collected from the wild; therefore, these species are needs to be domesticated and conserved for future generations.

A TIME-HONORED MEDICINAL PLANT- CASSIA AURICULATA WITH RESOURCE CONSERVATION TECHNIQUES UNDER NON-ARABLE LANDS OF SEMI-ARID REGIONS

S. Kala^{1*}, H. R. Meena, I. Rashmi, Shakir Ali, Ashok Kumar and Anita Kumawat

¹ICAR-Indian Institute of Soil & Water Conservation Research Centre
Kota, Rajasthan, India

ABSTRACT

The *Cassia auriculata* flower (fresh petals /dried form) was traditionally used by anti-diabetic tea in India, China, Srilanka and other Asian countries. Dry flower powder is also having high market value as an important ingredient in many pharmaceutical and cosmetic preparations. While *Cassia auriculata* is one of the important multipurpose woody leguminous shrub having time-honored and high valued medicinal as well as dye yielding traits and it has yet not been utilized effectively so far. This multi-utility plant has high market values in terms fresh and value added products. The main objective of the project is to identify potential *Cassia auriculata* genotype for high density cultivation and resource conservation in non-arable land/degraded land management. Based on over all genotype performance evaluation using various biometrical and biochemical attributes in *Cassia auriculata*. The following genotype viz., CA-4, CA-3 and CA-1 were selected as superior genotypes in terms growth and yield. Finally, CA-4 has been screened as an elite genotype for high density planting under ravine land based on its overall significance in growth and productivity. The field evaluation of high density plantation trial with *Cassia auriculata* (CA-4) was established under six different treatments in Chambal ravine at ICAR-IISWC, Research centre, Kota-Rajasthan during 2019-2021. The treatment (T₄) has shown highest plant growth (134 cm), Average diameter (8.9 mm), plant survival (81.5 %) Average number of stem/plant (6) and Avg. number of flower head/plant (12) compare to other treatments. The comparative assessment of different treatments on plant survival and growth and flower production were clearly indicated that treatment T₄ was significantly best treatment compare to other treatments in ravine land, as a high density plantation under non-arable lands for achieving economic and environmental benefits. So, popularization of identified CA4 –elite genotype with T₄ -SCT as resource conservation techniques at two plant rows interval would be highly helpful for raising commercial. Thus, it can be utilized for rehabilitation, mass afforestation and eco-restoration operations in the degraded drylands with selected resource conservation treatments. It can also fit into agro-forestry, eco-restoration, mass afforestation and soil reclamation programmes as a legume based woody plant.

AGROFORESTRY SUSTAINING THE PAPER INDUSTRY IN DISTRICT SAHARANPUR

Isha katariya

Natural Resources and Sustainable Development
Amity University Campus, Sector-125, Amity University, Noida (U.P.)

ABSTRACT

Star Paper Mills is one of the largest paper mills in India that produces virgin paper. The mill is not only made papers but also promoted agroforestry and the greening of the environment in different districts of western Uttar Pradesh on a large scale part of its Kisan nurseries development program, Star Paper Mills offers good quality seeds of Eucalyptus, poplar, and Bamboo, pesticides, micronutrients, manuals of guidance, etc. to the farmers free of charge. It has distributed millions of seeds of eucalyptus, bamboo and poplars seeds/planting material to the farmers for undertaking agroforestry in their farms. In addition, the company has developed infrastructure to develop superior clones of Eucalyptus and Poplar of high yields and their propagation technology on a commercial scale through vegetative means under standardized mist chamber conditions. In district Saharanpur, there are 80-90 Kisan nurseries at present. In Western Uttar Pradesh, clonal plantations yield double the productivity of seedlings within a shorter period. Farmers are facing so many problems due to lack of awareness and the evaluation of their crop is completely dependent on contractors or middle man. The clonal plantation is like a boon to the farmers. Farmers are giving a very good response to the clonal plantation, On the boundaries of their farmland, they grow mainly Eucalyptus and Poplar. The program of these clonal plants had started before 20 years and this is going on successfully. Day by day the requirement for wood in wood-based industries is increasing and only with the development of Kisan nurseries, it will be possible to meet up with the requirements of industries. This paper tries to assess the contribution of agroforestry for the sustenance of the paper industry, primary survey and focus group discussion has been done with the farmers of the 10 villages providing raw material to the Star mills to assess what has been the impact of agroforestry practices and how it has helped to sustain the paper mill.

AGROFORESTRY SYSTEMS: AN OVERVIEW - INDIAN PERSPECTIVE

A.K. Handa¹, Chhavi Sirohi², A. Arunachalam¹ and Suresh Ramanan S.¹

¹Central Agroforestry Research Institute, Jhansi (U.P.)

²Department of Forestry, CCSHAU, Hisar

ABSTRACT

The Agroforestry System is capable of yielding timber, fuelwood, biofuels, food, fodder, feed, and medicinal and industrial non-timber products, and conserve and rehabilitate ecosystems. However, in recent times it is often equated with the timber production on the farm, particularly in northern India. It is estimated that about half of the country's timber requirement is produced through the Agroforestry systems. There is a need to recognize that Agroforestry in India has numerous forms and combinations – ranging from timber based systems in the north to Kerala home gardens, Khejari systems in semi arid/ arid regions of Rajasthan, and so on. The farmers and land owners in different parts of the country integrate a variety of woody perennials in their crop and livestock production systems depending upon the agro-climatic conditions and local needs. As per the World Bank (2004) report an estimated 1.2 billion rural people currently practice agroforestry on their farms and in their communities, and depend upon its products. At present agroforestry meets almost half of the demand of fuel wood, 2/3 of the small timber, 70-80 per cent wood for plywood, 60 per cent raw material for paper pulp and 9-11 per cent of the green fodder requirement of livestock, besides meeting the subsistence needs of households for food, fruit, fibre, medicine etc. However, at presently the biomass productivity per unit area and time is less than 2 t ha⁻¹y⁻¹. Agroforestry practices have demonstrated that this could be safely enhanced to 10 t ha⁻¹y⁻¹ by carefully selecting tree-crop combinations. Area under forest is degrading due to tremendous demographic pressure and infrastructure growth needs while agricultural area is almost stable. In India, nearly 120.72 million ha land or 37 per cent of the total geographical area is under one or the other forms of soil degradation (e.g., water erosion: 93 million ha, wind erosion: 11 million ha, salt affected soils: 6.74 million ha, and 16.53 million ha of open forest area (2). Up to March 2007, 56.54 million ha area has been treated under various watershed development programmes, however, a sizeable area is yet to be treated. Trees are known to grow in areas polluted by heavy metals and other hazardous industrial chemicals. In fact, there are trees which can absorb and tolerate such pollutants which not only reduce crop yields but also impair quality of crop produce. In India, 24.68 million ha area is suffering from hazardous chemical pollution. These areas can be brought under cultivation through biological amelioration. Agroforestry can play vital role in such endeavours. Meeting diverse needs of people and livestock from limited land resources is only possible when Agroforestry becomes common land use taken on all arable and non-arable land. This will not only avert degradation but also enhance total productivity and restore eco-balance simultaneously. Agroforestry answers many problems that are faced by today's agriculture in terms of stability in production, regular returns, restoration of fertility, indiscriminate deforestation, drought mitigation, use of hazardous chemicals and environmental pollution.

AGROFORESTRY: A WAY TO IMPROVE SOIL HEALTH

**Anand Singh¹, Prashant Deo Singh¹, Prashant Kumar¹, S. K. Singh²,
Safik Ahamad¹, Praveen Kumar¹, Avijit Ghos¹ and Amit Kumar Singh¹**

¹ICAR-Indian Grassland and Fodder Research Institute, Jhansi, UP (India)

²Associate Professor, Seed Technology, BUAT, Banda, UP (India)

ABSTRACT

In order to meet people's current and future demands, sustainable agriculture production relies on scientific soil health management. Soil health is regarded as a key determinant in agricultural production performance. Agriculture intensification leads to nutrient losses due to open nutrient cycling and depletion of soil health/quality. Soil health is deteriorating across all continents and agro-climatic zones. Agroforestry refers to land-use systems in which woody perennials are cultivated in conjunction with herbaceous plants and/or livestock in a spatial arrangement, a rotation or maybe both, and in which the tree and non-tree components of the system interact ecologically and economically. Perennial woody plant-based systems have contributed in increasing soil health (physico-bio-chemical characteristics) and accomplishing the goal of sustainable development. Agroforestry system also adds nutrients in soil through their biomass which after decomposition become a source of nutrients and it also improve soil physical properties. The biological nitrogen fixation and carbon sequestration (soil) in the atmosphere serves to increase soil nutrient status, which aids in the global elimination of poverty. Soil and water conservation, in addition to increasing soil health, helps to boost the productive potential of the soil by preventing erosion losses.

AGROFORESTRY: A SATISFACTORY ACTION OF IMPROVE SOIL HEALTH AND ENSURES THE CONSERVATION OF SOIL & WATER

Payal Choudhary and Pankaj Kumar

Institute of Agricultural Sciences
Bundelkhand University, Jhansi, Uttar Pradesh

ABSTRACT

Agroforestry systems contribute significantly to the conservation of natural resources, particularly soil. Soil conservation is one of the key benefits of agroforestry, but empirical assessments of these benefits have been scarce due to the temporal and spatial complexity of agroforestry systems and soil resource dynamics. The soils are shielded from erosion caused by wind and water. Agroforestry systems mitigate the negative impacts of temperature and wind on soil fertility, soil flora, and fauna. In the context of sustainable management, soil quality, soil resilience or soil conservation, and protection of local or regional agroecosystems, the function and relevance of soils in agroecosystems has been recognised. Agroforestry practises contribute to increased production, improved nutrient cycling, and improved farmer socio-economic position. The dominance of many traditional agroforestry systems in India presents an opportunity for carbon sequestration, improved livelihoods, biodiversity protection, soil fertility improvements, and rural employment that should be reconsidered. Trees can be seen of as investments made by economic agents to keep natural assets like top soil and water from degrading. Farmers employ trees in this way in agroforestry systems by purposely mixing them with agricultural crops on the same plot of land. Despite the fact that one of the key benefits of agroforestry is soil and water conservation.

**AGRO-MORPHOMETRIC GENETIC VARIABILITY AND
DIVERSITY FOR YIELD RELATED TRAITS IN
CHICKPEA KABULI GENOTYPES (*CICER ARIETINUM* L.)**

**Umashankar¹, C. Bharadwaj^{1*}, Neeraj Kumar¹, Tapan Kumar², Yogesh Tiwari³,
Biswajit Mondal³, Inderjit Singh⁴, Shayla Bindra, P. K. Sharma⁵ and Shiv Kumar²**

¹ICAR-Indian Agricultural Research Institute, Division of Genetics, Pusa, New Delhi, India

²ICARDA FLRP, Amlah, Bhopal, MP, India

³ICAR-IIPR, Kanpur, Uttar Pradesh, India.

⁴Division of Plant Breeding & Genetics, PAU, Ludhiana, India

⁵Division of Genetics & Plant Breeding, CCSU, Meerut, Uttar Pradesh, India

ABSTRACT

The ICARDA Chickpea Adaptation Trial (CAT) was carried out to assess the nature and extent of genetic variability, heritability, genetic advance, among the thirty-six chickpea genotypes. The experiment was carried out in a randomized complete block (RCBD) design with two replications during the two consecutive rabi seasons. The analysis of variance (ANOVA) results showed significant differences among all the genotypes for all five Traits. The dendrogram derived from the present study clearly showed three large clusters, among which the IInd was divided into two sub-clusters, IIA and IIB. Results obtained from the analysis of data were used for making similarity index matrix using NTSYSPC software. Mean performance value for different traits studied revealed that the highest mean value for days to 50% flowering and days to maturity which were observed in cluster IIA and cluster III respectively indicates their delayed on two different sets of flowering and maturing nature than the remaining genotypes. While, cluster III and cluster IIB for days to 50% flowering and days to maturity having lowest value indicating their earliness towards both traits respectively. Genotypes of cluster III were also having highest plant height while, its lowest value was recorded in cluster IIA. High seed yielding genotypes were grouped in cluster I whereas, of low mean value in cluster III. 100 seed weight mean value was found highest in cluster III while, it was lowest in cluster IIB. FLIP12193C and FLIP12169C were found to be having maximum similarity with Pusa3022 (Check) as they fall on a single branch. Euclidean distance of 680 unit we could get clearly 3 clusters, Ist, IInd and IIIrd, comparably of single genotype which attached with cluster II roughly at 700 unit of Euclidean distance. Further cluster II had 2 sub clusters, IIA and IIB, comparably these were early maturity. The genotype FLIP8885C seems lowest yielder and hence clustered separately from others. The above results indicate that these genotypes having sufficient genetic diversity to generate segregants through crossing programme.

AN ECONOMIC ANALYSIS OF MARKETING AND PROCESSING OF PAPAYA IN JAIPUR CITY OF RAJASTHAN

Suman Chaudhary and S.S. Jheeba

Sri Karan Narendra Agricultural University, Jobner, Jaipur, Rajasthan

ABSTRACT

Horticulture crops cover large varieties of fruits and vegetables, flowers, plantation/spice crops, medicinal and aromatic plants, roots and tuber crops. During 2016-17, the production of horticulture crops was about 305.40 million tons from an area of 24.925 million hectares. India is the world's second largest producer of fruits next to China that occupied an area of 6.48 million hectares with a production of 92.846 million tons. The original home of papaya is Tropical America. The Papaya (*Carica papaya* L.) is an economically important fruit in India. Brazil stands out as the world's largest producer, supplying 27 per cent of the world demand. India is the fourth largest producer and supplier of papaya in the world. It occupied an area of 1.36 lakh hectare with a production of 6.11 million tons in India out of which it occupied an area of 720 hectare with a production of 10750 tons in Rajasthan. Major papaya growing states in India are Andhra Pradesh, Gujrat, Karnataka and Madhya Pradesh and West Bengal. The present investigation was conducted with the objectives to study market power of papaya wholesalers, price behavior of papaya over a period of time, value addition by different channels of papaya and constraints of papaya marketing. The market power is measured by two indices namely concentration ratio (CR) and Herfindahl-Hirschman index (HHI). The recorded data shows that the four and eight firm concentration ratio is 20.41 and 40.48, respectively. These ratio falls in the category of low concentration which means the market shows perfect competition to an oligopolistic competition. On the other hand the HHI values for four and eight firm are 104.16 and 204.95 which shows that the market is unconcentrated. Total marketing costs in channel-Ia channel-Ib and channel-Ic were observed to be ₹ 811.45 per quintal, ₹ 809.37 per quintal and ₹ 809.19 per quintal respectively in channel-I. Total marketing costs were observed to be ₹ 4770.40 in channel-II. Agency-wise breakup of the overall marketing costs in channel-II revealed that processors incurred the major share and wholesaler cum-commission agent incurred minor share in total marketing cost which accounted 88.82 per cent and 11.12 per cent respectively. Annual wholesale price of the crop exhibited significant linear trend in selected market. The time element alone explained 50.53 per cent variation in the wholesale prices of papaya in the selected mandi during the study period. With respect to arrivals highest indices was in the month of June (166.67) and lowest in January (60.51). Whereas, for prices the highest seasonal index was found July (116.21) and lowest seasonal index in month of June (87.82). The findings of cyclical fluctuations in wholesale price of papaya in muhanamandi exhibited no cycle. The magnitude of irregular fluctuations was recorded to be highest 102.17 in year 2008-09 and lowest 98.77 in year 2009-10. The extent of intra year price rise was observed 32.33 per cent, coefficient of average seasonal price variation was recorded 27.82 and coefficient of variation is 7.94 in selected market. The smaller magnitude of coefficient of variation revealed that there was greater consistency or smaller variability in the monthly prices of papaya in the selected market. The establishment costs of papaya processing units require machinery and equipment average costing ₹ 24,339.83. Average cost of papaya processing was ₹ 2.69 lakh (₹ 85.86 per kilogram). For different processing units, average fixed and variable costs accounted ₹ 1,794.052 (₹ 0.56 per kilogram) and ₹ 2.67 Lakhs (₹ 85.30 per kilogram) respectively. During study period investment in papaya processing units was profitable and financially feasible. NPW was positive, BCR was more than unity in all processing units, PBP and PI was also reliable. The major problems faced by the sellers and processors were higher rental value, higher transportation charges, higher cost of power supply, high market fees and charges, scarcity of labor and in-adequate supply of raw material.

AN INTRODUCTION TO IDEOTYPE BREEDING

**Rohitash Sharma¹, Deepak Gupta², Babulal Dhaka³,
Gopi Krishan Gaur⁴, Harshit Chaturvedi⁵ and Shivashish Verma⁶**

¹²³⁴⁵Department of Genetics and Plant Breeding, SKNAU, Jobner, Rajasthan

⁶Department of Genetics and Plant Breeding, CSAUAT, Kanpur, U.P.

ABSTRACT

The changing climate demands the crop varieties having combination of desirable traits for wider adaptability and higher yield. Breeding to develop the crop varieties possessing a desired set of traits in one type is known as 'Ideotype Breeding' and such a plant is called 'ideotype'. In this type of breeding a conceptual model of plant is developed first and then efforts are made to develop such plants whereas, conceptual breeding does not follow this scheme. Ideotype is developed keeping in mind the objectives and requirements of an ideotype breeding. Usually the varieties developed with individual plants which are weak competitors are preferred to ensure better yield of plant population in the field, because the plants which are strong competitors may perform good individually but performance of population is not encouraging. Ideotype breeding is a systematic way involving various steps such as developing a conceptual plant type, selection of source(s) for the traits, incorporation of desired traits from various sources into one type, and selection of plants with an ideal combination of traits. Generally, the traits having positive correlation among themselves, and with yield are preferred for ideotype. If the traits under consideration are not correlated positively, synchronous improvement in the traits becomes a problem. The ideotype characteristics vary with changing climate and demands. Ideotype breeding is an efficient and effective method of breaking yield barriers, finding solutions of various problems e.g. biotic and abiotic stresses, and developing cultivars for specified environments. On the other hand, this is a slow method of combining various traits from various sources and sometimes success rate of combining various traits is very low due to very strong linkages of desired traits with some unfavourable traits. Ideotype breeding is not a substitute for traditional or conventional breeding rather it is a supplement to the traditional breeding.

AN OVERVIEW: APPLICATIONS OF NANOTECHNOLOGY IN THE FOOD & AGRICULTURE SECTORS TO NURTURE NATURE.

Darshita Rawat* and Kumud Dubey

Forest Research Centre for Eco- Rehabilitation, Prayagra
(A Centre of Forest Research Institute, Dehradun)

ABSTRACT

Agro-food-based nanotechnology is expected to become a propelling economic entity in the upcoming years, as it is among the most essential tools in modern farming. Nanotechnology provides novel agrochemical agents to increase crop output but also creates the possibility of promoting sustainable agriculture & food. Nanotechnology seems to have the potential to enhance resistance to disease, plant development, and nutrients usage by allowing a targeted supply of agrochemicals. Nanotechnology itself and its applicability have surfaced among the most innovative and promising solutions for reshaping the food and agricultural sectors. Nanotechnology offers a wide range of unique applications ranging from fields to fresh food, in order to meet the demands of an ever-increasing population. Current advancements in nanotechnology have led to new avenues, bringing rapid alterations to modern agriculture techniques. The necessity of Nanotechnological applications in agriculture and food industries is highlighted, providing farm-to-fork explanations. It is regarded a burgeoning domain of research that has been subjected in many research disciplines and therefore it is expected to play a pivotal role in food and agricultural sectors in the upcoming years. This article also examines significant breakthroughs regarding nanotech applications in the agricultural field and food industry.

Organized jointly by

National Environmental Science Academy (NESA), New Delhi
Rani Lakshmi Bai Central Agricultural University, Jhansi, U.P.
ICAR-Indian Grassland and Fodder Research Institute, Jhansi, U.P.
ICAR-Central Agroforestry Research Institute, Jhansi, U.P.
Bundelkhand University, Jhansi, U.P.
Central Ayurveda Research Institute, Jhansi, U.P.

ANTIOXIDANT AND ANTIMICROBIAL STUDY OF SCHEFFLERA VINOSA LEAVES CRUDE EXTRACTS AGAINST RICE PATHOGENS

Nitesh Singh and Anirudh Kumar

Department of Botany
Indira Gandhi National Tribal University (IGNTU), Amarkantak, Madhya Pradesh, India

ABSTRACT

Plant extracts are one of the best possible sources of bioactive molecules, and are being used globally as antioxidants and natural antimicrobial compounds. In current study, *Schefflera vinosa* leaves extract was prepared through Soxhlet extraction procedure using methanol and chloroform as solvents. The extract was investigated for total antioxidant, phenolic and flavonoid contents, free radical scavenging and antimicrobial activities. The free radical scavenging activities were evaluated through 2,2-diphenyl-1-picrylhydrazyl (DPPH), 2,2'-azino-bis-3-ethylbenzotiazolin-6-sulfonic acid (ABTS) and Ferric-reducing/antioxidant power (FRAP) assay. The antimicrobial activity of extract was determined through poisoned food method. The methanolic extract has exhibited high antioxidant, phenolic, and flavonoid activities compared to chloroform extract. Similarly, free radical scavenging activities (ABTS, DPPH and FRAP) were higher in methanolic extract. Further, Fourier-Transform Infrared Spectroscopy (FTIR) used to determine the functional group and Gas chromatography-mass spectrometry (GC-MS) to elucidate volatile composition of the crude extract. Different functional group like N-H, O-H, C-O, C-N, C-H, C=O, C≡C and C-O-H presence indicate the existence of many metabolites in the extracts. GC-MS study identified 61 compounds and subsequently, these molecules were screened virtually using DockThor. Furthermore, antimicrobial study was confirmed against rice pathogens like *Magnaporthe oryzae* (M. oryzae) and *Xanthomonas oryzae* pv. *oryzae* (Xoo). Molecular docking study further suggested that phytochemicals (3-Isopropoxy-1,1,1,7,7,7-hexamethyl-3,5,5-tris (trimethylsiloxy) tetrasiloxane, and 2-Methoxy-5-methylthiophene) targets Histone Deacetylase (HDAC) of M. oryzae and Peptide Deformylase (PDF) of Xoo, which could inhibit their growth. Hence, this study indicated that *Schefflera vinosa* extracts could be an important ingredient as an antioxidant as well as antimicrobial agent against rice pathogens. Keywords: Antioxidant, Antimicrobial, Plant extracts, Molecular docking, Phytoconstituents. Biography of presenting author Nitesh Singh, Completed his 12th in year 2011, Graduation in year 2014, M.Sc in Life Sciences from Babasaheb Bhimrao Ambedkar University (a Central University) Lucknow, India in year 2016. Recently

**ANTIOXIDANT AND ANTI-INFLAMMATORY ACTIVITY OF
GREEN SYNTHESIZED SILVER NANOPARTICLES USING
TRIFOLIUM ALEXANDRINUM LEAVES EXTRACT**

**Oshin Verma*, Smrati Sharma, Tejveer Singh¹
Radhakrishna Auji¹, Ramesh Kumar²**

¹Indian Grassland and Fodder Research Institute,
Indian Council of Agricultural Research, Jhansi (U.P. India)

²Department of Biochemistry, Bundelkhand University, Jhansi, (U.P. India)

ABSTRACT

Inflammation and oxidative stress are closely related pathophysiological conditions, one of which can be easily induced by another. Both of these processes are the underlying cause of many chronic conditions such as multiple sclerosis, diabetes, rheumatoid arthritis and coronary artery disease. Further, oxidative stress is a major concern that can activate a variety of inflammatory pathways leading to chronic conditions including cancer, diabetes, cardiovascular, neurological and pulmonary diseases. Although synthetic drugs have been proved to be effective for controlling inflammatory disorders, adverse effects of these medications cause an increasing interest in the development of alternative tools that exhibit novel mechanisms of action from different origins. In this regard, green metal nanoparticle synthesis is promising and offers alternative therapeutic options effective against a wide variety of diseases. Therefore, AgNPs was synthesized using *Trifolium alexandrinum* leaves extract. Further, UV-Vis spectroscopy was applied for the investigation of the reaction proceeds. To characterize the greenly synthesized AgNPs, Fourier-transform infrared spectroscopy (FTIR), dynamic light scattering (DLS) particle size, and zeta potential were utilized. In addition, antioxidant and anti-inflammatory activities of the greenly synthesized AgNPs were evaluated. The dose-dependent antioxidant activity of AgNPs imparted by the plant phenolic and flavonoid components was evaluated using in vitro 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay and found to be comparable to standard ascorbic acid. The AgNPs had shown 82% inhibition with scavenging DPPH activity. Considering the anti-inflammatory activity (1% albumin denaturation), the green synthesized AgNPs inhibited the heat denaturation of proteins by $546.6 \pm 4.65\%$. The characteristics of the synthesized silver nanoparticles suggest their application as a potential anti-inflammatory and antioxidant agent.

ANTIOXIDANT RESPONSE DURING AGEING IN OAT SEEDS

Reetu Verma¹, Bhumika Khare² and Maharishi Tomar²

^aICAR-Indian Grassland and Fodder Research Institute, Jhansi, India

^bBundelkhand University, Jhansi, India

ABSTRACT

Oat (*Avena sativa* L.), a member of the family Poaceae is one of the major cereal crops of the world. Oat is grown for grain as well as fodder, hay, and silage. Many of the processes implicated in seed ageing appear to be mediated by free radicals and is suggested to be a primary cause of deterioration in stored seeds. Seeds contain numerous free-radical scavenging enzymes, such as catalase (CAT), peroxidase (POD) and superoxide dismutase (SOD). These enzymes are known to intricately modulate reactive oxygen species (ROS). The present study was conducted to assess the activities of three antioxidant enzymes viz. SOD, CAT and POD in seeds of 26 diverse oat varieties (UPO-94, RO-19, SKO-20, HJ-8, OS-7, JHO-851, JO-09-93, OS-6, HFO-114, SKO-90, JHO-2001-3, SKO-96, Kent, NDO-1, JHO-2004, UPO-212, Sabazar, NDO-2, JHO-99-1, OS-346, JHO-99-2, JO-03-91, OL-125, PLP-1, JHO-822 and JO-1) from four years (2014-2017). SOD activity was observed from 86.86 to 188.06 U/mg protein in 2017, 68.49 to 144.21 U/mg protein in 2016, 54.25-118.39 U/mg protein in 2015 and 44.88-98.75 U/mg protein in 2014, respectively. Varieties JHO-99-1, JO-03-91, JO-03-91, SKO-20, UPO-212, HFO-114, JHO-822, PLP-1 and JO-1 were observed superior. CAT was found from 0.082 to 0.279 U/mg protein in 2017, 0.069 to 0.208 U/mg protein in 2016, 0.034 to 0.133 U/mg protein in 2015 and 0.006 to 0.092 U/mg protein in 2014, respectively. UPO-94, JO-03-91, SKO-90, OS-6 and JHO-851, SKO-20, OL-125 and JHO-99-1 showed maximum CAT activity. POD showed variations from 0.561 to 1.613 U/mg protein in 2017, 0.383 to 1.453 U/mg protein, 0.268 to 1.179 U/mg protein and 0.184 to 0.783 U/mg protein, respectively. SKO-20, OL-125, JO-03-91, JHO-99-1, RO-19, OL-125, Sabazar and PLP-1 showed the highest value of POD activity. Based on the biochemical analysis, wide variations were found among 26 oat varieties. SOD, CAT and POD activity decreased with ageing.

ANTI-TRANSPIRANT SPRAYS CAN IMPROVE CALCIUM CONTENT OF APPLE FRUIT

Tashi Angmo*¹, M. U. Rehman¹ and Safina Kosser²

¹Division of Fruit Science SKUAST-K, Shalimar, Srinagar, India

²Division of Fruit Science SKUAST-J, Chatha, Jammu, India

ABSTRACT

Calcium, one of the most important mineral element determining the quality of the fruit; is poorly translocated in certain fruit crops particularly apple, consequently affecting its keeping quality. The reason being the mobility of calcium through xylem only which within the fruit tissue gets disintegrated at the cell expansion phase. In an attempt to increase calcium content of such fruits foliar application of calcium salts have been practiced for decades. But even numerous sprays did not always achieve the desired effects. Knowing that calcium moves mainly with the transpirational stream, uptake of calcium can be promoted by changing the sink strength by decreasing leaf transpiration and by increasing abundance of functional xylem vessels in fruit. In this regard an experiment was conducted at SKUAST-K, Shalimar campus in which apple trees were treated with anti-transpirants: ABA@ 400ppm, kaolin@ 50000 ppm and salicylic acid @150ppm; and calcium chloride @ 4000 ppm at four different stages at an interval of 35 days, starting at 40 days after full bloom, on two different apple varieties (Super Chief Sandidge and Golden Delicious Reinders). Investigation revealed that all the anti-transpirants and calcium chloride spray had significant influence on fruit calcium content. However, Maximum values for fruit calcium content were observed in Abscissic acid treated fruits. ABA, a plant growth regulator, used as anti-transpirant improved calcium uptake and also increased xylem distribution within the apple fruit. Therefore, treating the plants with anti-transpirants has proved to be a very useful approach in increasing fruit calcium through specific reduction of leaf transpiration without significant changes in fruit yield.

PROSPECT OF INTEGRATED NUTRIENT MANAGEMENT THROUGH PELLETING TECHNIQUE

Manish Kumar Sharma*¹ and ²Rajveer Singh Yadav

Indira Gandhi Agricultural University, Raipur, Chhattisgarh
Mahatma Gandhi Chitrakoot Gramodaya Vishwavidyalaya, Chitrakoot, Satna (M.P.) India

ABSTRACT

The importance and need of integrated nutrient management has been realized very much now-a-days. The integration of inorganic and organic sources not only ensures nourishment of crop but also improves soil health in sustainable manner. The pelleting of inorganic and organic sources helps in cutting down requirement of chemical fertilizer by increasing nutrient use efficiency. Pelleting method helps in reducing losses of nutrients by slow release of nutrients. In an experiment conducted at Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.) in Kharif-2012, it has been found that rice yield recorded 5.63 t ha⁻¹ under pelleted 2.5 t FYM + 80:50:30 kg N: P₂O₅:K₂O ha⁻¹. The highest nitrogen, phosphorus and potassium use efficiency were also recorded under same treatment. Importance of pelleting technique can be increased by conducting more experiments in different crops.

APPLICATION OF DSSAT CERES-MAIZE MODEL: INTERCOMPARISON OF FUNCTIONS FOR PHENOLOGICAL RESPONSES TO TEMPERATURE

M. Swetha Sree

Regional Agricultural Research Institute, ANGRAU, Tirupati

ABSTRACT

Agriculture is strongly influenced by weather and climate. Climatic variables especially temperature impacts is critical for agriculturalist to ensure global food security. Adaptive measures should be taken to mitigate the adverse effects. Crop modeling is widely accepted as a useful tool for research and management purposes in agriculture. The objective of this study was to validate the potential effects of temperature on maize phenology and grain yields of maize using DSSAT CERES-Maize model. A split plot design field experiment was carried out with hybrids (DS 900M, Pinnacle and CP818) of maize and dates of sowing (June II FN, July I FN, July II FN and August I FN). The data reveals that crop weather interactions particularly interms of temperatures in Pinnacle hybrid recorded higher Growing degree days (3053.3°C) and heat use efficiency ($1.0 \text{ kg ha}^{-1}\text{ }^{\circ}\text{C day}^{-1}$) compared to D.S 900M and CP818. Days after planting to anthesis (observed (DAS): 58.3 ± 2.13 days; DSSAT-CERES-Maize (DAS)- 58.3 ± 2.13 and RMSE= 6.58 days) and maturity (observed (DAS): 104.08 ± 5.97 days; DSSAT-CERES-Maize: 104.08 ± 5.97 and RMSE= 5.46 days). Observed Maize grain yield was 2811.2 ± 802.8 and DSSAT-CERES-Maize simulated mean yield was 2769.9 ± 846.1 and the RMSE was 244.3 kg ha^{-1} . The model validion showed good consistency for grain yield, number of days to anthesis and physiological maturity, number of grains per m^2 were as it was fair for unit grain weight at maturity and poor for stover weight and harvest index.

APPLICATION OF REMOTE SENSING IN AGRICULTURE

Hansa Baradwal¹ and Avijit Ghosh²

¹Bundelkhand University, Jhansi, U.P.

²Indian Grassland and Fodder Research Institute (IGFRI) Jhansi, U.P.

ABSTRACT

Remote sensing has been found to be a valuable tool in evaluation, monitoring and management of land, water and crop resources. The launching of the Indian remote sensing satellite (IRS) has enhanced the capabilities for better utilization of this technology and significant progress has been made in soil and land cover mapping, land degradation studies, monitoring of waste land, assessment of crop conditions crop acreage and production estimates. The basic principles of remote sensing with satellites and aircraft are similar to visual observations. Energy in the form of light waves travels from the sun to Earth. Light waves travel similarly to waves traveling across a lake. The distance from the peak of one wave to the peak of the next wave is the wavelength. Energy from sunlight is called the electromagnetic spectrum. Remote sensing are important tools in timely monitoring and giving an accurate picture of the agricultural sector with high revisit frequency and high accuracy. For sustainable agricultural management, all the factors which are influencing the agricultural sector need to be analyzed on spatio-temporal basis. The remote sensing along with the other advanced techniques such as global positioning systems and geographical information systems are playing a major role in the assessment and management of the agricultural activities.

**APPLICATION OF SOIL ENZYMATIC DYNAMICS FOR EVALUATION
OF BIOREMEDIATION OF CHLORPYRIFOS CONTAMINATED SOIL BY
BIOCHAR AIDED *PELARGONIUM GRAVEOLENS* L. VEGETATION**

Ranu Yadav and Puja Khare

Crop Production and Protection Division
CSIR-Central Institute of Medicinal and Aromatic Plants, Lucknow, India

ABSTRACT

Chlorpyrifos, a broad-spectrum organophosphorus insecticide is known for deleterious effects on the soil enzymatic activities. The present study examines the ameliorative effect of the aromatic crop (*Pelargonium graveolens* L.) vegetation and biochar amendment (4% w/w) on chlorpyrifos contaminated agriculture soils (having concentration: S1: 46.1 and S2: 95.5 mg kg⁻¹). The phytoremediation efficiency and tolerance of *P. graveolens* for chlorpyrifos with and without biochar amendment were evaluated in a greenhouse experiment. The enzymes involved in the mineralization of phosphorous (alkaline phosphatase), nitrogen (N-acetyl glucosaminidase), sulfur (aryl sulphatase), carbon (cellulase, β -glucosidase, dehydrogenase, phenoloxidase), and peroxidase were used for soil enzymatic stoichiometry with vector analysis and enzyme-based indices (W_{Mean} , G_{Mean} , IBRV2, TSQI, and BAI). The results of the study demonstrated that the biochar incorporation enhanced the activities of ecoenzymatic (16.7-18.6%) along with the tolerance of *P. graveolens* (from 42-45% to 55-67%) in chlorpyrifos contaminated soil. The increase in soil enzymatic activities and enzyme base indices in BC-aided *P. graveolens* planted soil as compared with their control suggested a reduction in the toxicity of chlorpyrifos on soil microbiota. The gradual increase in vector angle ($A^\circ > 45$) with soil enzyme stoichiometry over time suggests improved nutrient acquisition. The present study concludes that biochar supplement with *P. graveolens* improves the biological health of soil and plant productivity in chlorpyrifos contaminated soil.

APPLICATIONS OF CRISPR CAS9 IN CROP IMPROVEMENT

Shubham

Rani Lakshmi Bai Central Agricultural University, Jhansi

ABSTRACT

Right from the beginning, the field of genetics is filled with groundbreaking discoveries and innovations. One such innovation is CRISPR Cas9 which is the easiest, cheapest and fastest genome editing tool. CRISPR stands for Clustered Regularly Interspaced Short Palindromic Repeats which can be characterized as one of the main parts of the bacterial immune system to prevent itself from attacks of viruses.

Talking about the applications, CRISPR can be used to treat several genetic diseases in humans as well as livestock by deleting or switching off the causing gene. It has tremendous scope in agriculture science in the areas of mutation breeding, crop improvement, climate resilient agriculture, biofortification, and making of model plants to understand the complex genetic crops like wheat. Some examples of such applications include the browning-resistant mushrooms, low-nicotine tobacco, high-amylopectin waxy corn (*Zea mays*) and false flax (*Camelina sativa*) with enhanced omega-3 oil etc. which were approved by the US Department of Agriculture (USDA) in record time. This technology has tremendous impacts on agricultural and horticultural crops like high vitamin C content and resistance to bacterial spot disease in tomato, elimination of gluten for celiac patients in wheat, cold as well as submergence tolerance and blast resistance genotypes in rice, early flowering genotypes in soybean, citrus canker resistance in citrus by knock-out of susceptibility gene, high starch content in potato, resistance to ipomovirus in cucumber etc.

In conclusion, tools like CRISPR Cas9 with precise genome editing abilities are the need of the hour for controlling the gene expressions in plants and producing desirable varieties for achieving the goal of zero hunger and food security.

ARTIFICIAL INTELLIGENCE IN AGRICULTURE

Suman Kantwa and Mamta Choudhary

Sri Karan Narendra Agriculture University
Jobner, Jaipur, Rajasthan, India

ABSTRACT

According to Food and Agriculture Organization of the United Nations, the world population will reach over 9 billion by 2050. Rapid population growth, shrinking farmland, dwindling natural resources, erratic climate changes, and shifting market demands are pushing the agricultural production system into a new paradigm. The new agricultural system must become more productive in output, efficient in operation, resilient to climate change, and sustainable for future generations. In such circumstance more efficient farming practices can be attained using the recent technological advancements and solutions to current bottlenecks in farming. A direct application of AI (Artificial Intelligence) or machine intelligence across the farming sector could act to be an epitome of shift in how farming is practiced today. Farming solutions which are AI powered enables a farmer to do more with less, enhancing the quality, also ensuring a quick GTM (go-to-market strategy) strategy for crops. Artificial Intelligence in agriculture has brought an agriculture revolution.

ASHWAGANDHA (*WITHANIA SOMNIFERA*): A MEDICINAL HERB

Preeti Basser*, Sheetal Gupta and Rohitash Sharma

Department of Genetics and Plant Breeding
Maharana Pratap University of Agriculture and Technology, Udaipur (Rajasthan), India

ABSTRACT

Ashwagandha is one of the most popular medicinal plants commonly known Winter Cherry or Indian ginseng which is well known herb possessing several medicinal benefits and is important 'Rasayana' as "Sattvic Kapha Rasayan" in Indian Ayurveda. Different parts of the plant are used for various purposes; for example, ointment from leaves and berries is applied to treat cuts, wounds, abscesses, and inflammation. Ashwagandha roots have been commonly used for several kinds of herbal formulations. The roots of Ashwagandha has more than 35 chemicals constitutes. Most of pharmacological activities of ashwagandha have been attributed to two main withanolides, withaferin A and withanolide D. The plant root is used as a popular supplement for lessening anxiety and stress. In addition to its high antioxidants content, the consumption of the roots improves cardiovascular health, reduces swelling and stress, strengthens heart muscles, regulates cholesterol, and reduces hair loss in the human body. Moreover, the roots have also been used for veterinary purposes to treat cattle. A decoction of cooked roots and leaves fed to sheep, cows, and buffalo enhances milk production, while it is also used as an antipyretic and sexual tonic. Ashwagandha leaves possess considerable anticancer activities. Active constituents for these bioactivities were identified as two main Withanolides, Withanone and Withaferin A in i-Extract, and triethylene glycol in WEX. The low doses of leaf extracts protect normal cells against oxidative stress. The extracts and the purified constituents (Withanone, Withanolide A from i-Extract, and triethylene glycol from WEX), when used at low dose, protected the glial and neuronal cells from oxidative stress. Furthermore, combination of the extracts and active components were highly potent, endorsing the therapeutic merit of the combinational approach.

**ASSESSMENT OF GENETIC DIVERSITY AND ASSOCIATED
CHARACTERS ANALYSIS FOR YIELD AND IT'S COMPONENT
TRAITS IN KODO MILLET (*PASPALUM SCROBICULATUM* L.)**

K K Sharma and Ruchi Bishnoi

¹Genetic and Plant Breeding, COA. JNKVV Jabalpur, Madhya Pradesh

²SHUATS Prayagraj, Uttar Pradesh

ABSTRACT

The present investigation was carried out to evaluate 21 Kodo millet genotypes to study the extent of genetic variability for yield, different yield attributing characters and their association with seed yield and also to find out the extent of genetic divergence prevailing among the genotypes. These were evaluated in randomized complete block design with three replications under All India Coordinated Research Project on Small Millet, at the Instructional Farm of the College of Agriculture, Rewa (MP) during *kharif* 2019. The genotypes KMNDL-3, KMNDL-2, RPS-520, DK-159 found highest yielding among all the 21 genotypes. Highest estimates of PCV and GCV were observed for harvest index and grain yield per plant. High estimates of heritability were recorded for biological yield per plant, day to 50% flowering, ear length and harvest index. High genetic advance was recorded for harvest index and grain yield per plant. Thus, these characters showed additive gene action in their expression. Strong association of grain yield/plant with harvest index, number of racemes above thumb and day to maturity at phenotypic level revealed that selections based on these traits would ultimately improve the grain yield. Path analysis indicated that harvest index had the maximum positive direct effect on grain yield per plant followed by biological yield per plant, day to maturity, number of racemes above thumb, number of tillers per plant and day to 50% flowering. It means these characters may be included in selection criteria for crop improvement in kodo millet. Based on relative magnitude of D^2 estimates the 52 kodo genotypes were grouped into 5 distinct non-overlapping clusters. Among 5 clusters, Cluster I had highest number of genotypes 11. Highest inter-cluster distance was observed between cluster IV and II for maximum numbers of traits. Highest intra-cluster distance were observed between cluster III and cluster IV.

ASSESSING IMPACT OF ECO-FRIENDLY IRON AND ZINC OXIDE NANOPARTICLES FABRICATED VIA GREEN SYNTHESIS ON GRAPEVINE CV. THOMPSON SEEDLESS

Yukti Verma¹ and Ajay Kumar Upadhyay²

^{1,2}ICAR-National Research Centre for Grapes
Pune, Maharashtra, India

ABSTRACT

Abstract: For the past few decades, meticulous research efforts have been made in the direction of synthesizing cost-effective nanoparticles for enhancing nutrient use efficiency. Considering this, eco-friendly nanoparticles of iron and zinc were fabricated through novel green route using grapevine cv. Manjari Medika pomace. The total phenol and flavanoid content was determined in pomace extract using methanol as extraction solvent. The obtained products (assumed as Fe-NPs and Zn-NPs) were subsequently characterized by Fourier Transform Infrared Spectroscopy (FTIR), UV-vis spectra, Scanning Electron Microscopy (SEM) and Particle Size Analysis techniques. The LCMS/MS was performed for the identification of biomolecules present in the grape pomace extract for formulating Fe-NPs and Zn-NPs. The FTIR peaks of Fe-NPs at 433 and 518 cm^{-1} indicated Fe-O vibration confirming the synthesis of iron oxide nanoparticles. The morphology of Fe-NPs was monitored by SEM analysis and particles were found in agglomerated form. The mean particle size of Fe-NPs was found to be 74.52 nm. The FTIR peaks of Zn-NPs at 406.05, 835.18 and 879.54 cm^{-1} indicated Zn-O stretching vibrations; 1394.53 cm^{-1} corresponded to C=C, the peak at 2322.29 cm^{-1} was ascribed to C \equiv C stretching vibration. The morphology of Zn-NPs was mostly spherical/agglomerated in shape and the mean particle size was 90.67 nm.

To assess the impact of nanoparticles on grapes, pot culture studies as well as field experiments were conducted. A significant increase in leaf Fe (+30.28% and +36.59%) and Zn content (+20.90% and +28.39%) was recorded after 14 and 28 days of application of Fe-NPs and Zn-NPs over conventional fertilizers in field studies. Similarly, a significant increase in berry Fe (+36.98%) and Zn (+30.07%) content was recorded. These findings suggested that Fe and Zn-NPs have potential applications and could be used as a promising candidate for enhancing micronutrient content in grapes.

ASSESSING THE IMPACT OF ELEVATED OZONE AND OZONE PROTECTANTS ON RHIZOSPHERIC ENZYMES OF GARLIC (*ALLIUM SATIVUM*)

Gayathri J^{1*}, Boomiraj K² and Avudainayagam S²

¹Division of Environmental Science, Indian Agricultural Research Institute, New Delhi

²Tamil Nadu Agricultural University, Coimbatore

ABSTRACT

Tropospheric ozone is a phytotoxic air pollutant which is a consequential issue due to its increasing concentration levels that provides way to lower agricultural productivity. It is a short-lived greenhouse gas formed from the photochemical dissociation of CO, methane or NMVOCs emitted from vehicles, solvents, industries etc. The study conducted in the part of Western ghats (Nilgiris) which is a well-known biodiversity hotspot. The increasing ozone concentration levels intended us to study the impact of elevated ozone on rhizospheric soil enzymes in garlic. The soil enzymes are important to maintain soil health that support and produce healthy plants. The pot experiment was conducted in Open top chamber (OTC) where the commercial variety of garlic (Ooty 1) been exposed to different elevated ozone levels of 150ppb and 200ppb and their interaction with farmers' friendly ozone protectants (Panchagavya, Neem oil and Ascorbic acid) which helped in scavenging the ozone effects on apoplast of the crop were also assessed. Soil enzymes were showed significant differences due to exposure under elevated ozone concentration. The highest value of catalase ($5.38\mu\text{g}$ of $\text{H}_2\text{O}_2/\text{g}$ of soil) and Beta-glucosidase ($155.15\mu\text{g}/\text{g}$ of soil) was recorded in T_1 – Ambient ozone level, whereas highest value of alkaline phosphatase ($405.87\mu\text{g}/\text{g}$ of soil) urease ($91.80\mu\text{g}/\text{g}$ of soil) was observed in T_3 – Elevated ozone exposure @ 200 ppb. Treatment T_{10} – Elevated ozone exposure @ 200 ppb + foliar spray 3% Panchagavya has recorded highest peroxidase activity in soil, whereas highest acid phosphatase activity ($405.87\mu\text{g}/\text{g}$ of soil) was recorded in T_4 – Ambient Ozone level + foliar spray 3% Panchagavya. The ozone protectants (panchagavya, neem oil and ascorbic acid) helped in scavenging the ozone in the apoplast of the leaves of garlic, among them panchagavya performed well followed by neem oil and ascorbic acid. Moreover, the tropospheric ozone effects on yield and quality of both agricultural as well as horticultural crops requires more attention to withstand productivity for future climatic change scenarios and identification of suitable remedial measures against tropospheric ozone to sustain our food production for ensuring food security.

**ASSESSMENT OF ABOVE GROUND BIOMASS, CARBON
ACCUMULATION OF *DENDROCALAMUS STRICTUS* AND
*THYRSOSTACHYS OLIVERI***

Neha Devi¹, Ajay Thakur² and Hukum Singh³

^{1,3}Forest Ecology and Climate Change Division, FRI, Dehradun, India

²Tree Genetics and Tree Improvement Division, FRI, Dehradun

³Forest Ecology and Climate Change Division, FRI, Dehradun, India

ABSTRACT

The bamboo stands have uneven age structure, and often differently aged culms are found distributed throughout a stand. Bamboos can be integrated into a variety of land use-based climate change mitigation activities such as agro-forestry systems, afforestation/reforestation as they are the fastest growing plants. The carbon content of the stock comprises about 50% of the total biomass. Due to its high growth rate compared to the most other plant species, bamboos have become a favourite choice of species to absorb atmospheric carbon and is expected to play a bigger role in mitigating the impact of future climate change. The aim of this study was to compare the stand distribution of *Dendrocalamus strictus* and *Thyrsostachys oliveri* estimate the aboveground biomass (AGB) and carbon storage in different components of the bamboo species; develop allometric models to estimate the AGB of the bamboo species and, compare the most efficient at aboveground biomass accumulation values of raw and carbonized culms of the bamboo species grown in the New forest area, Forest Research Institute, Dehradun. The values of R^2 were calibrated >0.85 for all the selected models stipulating that all models are apparently equally efficient. The $(Y=a \times DBH^b)$ was found to be the best performing allometric model and was used for fitting different biomass components using DBH as illustrative variable. Enriching degraded forests and deforested areas with such a bamboo species could be an effective means of increasing the carbon sequestration potential of such ecosystems. Intensification of bamboo plantation in India can potentially contribute substantially to carbon mitigation and sustainable energy production.

**ASSESSMENT OF CUTTING SIZE AND EXOGENOUS HORMONE
TREATMENT ON SPROUTING AND ROOTING POTENTIAL IN THE INDO-
PACIFIC MULTIPURPOSE LEGUME TREE-*Parkia timoriana* (DC.) Merr.**

Manish Kumar Singh, Papori Borpuzari and Priyanka Saikia

Silviculture and Forest Management Division,
Rain Forest Research Institute, Jorhat, Assam

ABSTRACT

Different hormonal treatment and their interaction with stem cutting sizes on sprouting, rooting potential and subsequent transplanting survival percentage of the commercially important multipurpose legume tree *Parkia timoriana* were investigated. The study was conducted in partially controlled environment with two factorial treatments considering factor A cutting size (long cuttings: dia. 2-2.5 cm with 4-5 nodes and mini cuttings: dia. 1-1.5 cm with 1-2 nodes) and factor B rooting hormone in different concentrations [Indole-3-butyric acid (IBA), Naphthalene Acetic Acid (NAA) and Indol-3- Acetic acid (IAA)] in 50 ppm, 100 ppm and 200 ppm, while the untreated cuttings were used as control. 30 cuttings of each size bearing desired number of buds were planted in polybag (sand, soil and FYM in 1:1:1 ratio) for each treatment. In present study, long cutting of *Parkia* significantly enhance the sprouting parameters i.e. days to sprout, sprout length, sprout diameter as well as rooting parameters i.e. root length, rooting percentage. Also, long cuttings have higher transplanting survival percentage as compared to mini cuttings. Long cuttings treated with IBA 200 ppm significantly improved survival percentage (87%) and rooting percentage (87.5%) followed by NAA (200 ppm) as compared to other treatments. In addition, the impact of different hormonal concentration on survival percentage and rooting percentage for mini cuttings were significantly very low compared to long cuttings. Thus, it is advisable to use long cuttings, along with application of IBA (200 ppm) and NAA (200 ppm) for propagating of *P. timoriana* through stem cutting.

NATURAL FARMING : A VISION TOWARDS A HEALTHY NATION

Priyanka Kantwa and Gunjan Guleria

College of Agriculture, RLBCAU, Jhansi

ABSTRACT

Natural farming is an ecological farming approach established by Masanobu Fukuoka (1913–2008), a Japanese farmer and philosopher. It was introduced in his book 'The One-Straw Revolution' in 1975. which is also referred as "THE FUKUOKA METHOD" or "THE NATURAL WAY OF FARMING " or "DO - NOTHING FARMING". Due to losses caused by conventional farming like losses of biodiversity, reduction in soil fertility and productivity, increased weed resistance and many more, thus we are moving towards natural farming. The advantages of natural farming includes reduced exposure to pesticides and chemicals, builds up healthy soil and helps in combating erosion, fighting the effects of global warming, supports water conservation and discourages the algal blooms, supporting animal health and welfare and increases the biodiversity. The four pillars of zero budget natural farming are 1. Jivamrita / Jeevamrutha: fermented microbial culture that provides nutrients to soil and also promotes the activity of various microorganisms and earthworms in the soil. 2. Bijamrita / Beejamrutha: the process of treating seeds or plant material with cow dung and cow urine to provide protection against various fungal and soil borne diseases. 3. Acchadana (mulching): the application of soil mulch, straw mulch (dried biomass waste of previous crop) and live mulch (symbiotic intercrops and mixed crops) to the growing crops. 4. Whapasa (moisture): the roots of plants need water vapours instead of water

ASSESSMENT OF GENETIC VARIABILITY IN CHICKPEA GENOTYPES AGAINST TEMPERATURE EXTREMITIES

**Somsole Bharath¹, Neeraj Kumar¹, R.V. Charitha Reddy¹, Amita Singh¹,
Anshuman Singh^{1*}, Meenakshi Arya², Rumana Khan¹ and S.K. Chaturvedi**

¹Department of Genetics and Plant Breeding

²Department of Plant Pathology

Rani Lakshmi Bai Central Agricultural University, Jhansi, Uttar Pradesh, India

ABSTRACT

Rising global temperatures due to climate change are affecting chickpea crop performance in several regions of the world. High temperature stress is one of the important abiotic stresses hindering in achieving potential yield in crop plants. High temperatures affect plants at various organizational levels, primarily accelerating phenology to limit biomass production and shortening reproductive phase to curtail flower and pod numbers, thus resulting in severe yield losses. Although, genetic resource is available for heat stress tolerance in chickpea, studies on inheritance and its utilization in breeding program remain very limited. In the present research, a field experiment is being carried out in augmented design to evaluate 500 chickpea genotypes for high temperature tolerance based on agro-morphological, cytological and physiological traits. The important traits in the evaluation includes chlorophyll content, chlorophyll fluorescence, pollen viability, days to 50% flowering, number of pods per plant, number of seeds per pod, and seed yield per plant. The evaluation of chickpea genotypes based on these traits will be useful for screening contrasting genotypes for heat stress and would pave the way for characterization as well as variability assessment of chickpea.

ASSESSMENT OF GENETIC VARIABILITY PARAMETERS IN CLUSTER BEAN (*CYAMOPSIS TETRAGONOLOBA*(L.) TAUB.)

***Mahendra Kumar Ghasolia¹, Ashok Kumar Meena²**

Department of Plant Breeding and Genetics
Mahatma Jyoti Rao Phoole University, Jaipur, Rajasthan
Department of Plant Breeding and Genetics
Sri Karan Narendra Agriculture University Jobner, Jaipur, Rajasthan-303329, India

ABSTRACT

Ten genotypes of cluster bean [*Cyamopsis tetragonoloba* (L.) Taub] were evaluated to estimate variability, broad sense heritability and genetic advance over mean for yield and related attributes, during Kharif 2019 were evaluated in Randomized Complete Block Design with three replications. Substantial amount of genetic variations were observed with low influence of environment indicated consistence performance of the genotypes. GCV and PCV were highest for number of braches per plant followed by biological yield and harvest index. Greater magnitude of heritability coupled with high to moderate genetic advance as per cent of mean was observed for Number of branches per plant, plant height and Number of clusters per plant indicates predominance of additive component for these traits and hence direct selection would be more effective in improving these traits.

ASSESSMENT OF POST EMERGENCE HERBICIDE TOLERANCE (*IMAZETHAPYR*) FOR COWPEA

**Priyanshi Garg¹, Ayushi Jaiswal¹, Anshuman Singh^{1*},
Meenakshi Arya, M. K. Singh¹ and S.K. Chaturvedi**

¹ Department of Genetics and Plant Breeding
Rani Lakshmi Bai Central Agricultural University, Jhansi, Uttar Pradesh, India

ABSTRACT

Cowpea (*Vigna unguiculata*) is an annual herbaceous legume also known as black-eyed pea. It is also considered as poor's man meat as it contains high amounts of proteins, minerals and vitamins. It is grown all over India, more particularly in the central and peninsular regions. Maharashtra, Andhra Pradesh, Karnataka, Tamil Nadu, Madhya Pradesh and Rajasthan are the principle states for cowpea cultivation. Weed is a major obstacle in its production, to maintain proper yield manual weeding is effective but it is not favourable because it demands large number of laborers which is expensive. Therefore to control cost and increase yield of crop the use of herbicide presents a viable solution. Through this method a broad spectrum of weeds can be controlled. To evaluate the effectiveness of herbicides, an experiment was carried out in RLBCAU, Research Farm, Jhansi in Kharif 2020 with 100 germplasm and 2 checks in Augmented Block Design layout. A dose of *Imazethapyr* @ 80g.a.i. was applied at intervals of 70DAS, 80DAS and 90DAS after post emergence. The results showed that 60% germplasm were found tolerant and checks PL5 and PL3 were highly tolerant and tolerant respectively. Different Cowpea genotypes showed different tolerance level to dose of herbicide and tolerant genotypes will be helpful in development of post emergence herbicide tolerance varieties in future breeding programmes.

BADRI COW KAMDHENU FOR HILLS (A CONCEPT PAPER)

Mansi Arya* and Satpal Singh Bisht

Department of Zoology, Kumaun University, Nainital

ABSTRACT

The present study was conducted in the Kumaun region of Uttarakhand and correlated with the available literature, Badri cow is popularly known as Pahadi Gai. The physical characteristics of the Badri cow are color black, brown, grey, and small size with an average weight of 200-250 kg. The neck is wide and small and these cows are having very bright and alert eyes. The ears are always erected and show the alertness of the animal. The legs are small and straight with a hard footpad and hooves, this enables these cows to walk easily on heights and valleys in the hilly areas.

Badri cows give high-quality milk as they graze on varied shrubs and herbs of nutraceutical value in the forests of mountains. Like sheep and goats, these cows can graze on steep slopes which is not the same case with other cow breeds. Cow milk is proven to be the most nutritious food with the bio-protective effect which contains therapeutic proteins, vitamin A, vitamin B complex, calcium, phosphorous, and minerals. Badri cow A2 beta-casein protein is useful in hormonal disorders, diabetes, hypertension, dyslipidemia, and cancer patient. Not only milk the Badri cow urine is also used to modulate the immune system via cellular and humoral immune responses. This cow has got religious importance in Hindu civilization in general and the Kumaun region in particular. Badri cow could be a great source of nutraceutical diet and therapeutic dairying.

BIODIVERSITY AND CONSERVATION OF PLANT SPECIES

Anchal Singh^{*1}, Ashutosh Kumar² and Milind Sagar³

¹Department of Agronomy

Banda University of Agriculture and Technology, Banda, Uttar Pradesh

²Department of Soil Science and Agricultural Chemistry

Banda University of Agriculture and Technology, Banda, Uttar Pradesh

³Department of Agronomy, Banda University of Agriculture and
Technology, Banda , Uttar Pradesh

ABSTRACT

Biodiversity is the variety of different forms of life on earth, including the different plants, animals, micro-organisms, the genes they contain and the ecosystem variation, species variation (number of species) within an area, biome or planet. There are an estimated 500,000 species of land plants (angiosperms, gymno sperms, ferns, lycophytes and bryophytes), with diversity strongly concentrated in the humid tropics. Many species are still unknown to science. The total number of angiosperm species at around 450,000, of which 10-20% are still unknown to science. The total number of gymnosperms (1000 species), ferns (10,000 species), lycophytes (1300 species), mosses (9000 species) at present. Habitat loss and associated fragmentation is the biggest single threat to plant diversity, particularly in the tropics. Overexploitation of the whole plant or enough of it to reduce the chance of survival is the second most important threat to plant species. Only a minority of plant species have a specific human use, many more play important roles in natural ecosystems and the services they provide, and rare species are more likely to have unusual traits that could be useful in future. The major threats to plant diversity include habitat loss, fragmentation, and degradation, overexploitation, invasive species, pollution and anthropogenic climate change. The loss of biodiversity is a global crisis. Earth's rich biodiversity is vital for the very survival of mankind. Biodiversity conservation may be *in situ* as well as *ex situ*. The Conservation of plant diversity is a huge task if viewed globally, but the combination of a well- designed and well- managed protected area system and *ex situ* gap- filling and back-up should work anywhere. The most urgent needs are for the completion of the global botanical inventory and assessment of the conservation status of 94% of plant species not yet evaluated, so that both *in* and *ex situ* conservation can be targeted efficiently. In *in situ* conservation, the endangered species are protected in their natural habitat so that the entire ecosystem is protected. *Ex situ* conservation methods include protective maintenance of threatened species in zoological parks and botanical gardens, *in vitro* fertilization, tissue culture propagation and cryop reservation of gametes. *Ex situ* conservation is mainly done for conservation of crop varieties, the wild relatives of crops and all the local varieties with the main objective of conserving the total genetic variability of the crop species for future crop improvement. In this abstract study about biodiversity of plants and it's conservation strategies for future use .

BIODIVERSITY CONSERVATION: A GLOBAL ISSUE

Darshita Rawat and Kumud Dubey

Forest Research Centre for Eco-Rehabilitation (Prayagraj)
A centre of Forest Research Institute, Dehradun

ABSTRACT

Biodiversity is generally associated with the diversity of life on Earth at all levels, from genes to generations in the ecosystem, and it includes an ecological, cultural and evolutionary system that keeps the life process going. Biodiversity holds importance for potential benefits which are yet to be recognized, and it also has cultural importance for people, including spiritual or religious causes. There are a few underlying causes of biodiversity loss that are directly linked as a threat to biodiversity which includes habitat loss, land degradation fragmentation of habitat, unsustainable resource use, invasive species, pollution, and global climate change, invasive species, and pollution. Rapidly growing population and over consumption are among the underlining root causes of the loss of biodiversity. Conservation is defined as the systematic utilization of natural resources to maintain a natural equilibrium, moreover, it also refers to the smart usage of natural resources to meet the demands of the present generation even while preserving enough for the succeeding generations as well. Protecting, preserving, and preventing the genetic diversity of a species, rescuing species from extinction, and protecting habitat from damage and deterioration are among the parameters that can mitigate stress on biodiversity. Apparently, on other hand In-situ (on-site) conservation & Ex-situ (off-site) conservation is the strategy that is practiced to preserve a range of living species throughout the entire globe. The government & underlying management authorities alone would not be able to retrieve the lost glory, therefore each person must take charge of his actions and stand united to make the environment a flourishing place not just for humans but also for the wildlife which persists.

**BIODIVERSITY; THREATS, CONCEPTS AND
CONSERVATION IN WORLD**

Pratyushamani Awasthi and Arjun Lal Yadav

Institute of Agricultural Sciences
Bundelkhand University Jhansi, Uttar Pradesh

ABSTRACT

Biodiversity is the variety of different forms of life in earth, including the different animals' plants, micro-organisms, the genes they contain and the ecosystem they form. It refers to ecosystem variation, species variation (number of species) within an area, biome and planet. Relative to the range of habitats, biotic communities and ecological processes in the biosphere, biodiversity is vital in a number of ways including promoting the aesthetic value of the natural environment, contribution to our material well-being through utilitarian values by providing food, fuel, timber and medicine. Biodiversity is the support of system. Organisms depend on it for the air to breathe, the food they eat, and the water to drink. Wetlands filter pollutants from water, plants and trees reduce global warming by absorbing carbon, fungi and bacteria break down organic materials and fertilize the soil. It has been empirically shown that origin species richness is linked to the health ecosystem is the quality of life for humanity. The ecosystem service of biodiversity is maintained through formation and protection of soil Conservation and purification of water hydrological cycle regulation of biochemical cycle absorption and breakdown of pollutants and waste materials through decomposition, determination and regulation of the natural world climate. Despite the benefits from biodiversity today's threats to species and ecosystem are growing day by day with alarming rate and virtually all of them are caused by human mismanagement of biological resources often stimulated by imprudent economic policies, pollution and faulty institutions in addition to climate change.

**BIODIVERSITY /ETHNO-MEDICINAL STUDY OF
CENTRAL UNIVERSITY OF RAJASTHAN, AJMER (RAJASTHAN) AND
THEIR TRADITIONAL HUMAN USE**

B. Sharma¹ and R. B. Sharma²

¹Central University of Rajasthan-Bandarsindri (Rajasthan) India

²Nimbark Shri Charorai, Jaipur (Rajasthan) India

ABSTRACT

Since 2009, about 3000 persons are living in Central University of Rajasthan (CURAJ) Bandarsindri-305 817 (Rajasthan) India. CURAJ is located on the Jaipur-Ajmer Expressway (NH8), 83 km from Jaipur and 40 km from Ajmer, and measures more than 209 hectares. Its location at 26.627392°N, 75.031672°E. with elevation of 457 M above mean Sea level. Sandy soil with little clay. The temperature may go as high as 48.0°C in summer and as low as (-) 0.5°C in winter (Hypothermic Regime). The climate of the area is semi-arid sub-tropical, mean annual rainfall is 570 mm, July and August account for about 65 percent of annual rainfall. Biodiversity/Ethno-medicinal survey was conducted through random sampling technique in different seasons and areas for preceding 2 years using square quadrat method. The floral biodiversity of CURAJ and the surrounding area is related to the Aravalli hills. Data on medicinal plants collected from the area under study reveal that the study area has 55 species (30 family) of medicinal plants, Poaceae-8, Fabaceae-7, Solanaceae-3, Moraceae-3, Euphorbiaceae-3, Phyllanthaceae-3 and others less than 3 spp. The interviews and discussions with the traditional local community, staff, stakeholders, and in-situ observations in the field reveal that local people have a close association with the surrounding environment and people in the vicinity of the area have good knowledge of the usefulness of medicinal plants. The medicinal value of the plants was discussed with different age groups and it was observed that persons having 50- 60 years of age had more traditional knowledge about medicinal plants. There is an urgent need to prepare inventories and records of all ethnobotanical information available among the diverse ethnic communities before the traditional culture is lost completely and all conservation measures should be adopted for saving the floral biodiversity of the area.

BIODRAINAGE POTENTIAL OF TREE SPECIES IN RECLAIMING WATERLOGGED WASTELAND THROUGH AGROFORESTRY

Jatin Kumar, D.R. Bhardwaj and Saurabh Kumar

Department of Silviculture and Agroforestry
Dr. Y S Parmar University of Horticulture and Forestry, Nauni, Solan (H.P.)

ABSTRACT

Waterlogging and its associated soil salinity are major impediments to the sustainability of irrigated agriculture. Although conventional engineering drainage technologies such as subsurface or vertical drainage combat the problem, they are costly and generate huge quantities of effluent which is difficult to dispose of. Biodrainage, which removes excess soil water by deep-rooted fast-growing trees through evapotranspiration using bioenergy, is an appropriate alternative. Heavy rainfall, poor drainage, excess irrigation, hard pan, shallow water table and seepage from canal cause the waterlogging problems. Arid and semiarid regions of the country are affected mostly due to canal irrigation without provision of enough drainage, which increases water-table and secondary salinization problem. For sustainable development, we have to reclaim such problematic areas and maximise the country's cultivated area. The reclamation processes include biological, chemical and mechanical measures. Under biological measures, tree based systems have the potential to reclaim waterlogged and saline soils efficiently and sustainably by improving soil health quality. The short rotation, fast growing tree based agroforestry systems have shown potential in bio-drainage treatment to prevent waterlogging in canal-irrigated areas of our country such as Haryana, Rajasthan, etc. Trees such as *Eucalyptus*, *Populus*, *Casuarina*, *Dalbergia*, *Syzygium*, *Acacia*, *Prosopis*, *Leucaena*, etc. are found to be effective in lowering shallow groundwater tables and reversing salinity trends. Integration of trees such as *Eucalyptus* and *Populus* along with crops in a unified agroforestry system, on approach roads, field bunds or on dykes of ponds in an integrated farming system, is a viable option to reclaim the waterlogged wastelands to increase the extent of agricultural land in India.

**BIOINTENSIVE MANAGEMENT OF WILT DISEASE COMPLEX
(MELOIDOGYNE INCOGNITA-FUSARIUM UDUM) INFESTING RED GRAM**

Rizwan Ali Ansari

Department of Plant Protection, Faculty of Agricultural Sciences
Aligarh Muslim University, Aligarh, Uttar Pradesh, India

ABSTRACT

The present study examines the devastating effects of *Meloidogyne incognita* and *Fusarium udum* either individually or concomitantly on the red gram. It was observed that 2000 juveniles of *M. incognita* inoculated plants caused significant damage to crop biomass and yield characters. Likewise, 2.00g *F. udum* inoculation significantly impaired the plant growth and yield attributes such as plant height, fresh and dry weight, pod and nodule formation, nitrate reductase activity, chlorophyll, nitrogen, phosphorus, potassium content of plants, also exhibited significant wilting in the plants. Interestingly, simultaneous inoculation of both pathogens caused greater tunes of plant health deterioration. Moreover, plants inoculated with 600 spores of *Glomus fasciculatum* and 2.00g of *Trichoderma harzianum* protected the plants significantly from pathogens attack. Application of plant symbiont and pathogen antagonist irrespective of their inoculation schedule enhanced plant biomass and yield characters, and also restricted the multiplication of the pathogens. Consortium application of plant symbiont and biocontrol agent significantly reduced the pathogens-related parameters such as root galls, eggmasses, fecundity, final nematode population, wilt severity, and enhanced the plant growth characters. Application of these microbial agents may be used for the management of disease complex as it is eco-friendly and safe for our environment.

**BIOLOGY AND BIOTIC POTENTIAL OF TOBACCO CUTWORM,
SPODOPTERA LITURA (F.) ON DIFFERENT HOSTS AND MERIDIC DIET**

Hemant Kumar, Sagar, D.* and Keerthi M. C.

Division of Entomology
ICAR-Indian Agricultural Research Institute, New Delhi

ABSTRACT

The tobacco cutworm, *Spodoptera litura* (F.) (Lepidoptera: Noctuidae), is a highly polyphagous insect pest and reported to feed belongs to at least 40 botanical families, including economically important crops within Brassicaceae, Malvaceae, Poaceae and Solanaceae. It is widely distributed throughout tropical and temperate Asia, Australasia and the Pacific Islands. The present study was carried out at Division of Entomology, ICAR-IARI, New Delhi, under controlled conditions ($27\pm 1^{\circ}\text{C}$, $65\pm 5\%$ RH and photo period of 14:10 hours of L: D). The objective was to study the biological attributes and biotic potential of *S. litura* on different hosts viz., cauliflower, cabbage, tomato, castor and it was compared with the meridic diet. The incubation period was highest when reared on meridic diet (4.0 ± 0.0 days) and non-significant differences were observed between cauliflower, cabbage and castor. Similarly the total larval duration was highest when reared on meridic diet (17.56 ± 2.95 days) and lowest on the castor (12.33 ± 0.6 days). The larval and pupal weight (10^{th} and 2nd day) was highest when reared on castor (0.989 ± 0.22 and 0.369 ± 0.043 g), while the lowest larval weight was recorded on meridic diet (0.117 ± 0.097 g) and lowest pupal weight on tomato (0.247 ± 0.0348). The sex ratio of *S. litura* was highest when reared on tomato (1.6) and the highest percent adult emergence was recorded on castor (92%). The total developmental index was highest when reared on castor (3.9). Fecundity is one of the most important parameters and it was highest when reared on castor (1791.7 ± 198.8). The biotic potential of *S. litura* was $1.29*10^{27}$, $2.53*10^{28}$, $1.93*10^{29}$, $3.82*10^{24}$ and $1.85*10^{31}$ when reared on meridic diet, cauliflower, cabbage, tomato and castor, respectively.

**BIOMASS PRODUCTION AND CARBON BUDGETING
OF FOREST COMMUNITIES IN COL. SHER JUNG NATIONAL PARK,
HIMACHAL PRADESH, INDIA**

Sourav Ranjan Mohapatra^{1*}, S. Balaji Naik², Umakanta Dash³

¹Department of Forest Biology and Tree Improvement

³Department of Silviculture and Agroforestry
Kerala Agricultural University, Thrissur

²Faculty of Forest Sciences and Forest Ecology
Georg-August-Universität, Göttingen

ABSTRACT

Assessment of biomass components is essential to account for total carbon sequestered by the vegetation over a specific time and would be the key determinant of land-use change and deforestation influence the net carbon fluxes. Furthermore, knowledge of carbon density and biomass is considered the most promising approach to mitigating greenhouse effects and environmental degradation. Therefore, forest communities, viz. *Shorea robusta* (S_r), *Eucalyptus tereticornis* (E_t), *Syzygium cumini* (S_c), *Shorea robusta* + *Terminalia tomentosa* (S_rT_t), *Shorea robusta* + *Eucalyptus tereticornis* (S_rE_t), *Shorea robusta* + *Syzygium cumini* (S_rS_c), *Shorea robusta* + *Diospyros melanoxylon* (S_rD_m), and mixed forest community (M_x), selected based upon their dominance were investigated for biomass production and carbon stock in vegetation as well as in soil in the Col. Sher Jung National Park, Himachal Pradesh, India. The total biomass of vegetation among forest communities varied substantially. Mean above-ground and below-ground biomass was 79.39 ± 0.96 % and 20.61 ± 0.25 % respectively, of total vegetation biomass (4285.97 ± 49.85 t ha⁻¹) in forest communities. The shrub community accounted for 79.69 ± 3.04 t ha⁻¹, while herb communities accounted for 24.01 ± 0.74 t ha⁻¹. The contribution of pure *Shorea robusta* community to total biomass was found to be higher (760.67 ± 10.63). Ecosystem Carbon density (Vegetation + Soil + Detritus) was highest in *Shorea robusta* forest (502.15 ± 4.72 t C ha⁻¹) and minimum in *Syzygium cumini* community (346.55 ± 0.94 t C ha⁻¹). Thus, it implies that ecosystem carbon density (Vegetation + Soil + Detritus) significantly varied according to the type of vegetation. Correlation of Ecosystem Carbon density was found to be highly positive with Above Ground Biomass (0.994) and Below Ground Biomass (0.976). Moreover, the soil: vegetation carbon ratio for each community was greater than 0.50, which implies that in the near future if any accident or conversion takes place then this system can be a major source of CO₂ flux into the atmosphere.

BIOMASS PRODUCTION CAPACITY OF *AGERATINA ADENOPHORA* AND ITS IMPACT ON ASSOCIATED HERB SPECIES IN BANJ OAK AND CHIR PINE FOREST OF KUMAUN HIMALAYA

Bhawna Negi, Kavita Khatri, S.S. Bargali and Kiran Bargali

Department of Botany, D.S.B Campus
Kumaun University, Nainital, Uttarakhand, India

ABSTRACT

Growth rate is a vital trait for plants because both survival and reproduction depend on it. High growth rate, which is associated with high photosynthetic rate, has been found to contribute to invasiveness of some invasive plants. The impact imposed by invasive species on native co-occurring species depends specifically on interacting species competing for resources, density of each population and abiotic conditions. Therefore, in view of the above, the competitive effect of *Ageratina adenophora* on six native co-occurring species was assessed in two forest types viz., broad-leaved evergreen Banj oak forest (BO) and coniferous Chir pine (CP) forest in Nainital district of Kumaun Himalaya (part of Central Himalaya). In each forest type, three subplots of 20m × 20m size were established and five quadrats, each of 1m × 1m size were randomly placed in each sub-plots thus compounding to a total of 30 quadrats (2 forest × 3 subplots × 5 quadrats) were sampled using destructive method. Higher density of *A. adenophora* was recorded in CP (~110 ind. m⁻²) as compared to BO forest (~96 ind. m⁻²) which differed significantly ($p < 0.05$) with native species density. On average aboveground and belowground biomass of *A. adenophora* was > 90% than the aboveground and belowground biomass of native co-occurring species. An inverse pattern of biomass allocation was recorded in two studied forest types. Correlation analysis revealed that biomass of most of the native species decreased with increasing biomass of *A. adenophora* though the impact was insignificant while *Carex cruciata* was the only species that recorded significant positive effect. To conclude compared with native herb species invasive *A. adenophora* had higher biomass contributing to carbon and energy gain in both the forest sites. The findings from study showed the potential mechanisms underlying growth advantage of *A. adenophora* over co-occurring native herbs.

BIOSYSTEMATIC STUDIES ON SUBFAMILY OLETHREUTINAE (TORTRICIDAE: LEPIDOPTERA) OF SOUTHERN KARNATAKA

Karthik Reddy M.

Division of Entomology, ICAR-Indian Agricultural Research Institute
Pusa Campus, New Delhi

ABSTRACT

The superfamily Tortricoidea comprises a single family, Tortricidae. It is one of the most species-rich superfamilies of Microlepidoptera, containing 10,365 species spread across 1151 genera. Tortricidae is divided into three subfamilies: Chlidanotinae Meyrick 1906, Tortricinae Latreille 1803, and Olethreutinae Walsingham 1895. They are diverse and abundant components of tropical, subtropical and temperate forest ecosystems. They are economically important as many species are pests of agricultural and horticultural crops. A total of 489 species have been described in the family Tortricidae from India. The subfamily Olethreutinae is the most species-rich, with 300 species assigned to 102 genera and six tribes. The present research focuses on the systematics and faunistics of the subfamily Olethreutinae in Southern Karnataka as there have not been concerted efforts to explore the biodiversity of Southern Karnataka for Tortricid fauna in the past 100 years. The whole collection of 728 Olethreutine moth specimens comprised of 36 species captured from diverse localities of Southern Karnataka using mercury light traps operated from dawn to dusk. Taxonomic study revealed that species recorded during the present study represent 26 genera and 5 tribes. Five species have been proposed to as new to science, two species as new records to India, and twenty-two species as new records to Karnataka. Identification was done using morphological characters like labial palpi, wing pattern and genitalia characteristics while confirmation was done using mtCOI gene sequencing. High quality photographs and illustrations were provided along with keys to all tribes, genera and species.

BROWN MANURING PRACTICES IN RICE FIELD

Ravi Verma¹, A.K. Singh², Shivanand Maurya¹ Rahul Verma³

¹Department of Agronomy, A.N.D.U.A.T., Ayodhya, Uttar Pradesh

²Department of Agronomy, A.N.D.U.A.T., Ayodhya, Uttar Pradesh

³Department of Agronomy, J.V. College, Baraut, Uttar Pradesh

ABSTRACT

Brown manuring is simply a “no-till” version of green manuring, using a selective herbicide to desiccate the crop before flowering instead of using cultivation. According to this technique, green manure crops are grown along with the crop and killing them with the help of herbicide. The plant residues are left standing in the field along with the main crop without incorporation/in-situ ploughing until its residue decomposes itself in the soil. It helps to add organic manure besides weed suppression by its shade effect. The post-emergence herbicide spray on green manure leaves resulting in loss of chlorophyll in leaves showing brown in colour is referred to as brown manuring. Generally, brown manuring in rice is the practice of growing *Sesbania* spp. and rice together, and when these dhaincha plants overtake the rice plants in height at about 25 days of co-culture, a weedicide 2, 4-D is applied to kill these *Sesbania* plants. After 4-5 days of spraying, *Sesbania* plants will appear brown and then start dying; leaves will fall on the ground and form mulch and help in smothering of weeds. As it is a selective herbicide, it kills only *Sesbania* plants and not the rice plants. This is called the down knocking effect. As brown manuring is eco-friendly and helps to suppress weeds as well as add nutrition to the soil, it can be used as a good approach for higher production of crop and thereby leading to benefit for the farmers. It should thus be widely advocated by the extension agencies to realize its benefits for the farming community of the nation.

CHALLENGES OF HILL AGRICULTURAL SYSTEMS IN ALMORA DISTRICT, UTTARAKHAND

**Latika Pandey^{1*}, A. Arunachalam², Namita Joshi¹, Maneesh Yadav²,
Abbas Mehdi², A.K. Handa² and Suresh Ramanan, S²**

¹Gurukul Kangri University, Haridwar, Uttarakhand-249404

²ICAR-Central Agroforestry Research Institute, Jhansi

ABSTRACT

Almora district is a hill district of Uttarakhand which is widely known for its scenic beauty, rich cultural heritage and diversified agricultural systems. A questionnaire survey was conducted in two villages, namely Dantola and Mahatgaon of Kumaun Himalaya in the district Almora in order to know the status of agro-biodiversity and the current challenges in agriculture faced by the Himalayan farmers. The major challenges to the existing agro-biodiversity reported were crop-raiding by wild pigs, women drudgery, out-migration, decreased agricultural production in recent years, loss of agro-biodiversity, lack of interest in practicing agriculture among youth and decreased nutritional balance. Apart from this there have been an increase in the average annual temperature coupled with reduced and irregularity in rainfall. There is an urgent need to identify and implement suitable technological interventions in order to protect the crops from wild crop-raiders along with providing insurance against crop-raiding. In order to solve the problem of labour scarcity and low productivity, introduction of machinery to ease the farming becomes the need of the hour, which will further draw the attention of youths towards adopting agriculture as occupation, ultimately reducing the e-migration because of which many villages of the state have turned into ghost villages.

CHANGES IN EARTHWORM DIVERSITY INDICES IN TWO ECOTYPES OF KUMAUN HIMALAYA WITH REFERENCE TO DENSITY, BIOMASS AND PHYSICO-CHEMICAL PARAMETERS

Shikha Bora* and Satpal Singh Bisht

Department of Zoology
Kumaun University, Nainital, India

ABSTRACT

Earthworm communities are generally susceptible to even the slightest changes in the soil's Physico-chemical properties; the land-use practices significantly affect the earthworm population in all habitats and ecosystems. The present study investigates two different land-use systems, i.e., cultivated land and orchards. The difference in Physico-chemical properties of soil at different sites contributed to the formation of population patches for earthworm species. The Physico-chemical properties of soil at a particular site could facilitate the prediction of earthworm species. The objective of the present study was to investigate the diversity, abundance, biomass and distribution of earthworms in cultivated land and orchards. Earthworms (Annelida) are well-known soil engineers and are responsible for various peddological activities. They play a vital role in soil microbial activity, soil reclamation, porosity, water infiltration, and decomposition of leaf litter. The present study was conducted in two different land-use systems (Orchard and agriculture land) of Dhari Tehsil Uttarakhand, India (Altitude 1400 m. a. s. l. Latitude 29° 29' 41" N Longitude 79° 31' 07" E). Earthworms were collected by hand sorting method, rinsed in 70% alcohol, and preserved in 10% formalin. Collected worms and soil samples were brought to the laboratory for further investigation and analysis. Density and biomass recorded during the present investigation ranged from 0.1 m⁻² to 91.0 m⁻² and 5g⁻² to 15g⁻², respectively. In Agriculture, land worm density ranged from 1.0 m⁻² to 91.0 m⁻² and in the Orchards, worm density recorded was 5.0 m⁻² to 37 m⁻². In Agriculture land, maximum worm density was recorded at Padampuri and in Orchards at Pahadpani during July and October 2019. Minimum worm density was recorded at Churigarh in January. In 0-10cm, the minimum biomass recorded was 5 g⁻² in July and February 2019 and 10-20cm was 15g⁻² in July. The maximum soil moisture was 37% in 0-10cm depth and Okhalkanda 34% in 10-20cm soil layers in cultivated Land. In the Orchards maximum, soil moisture was recorded at Okhalkanda, i.e., 28% and 32% at 0-10 and 10-20cm, respectively. Soil pH was found to be nearly neutral in all study sites. The present investigation is an initial and first report from the Kumaun Himalaya on a comparative study of earthworm population dynamics in two different land-use systems

CHARACTERIZATION OF RHIZOBIUM ISOLATED FROM ROOT NODULES OF *Trifolium alexandrinum*

Narendra Kumar Bairwa and P. P. Jambhulkar
Muskan Yadav¹, Rishi Saxena¹ and A. Radhakrishna²

¹Department of Microbiology, Bundelkhand University Jhansi

²Department of Biotechnology, IGFR, Jhansi

ABSTRACT

In the present investigation on “Isolation And Characterization of Nitrogen Fixing Bacteria from agricultural rhizosphere” was carried out with the objectives of Isolation and Characterization of Nitrogen Fixing Bacteria. A study was undertaken to investigate the occurrence of Nitrogen Fixing Bacteria from Soil and Root nodule of Jhansi area. Four soil samples and two root nodule samples were collected randomly to estimate microbial population which used plate count method. The present study describes the characterization of Nitrogen Fixing Bacteria strain isolated from leguminous plant species. The characterization of isolated pure cultures through colony morphology analysis, cellular morphology and biochemical properties are including gram staining, catalase test, Methyl red test, and citrate utilization and nitrate reduction. All the isolates were found with poor absorption of Congo red dye and no growth on the YEMA with 2% NaCl. Therefore, all isolates were confirmed as Rhizobia and plant growth promoting bacterial strains. These properties suggest that rhizobium isolated in this study could find potential application for development of the sustainable agriculture as to be a good candidate of biofertilizer which help in soil fertilization without applying chemical fertilizers.

**CLASSICAL VIEWS OF COLLECTION PRACTICES IN
AYURVEDIC LITERATURE AND CURRENT GUIDELINES IN
GOOD COLLECTION PRACTICES OF MEDICINAL PLANTS**

Vaibhav Charde¹ and G. Babu²

¹Central Ayurveda Research Institute
Jhansi

ABSTRACT

In recent years, there has been a consistent rise in demand for plant-based medicines and healthcare products globally. At the same time, consistency of products in terms of quality, efficacy and safety have become increasingly major concerns. This concern is genuine as the very purpose of any healthcare product is centered on an ethical assurance to the end-user. In Ayurveda, Good field collection practices include method of collection, time of the collection (According to Virya and part used), region of collection, place of collection, collection according to desired action, collection of animal products, collection of food materials is mentioned in detailed and also validated by the modern chemical tool. Medicinal plant materials should be collected from the appropriate place and during the appropriate season or time period to ensure the best possible quality of both source materials and finished products. It is well known that the quantitative concentration of biologically active constituents of a drug, varies with the stage of plant growth, its stage of development and place of its occurrence. Therapeutic efficiency is assumed to depend on the quality and quantity of the secondary metabolites which in turn are influenced by the method of collection. The description of collection practices is well documented in Ayurvedic literature and its utility is validated by modern chemical tools for obtaining maximum quantity of active principles. Thus, the concept of Dravya Sangraha (collection of drugs) in Ayurveda truly holds a scientific stand and plays an essential role in deciding the original and crude drug quality.

CLIMATE RESILIENT AGRICULTURE: INDIAN PERSPECTIVE

V. K. Singh

ICAR–Central Research Institute for Dryland Agriculture
Hyderabad, Telangana

ABSTRACT

Climate Change and variability are the greatest threats to humanity. Increase in maximum and minimum temperature during monsoon and winter season, variable rainfall, increase in severity and frequency of extreme events are witnessed globally and in India impacting agriculture severely. The frequency and intensity of these events are going to increase in the years to come indicating the urgency. The Government of India launched a flagship network project 'National Innovations in Climate Resilient Agriculture' (NICRA) in 2011 to address the challenges of food production in the face of changing climate. The project aims at strengthening national research capability for addressing various issues associated with climate change, build capacities of stakeholders and demonstrate and disseminate resilient technologies and to support policy. As part of the technology demonstration component of NICRA, 151 climatically vulnerable districts were selected and technologies were demonstrated and assessed for their efficacy to minimize the impact of climatic stresses. Climate resilient agriculture practices such as soil organic carbon build up, *in-situ* water management practices, crop residue management instead of burning, water harvesting and recycling for supplemental irrigation, introduction of drought, heat, salt and flood tolerant varieties, water saving technologies, location specific agronomic and nutrient management, improved livestock feed and feeding methods were taken to farmers so as to enhance adoption. Institutions were established at the village at 151 locations, for enhancing adoption and dissemination of technologies. Building capacities of communities and stakeholders is key for enhancing adoption and spread of resilient technologies. As part of NICRA, promising technologies are identified for minimising the impact of climatic stresses and efforts are needed to mainstream these practices so as to reach large number of farmers in the country.

Organized jointly by

National Environmental Science Academy (NESA), New Delhi
Rani Lakshmi Bai Central Agricultural University, Jhansi, U.P.
ICAR-Indian Grassland and Fodder Research Institute, Jhansi, U.P.
ICAR-Central Agroforestry Research Institute, Jhansi, U.P.
Bundelkhand University, Jhansi, U.P.
Central Ayurveda Research Institute, Jhansi, U.P.

COMMON AYURVEDIC PREPARATION USED BY INDIAN POPULATION

Diksha Pandey¹, Kalpana Verma², Lavkush Dwivedi¹

¹Department of Biomedical Sciences, Bundelkhand University, Jhansi, Uttar Pradesh

²Department of Biotechnology, Bundelkhand University, Jhansi, Uttar Pradesh

ABSTRACT

The global use of herbal products is increasing at an unprecedented rate. India is a natural herb-based science motherland. Traditional medicine is used by more than half of the world's population, and one of its most important responsibilities is the use of plant extracts and active substances. In today's medical practice, there is growing knowledge and acceptance of the use of herbal medications. Although the majority of these uses are unconventional, It is a well-known statistic that more than 80% of the world's population relies on herbal remedies which maintain a healthy lifestyle. This increased use of herbal products has also led to various forms of abuse and adulteration of goods, which has led to disappointment for consumers and manufacturers and, in extreme cases, tragic results. The issue is numerous and large, making the worldwide herbal market dangerous. Toxicity related to the use of Ayurvedic medicines due to metal presence is becoming a more widely acknowledged possible public health issue. The current review article on Physicochemical and toxic examination of several Ayurvedic preparations utilized by the majority of the population in India is planned as an approach to generating better herbal medications manufactured in India without any toxicity. This study is based on the facts and analyses of current and existing herbal medicines inquiry, standardization, and quality, to provide a practical herbal cure system while limiting the risk of hazardous herbal medicines. Our research involves fact study and prediction analysis on relevant records and data connected to our research target, which has assisted us in concluding the physicochemical and toxic study of several Ayurvedic preparations utilized by the majority of the population in India.

**COMPARATIVE ASSESSMENT AMONG HYPERGLYCEMIC
PANCREATIC MORPHOMETRY OF ISLETS OF LANGERHANS (F_0),
 F_1 GENERATION AND SYZIGIUM CUMUNI TREATED OFFSPRINGS (F_{1-T})**

Kumari Rekha

PG Department of Zoology
Tilka Manjhi Bhagalpur University, Bhagalpur, Bihar

ABSTRACT

Syzigium cumuni, a herbal medicinal plant belongs to Myrtaceae family found in India and also in other parts of the world like Thailand, Philippines and Madagascar. Present study is designed to focus on comparative assessment of Pancreatic islets of langerhans on alloxan prompted diabetic male mice (F_0), the first generation obtained after mating with normal female mice (F_1) and counteractive impact of *Syzigium cumuni* (black plum) seed powder on F_1 generation (F_{1-T}). Histological slides were used for morphometric analysis. Comparative morphometric assessment of pancreatic islets were performed among F_0 (Diabetic), F_1 (Generation of F_0), F_{1-T} (F_1 Generation treated with *Syzigium cumuni*) at the time of birth and at weaning time. Destruction is inferred in pancreatic diameter in F_1 when compared with F_0 . Now when these F_1 were treated with *Syzigium cumuni* seed powder along with food, parameters were improved. Hyperglycemia may affect the epigenetic modifications during spermatogenesis and inherit through male germline and these alterations may passed onto more than one generations. *Syzigium cumuni* seed powder sparks the secretion of pancreatic insulin and it also brings back the histoarchitecture of beta cells of pancreas in F_{1-T} generation. Presence of various remarkable antihyperglycemic activities as observed during present research work deserves further investigations involving constituents of *Syzigium cumuni* seed powder that can be a better platform for the development of a new horizon for antihyperglycemic drugs. The outcomes of present study suggest that *Syzigium cumuni* seed powder can be used as supplementary or alternative herbal remedy for treatment of hyperglycemia and its related complications. These results confirmed that *Syzigium cumuni* seed can be utilized to cure diabetes as conventional and alternative system of medicine. Further comprehensive chemical and pharmacological investigations are needed to elucidate the mechanism of antihyperglycemic effect.

**COMPARATIVE COST - BENEFIT ANALYSIS IN
BOTANICALS IN COMBINATION WITH IMIDACLOPRID
AGAINST CHILLI THRIPS [*SCIRTOTHRIPS DORASLIS* (HOOD)]
ON CHILLI (*CAPSICUM ANNUUM* L.)**

Lekhraj Yadav and Anoorag R. Tayde

Department of Entomology
Sam Higginbottom University of Agriculture, Technology and Sciences
Prayagraj (Allahabad) (U.P.), India

ABSTRACT

A study was conducted during Kharif 2018 at central agriculture field, SHUATS Prayagraj (Allahabad), Uttar Pradesh (India). Eight treatments were evaluated against *Scirtothrips dorsalis* i.e., Neem oil + imidachloprid @ 2.5ml/lit + 0.1ml/lit, NSKE + imidachloprid @ 50gm/lit + 0.1ml/lit, Karanj oil + imidachloprid @ 10ml/l + 0.1ml/lit, Pongamia oil + imidachloprid @ 3ml/lit + 0.1ml/lit, Garlic sap extractl + imidachloprid 10gm/lit + 0.1ml/lit, Tobacco oil + imidachloprid @ 3ml/l + 0.1ml/lit, Imidachloprid 17.8 SL @ 0.2ml/lit and untreated control. Among the treatments the best and most economical treatment was Imidachloprid (1:11.77) followed by Neem oil + imidachloprid (1:11.11), NSKE + imidachloprid (1:8.07), Karanj oil + imidachloprid (1:7.79), Pongamia oil + imidachloprid (1:7.06), Tobacco oil + imidachloprid (1:5.98), Garlic sap extractl + imidachloprid (1:4.91) as compared to (1:3.54) Control.

COMPRESSED COMPLETE FEED BLOCKS: APPLICATIONS AND ISSUES IN INDIA

Putan Singh^{1*}, A.K. Patil², D. Gopinath¹ and Gauri Jairath¹

¹Regional Station, ICAR-IVRI, Palampur, Himachal Pradesh

²Department of Animal Nutrition, Vet. Sci. & A.H., Mhow, Madhya Pradesh, India

ABSTRACT

In India, animals are mainly reared on poor quality roughages/straws/stovers, which are mainly deficient in protein, minerals and vitamins; hence it is necessary to ensure that the diets provided to dairy animals are complete in terms of all required nutrients. By providing a balanced diet in the form of Compressed Complete Feed Block (CCFB), we can optimize/ improve animal production and also get maximum benefits. The CCFB is an innovative technology, which can support our dairy farmers in the balanced feeding of dairy animals, thus they can obtain maximum profit by enhancing milk production and maintaining the good health of dairy animals. Besides this economically viable technology, it is not being adopted by dairy farmers due to certain drawbacks like available feed block making machines are stationary type as well as costly requiring electricity. Therefore, bulky crop residues/straws need to be transported from the field to the place of feed block making machine installed, which involves a lot of labourers and transportation cost for the transportation of crop residues. To address these bottlenecks/drawbacks, Feed and Fodder Technology Laboratory, Animal Nutrition Division, ICAR-IVRI, Izatnagar has developed a Portable Tractor Driven Feed Block Maker and also got its design patent. This portable machine can prepare CCFB under field conditions on farmers' land. The CCFB technology not only able to address a multi-nutritional deficiency, but also comprises of multiple benefits like easy handling and transportation, less storage space requirement, availability throughout the year and reduces feed cost and methane emission. We do hope this Portable Tractor Driven Feed Block Maker would be popularized among dairy owners/farmers to fetch the benefits of CCFB technology in due course of time.

COMPUTATIONAL EVALUATION OF PHYTOCHEMICAL CONSTITUENTS FROM *MALUS PUMILA* (APPLE) FOR BREAST CANCER TREATMENT.

Suneetha Yeguvapalli^{1*} and Durga Rathikota²

^{1*}Department of Zoology, Sri Venkateswara University, Tirupati

²Department of Biotechnology, Sri Venkateswara University, Tirupati

ABSTRACT

Breast cancer is a complex disease with no known single cause that continues to be a global killer and the leading cause of cancer-related death in women. One of the first key targets of these emerging anticancer drugs was the epidermal growth factor receptor (EGFR). EGFR is overexpressed in almost half of instances of triple-negative breast cancer (TNBC) and inflammatory breast cancer (IBC). EGFR inhibitors for the treatment of breast cancer have so been studied in several trials. Furthermore, substantial study suggests that phytochemicals, which are plant secondary compounds contained in fruits, plants have oncopreventive Properties. Apple is a widely consumed fruit that is accessible throughout the year and is high in phytochemicals. The current study's major goal is to use computational methodologies to discover new anti-cancer medication candidates from plants. The ligands of the plant *malus pumila* were docked with protein (PDB ID:1M17) to predict novel potential inhibitors that could be employed as anticancer medicines for breast cancer. The physicochemical, pharmacokinetic, and drug-like properties help in the selection of the best compound for breast cancer treatment.

COMPUTATIONAL EVALUATION OF PHYTOCHEMICAL CONSTITUENTS FROM *MALUS PUMILA* (APPLE) FOR BREAST CANCER TREATMENT.

Durga Rathikota¹ and Suneetha Yeguvapalli^{2*}

¹Department of Biotechnology, Sri Venkateswara University, Tirupati

^{2*}Department of Zoology, Sri Venkateswara University, Tirupati

ABSTRACT

Breast cancer is a complex disease with no known single cause that continues to be a global killer and the leading cause of cancer-related death in women. One of the first key targets of these emerging anticancer drugs was the epidermal growth factor receptor (EGFR). EGFR is over expressed in almost half of instances of triple-negative breast cancer (TNBC) and inflammatory breast cancer (IBC). EGFR inhibitors for the treatment of breast cancer have so been studied in several trials. Furthermore, substantial study suggests that phytochemicals, which are plant secondary compounds contained in fruits, plants have oncopreventive Properties. Apple is a widely consumed fruit that is accessible throughout the year and is high in phytochemicals. The current study's major goal is to use computational methodologies to discover new anti-cancer medication candidates from plants. The ligands of the plant *malus pumila* were docked with protein (PDB ID:1M17) to predict novel potential inhibitors that could be employed as anticancer medicines for breast cancer. The physicochemical, pharmacokinetic, and drug-like properties help in the selection of the best compound for breast cancer treatment.

CONSERVATION AND IMPROVEMENT OF BUNDELKHANDI GOATS

Deepak Upadhyay*, B.P. Kushwaha, Pooja Tamboli and K. K. Singh

ICAR-Indian Grassland and Fodder Research Institute
Jhansi, India

ABSTRACT

Bundelkhand region possesses 3.21 million heads of goats (20th livestock census), out of which considerable numbers (around 30%) belong to Bundelkhandi goats, still considered as non-descript meat purpose breed. Bundelkhandi goats are hardy, have long legs, narrow face and are able to walk long distances and highly suitable for grazing. A typical Bundelkhandi goat is black in colour and medium to large in size. The body is compact and almost cylindrical in shape. ICAR-Indian Grassland and Fodder Research Institute, Jhansi maintaining these goat since last 20 years. Further, Bundelkhandi unit under AICRP on goat improvement is operational since 2018. In order to conserve, improve and characterize the breed, several villages of Datia district (MP) and Jhansi district (UP) have been adapted under the project with a total of 102 households/farmers and 2323 goats. The goats under field conditions are mostly kept on extensive system of management with almost zero input except family labourers. Based on morphological characteristics and higher body weights, bucks (10 no.) have been selected for distribution to goat rearing farmers as breeding bucks in adopted villages. Average body weights at birth, 3 month, 6 month, 9 month and 12 month were 2.22, 9.55, 12.48, 17.16 and 20.19 kg, respectively. Average daily milk yield was 0.551 kg, while average milk yield at 90 days was 42.7 litres with lactation length of 102.6 days. Average kidding rate was also found as 1.22. The singlet and twining percentage was recorded as 78 and 22%, respectively. Animals of adopted villages were provided with health coverage under field conditions, namely vaccination against PPR (600 animals), ET (1381 animals), FMD (400 animals) and deworming against endo-parasites (1253 animals), besides periodic treatment (1610 cases) of animals suffering from different diseases/ sickness. However, the mortality of goats was 13.59%, which was slightly higher than last year. Capacity building and livelihood improvement of goat keepers is also been taken care under the project. Under field condition several constraints were also identified including less availability of proven breeding buck, poor knowledge of feeding, breeding and health practices, inadequate housing, and unorganized marketing structure. Recognition of Bundelkhandi goat as registered breed at national level will further boost the conservation and promotion of these native goats of Bundelkhand region.

CONSERVATION OF MEDICINAL PLANTS-NEED OF HOUR (A REVIEW)

Singh Neelam Kumari Mahesh

Central Ayurveda Research Institute
Jhansi

ABSTRACT

Protection and conservation of medicinal plants is essential for the livelihood security and to ensure the availability of medicinal plant in future. Many medicinal plants are in trouble due to increasing population growth, urbanization, over harvesting, destruction of habitat and unrestricted collection of medicinal plants from the wild. AYUSH drug pharmacies are using almost 90% of the raw materials of medicinal plants from natural forests. Therefore, the conservation of medicinal plant resources has become a, need of hour. According to the Red List of threatened species, critically endangered plant species are 43, 113 endangered and 87 are vulnerable. A globally increasing demand of herbal medicines warrants their conservations. Sustainable use of medicinal plants and good field collection practices are important in these aspects. Most accepted and scientific means of conservations are in situ (conservation of plants in their natural habitat outside the native habitat) and ex situ conservation (like, seed storage, DNA storage, pollen storage, in vitro conservation, field gene banks and botanical garden etc.).

Organized jointly by

National Environmental Science Academy (NESA), New Delhi
Rani Lakshmi Bai Central Agricultural University, Jhansi, U.P.
ICAR-Indian Grassland and Fodder Research Institute, Jhansi, U.P.
ICAR-Central Agroforestry Research Institute, Jhansi, U.P.
Bundelkhand University, Jhansi, U.P.
Central Ayurveda Research Institute, Jhansi, U.P.

CONTAINING AND PREVENTING THE SPREAD OF EMERGING TRANSBOUNDARY DISEASE IN SUB-SAHARAN AFRICA – MAIZE LETHAL NECROSIS

**Suresh L.M., Yoseph Beyene, Manje Gowda, Michael Olsen,
Dan Makumbi, Walter Chivasa, and B.M. Prasanna**

International Maize and Wheat Improvement Center (CIMMYT)
ICRAF Campus, UN Avenue, Gigiri, PO Box 1041-00621, Nairobi, Kenya

ABSTRACT

Maize (*Zea mays* L.) is the most important cereal crop in sub-Saharan Africa (SSA), covering over 35 million ha, largely in smallholder farming systems that produce over 70 million metric tons (MMT) of grain. Environmental conditions prevalent in the different agro-ecological zones of Sub-Saharan Africa are very conducive to the growth and spread of pathogens. Maize production in sub-Saharan Africa is affected by a wide array of diseases. Many fungal and viral diseases have been affecting the maize crop and its productivity. Diseases often reduce production and cause up to 100% yield loss under severe epidemics depending on environmental conditions. There are various threats due to this transboundary Maize Lethal Necrosis (MLN) disease in maize on the food security, livelihood, and income of several million smallholder farmers in the SSA region. MLN disease first appeared in Kenya in 2011 and became a major threat to maize production in eastern Africa in subsequent years. In eastern Africa, MLN is caused mainly by the synergistic interaction between two viruses, Maize Chlorotic Mottle Virus (MCMV) and Sugarcane Mosaic Virus (SCMV). MLN can cause up to 100% yield loss in susceptible maize varieties. The disease poses a complex challenge as the MLN-causing viruses are transmitted by insect vectors, and also through contamination of the seed, especially by MCMV. It was very critical to have various options to tackle these threats. CIMMYT implemented a multipronged strategy as an option in partnership with several international and national partners to tackle the MLN challenge. These efforts included: a) b) establishing a state-of-the-art MLN Screening Facility in partnership with Kenya Agriculture and Livestock Research Organization (KALRO) in Naivasha for identifying sources of resistance to MLN, MCMV and SCMV under artificial inoculation; b) accelerated breeding and deployment of MLN-tolerant/resistant maize varieties with other relevant traits preferred by African smallholders; c) optimizing MLN diagnostic protocols; c) strengthening capacities of national plant protection organizations (NPPOs) across sub-Saharan Africa on MLN diagnostics, monitoring and surveillance system; d) creating awareness among the maize seed sector institutions on SOPs for producing and exchanging MLN-free commercial seed; e) disseminating information on farming practices for minimizing MLN incidence; e) establishing an MLN Phytosanitary Community of Practice involving various stakeholders, including national plant protection organizations (NPPOs), seed companies, regional/sub-regional organizations, etc.; and f) probing the epidemiology of the disease, especially the factors underlying seed contamination by MCMV. These comprehensive efforts have led not only in preventing the further spread of MLN into other major maize-growing countries in sub-Saharan Africa, especially southern and West Africa, but also minimized the incidence of the disease in the MLN-endemic countries in eastern Africa.

CORRELATION STUDIES IN GOMPHRENA

**Devarailava Kumar^{1*}, Balaji S. Kulkarni¹, Pavan Kumar P¹,
Dadapeer A. Peerajade² and Andrekha B. Chittapur²**

¹Division of Floriculture and Landscape Architecture, COH, Bagalkot, UHS, Bagalkot

²Division of Biotechnology and Crop Improvement, COH, Bagalkot, UHS, Bagalkot

ABSTRACT

Estimation of correlation among seventeen genotypes of *Gomphrena globosa* were observed using different morphological traits under Northern dry zone of Karnataka, India. The significant and positive correlation for flower yield per plant was shown with number of flowers per plant (0.990) and (0.973) which was accompanied by other traits viz., number of leaves per plant (0.914) and (0.888), number of primary branches per plant (0.848) and (0.789), stem girth (0.835) and (0.736), plant height (0.829) and (0.803), number of secondary branches (0.812) and (0.782), duration of flowering (0.722) and (0.698), inflorescence length (0.718) and (0.581), plant spread (0.671) and (0.648), days to first flowering (0.671) and (0.663), stalk length (0.606) and (0.594), days to 50 per cent flowering (0.591) and (0.548) as well as days to bud initiation to flowering (0.576) and (0.549) both at genotypic and phenotypic levels respectively. These results indicating that the prominent morphological traits are highly important and can be selected for future crop improvement programme in Gomphrena.

**CULTIVATION AND VALUE ADDITION PRACTICES OF ASHWAGANDHA
(WITHANIA SOMNIFERA) IN INDIA: A REVIEW**

Y.Y. Sumthane, Vinita Bisht and Annu

Department of Forest Products and Utilization
Department of Silviculture and Agroforestry
Department of Basic and Social Sciences
College of Forestry, BUAT, Banda, U.P.

ABSTRACT

Ashwagandha is one of the most revered plants in traditional Ayurvedic medicine in India. It is an erect, greyish, subshrub with inconspicuous yellow or greenish flowers followed by small, spherical, orangish-red berries containing yellow, kidney-shaped seeds. It grows three-to-five feet tall, mainly on waste land, but is cultivated widely as the whole plant; most commonly the root and leaf are used medicinally. The species is widely distributed in the northwestern Indian states of Gujarat, Madhya Pradesh, Maharashtra, Rajasthan, Uttar Pradesh, and the Punjab plains extending to the mountainous regions of Himachal Pradesh and Jammu. It also is cultivated in parts of Madhya Pradesh and Rajasthan.

CURRENT TECHNIQUES USED IN SOIL CONSERVATION

Pankaj Kumar, Payal Choudhary and Ravi Kalash

Institute of Agricultural Sciences
Bundelkhand University, Jhansi, Uttar Pradesh.

ABSTRACT

Minimum soil disturbance, permanent soil cover through crop residues or cover crops, and crop rotations are all part of conservation agriculture (CA) technology. Efforts to develop, enhance, and disseminate conservation-based agricultural technology have been ongoing in India for nearly two decades, and have made great progress since then, despite a number of barriers to CA implementation. In the Indo-Gangetic plains, enormous efforts have been made on no-till wheat under a rice-wheat rotation. Adoption of CA has more payoffs than drawbacks, but both adopters and promoters understand the balance between the two. deterioration is mostly driven by land use decision makers' actions, and it has significant ramifications for both human and natural systems. Soil erosion is still a serious environmental problem in India and other parts of the world, despite years of research and significant expenditure in restoration and prevention. Conservation methods commonly associated with glyphosate-resistant crops, such as reduced tillage and crop cover, improve soil conditions, there has been little research on their effects on soil when used in conjunction with glyphosate-resistant crops. Conservation activities are thought to benefit soil in the same way whether or not glyphosate-resistant crops are utilised. Many conservation measures are mature technologies aimed at stabilising the soil by encouraging the production of larger, more cohesive aggregates, providing a protective barrier against eroding wind or water, or lowering the erosive energy of these elements. These technologies are now being used with better production techniques in newer conservation strategies. Independent of the climate scenario, the selected soil conservation measures maintain their protective effect on soil resources. As a result, they can be suggested as sustainable soil/land management approaches in future climatic conditions with minor changes.

DEGRADATION AND REMOVAL OF PAHS USING BIOREMEDIATION TECHNIQUES FROM AGRICULTURAL SOIL-A REVIEW PAPER

Shreya Singh and Ningombam Linthoingambi Devi*

Department of Environmental Science
Central University of South Bihar, Fatehpur, Bihar

ABSTRACT

Soil is an important environmental matrix that directly or indirectly supports the life of all creatures. Despite being the ultimate sink for all contaminants, it has been neglected for a long time, resulting in poor soil quality. Due to the contamination of various toxic polycyclic aromatic compounds (PAHs) in soil it diverts the quality of soil and impacts the soil ecosystem. Some of the soil qualities like grain size, porosity, and water-holding capacity can alter by contamination of PAHs. Henceforth, it is necessary to identify ecologically sustainable treatment alternatives for contaminated site cleanup. Biological technologies, in particular are seen as promising because they are low-cost, safe, and ecologically beneficial. When it comes to pollutant degradation, microorganisms are known for their enzyme-catalyzed catabolic activity, which can be advantageous in the decomposition of PAHs. There are various microbes which are extensively used for the removal of PAHs in which *Cobetia marina*, *Rhodococcus sol* and *Pseudoalteromonas agarivorans* were found to be significant in degradation of PAHs. Present review paper is to compiled the various recent techniques used for the degradation and remediation of PAHs in agricultural soil.

**DEHYDROGENASE ACTIVITY, ALKALINE PHOSPHATASE,
MICROBIAL BIOMASS CARBON AND NITROGEN, UNDER A.
PROCERA BASED AGROFORESTRY SYSTEM OF BUNDELKHAND**

Garima Gupta¹, R.S. Yadav² and Deepak Maurya²

¹Rani Lakshmi Bai Central Agricultural University, Jhansi

²ICAR-Indian Institute of Soil and Water Conservation (RC), Datia

ABSTRACT

The present investigation aimed to analyze the role of different pruning regimes of *Albizia procera* on microbial biomass C, microbial biomass N, dehydrogenase and alkaline phosphatase activities under semi-arid agroforestry systems of Bundelkhand. We studied six year old *Albizia procera* based land uses at experimental farm of Central Agroforestry Research Institute, Jhansi. Six systems were used viz. unpruned *A. procera* agroforestry, 50% pruned agroforestry, 70% pruned agroforestry, sole tree, sole cropping and fallow. To ascertain the impact of *A. procera* based land uses and its management practices on soil, soil samples were taken at 0-5 cm and 5-15 cm soil depth and beneath canopy of *A. procera* at 1, 2 and 4 m distance from the trunk of the tree. Results revealed that Alkaline phosphatase and dehydrogenase activity decreased significantly at 4 m distance from trunk of *A. procera* at 1 m distance. Alkaline phosphatase activity in soil under *A. procera* land uses was in the order: *A. procera* unpruned + crop > *A. procera* unpruned + fallow > *A. procera* pruned 50 % > *A. procera* pruned 70 % > cropping > fallow. Spatially, C_{mic} and N_{mic} decreased significantly away from trunk of *A. procera* under all pruning regimes and land uses. Overall, C_{mic} and N_{mic} in descending order under *A. procera* based land uses as: *A. procera* unpruned + crop > *A. procera* unpruned + fallow > *A. procera* pruned 50% + cropping > *A. procera* pruned 70% + cropping > cropping > fallow. *A. procera* unpruned either with crop or fallow brought significantly higher build up in cumulative soil fertility compared to pruned *A. procera*. Further, beneath canopy of *A. procera*, cumulative soil fertility was also found higher inward to the canopy of the tree.

DEVELOPMENT OF BIO-FERTILIZER USING EICHHORNIA CRASSIPES AS A STARTING MATERIAL

Vijay Pratap Singh¹

¹Plant Biotechnology Laboratory, Department of Biotechnology
Delhi Technological University, Delhi, India

ABSTRACT

Eichhornia crassipes is commonly known as free floating perennial hydrophyte that belong to the Pontederiaceae family. As their physical appearance is different because of their leaves that are broad, thick, glossy as well as ovate and float over the water surface. It is observed as the worst aquatic plant weed because it is the wide productive plant that is present on the earth. That weed has some negative characters but besides this, it has alternative use of a low-cost organic biofertilizer that contain lots of beneficial features. This weed is a better absorber of nitrogen, phosphorous, potassium from the water as compared to other weeds. It is also used as the best source of compost material.

In the proposed work, we will conceptualise the idea of "best out of waste". That the way we utilise the weed in the way of management. First we take that weed from the water and after that, that weed will be dried in the presence of sunlight. Then that dried weed are grinded in a fine particle, then mixed with the ash and some animal manure as well as vermicompost. It is supposed that microbial degradation that break down the lipid, protein, sugar, fat and starch and after that further enhance biocompost will be tested for their potential in the field condition at horticulture department IILM-CET. Then we check the growth of tested plant will be estimated with the growth of control plant in the identical environment. That unwanted weed have lots of hazardous range from the ecological and economical to social that incline to endanger biodiversity that cause eutrophication, shelter pests, clogging the fresh water way as well as simulate agriculture and aquaculture, inhibit shipping and recreational activities. The available control techniques that is not fulfilled to contain its violent multiplication or proliferation. In the current time, it had proposed or visualised that their successful utilisation of that weed can decode or figure out the related problem that correlated with that. In the assumption the conversion of that vast biomass into bio fertilizer can come up with the fix the issue of manifold range. In a similar way, the fertiliser of water hyacinth can be utilised in the land field besides like a green manure or pathogen free compost that increase the fertility of soil and crop yield and commonly upgrade the quality of soil. Organic manure give a far better result than chemical fertiliser. It will be a level come step in remote rural area where people primarily depend on agriculture as means of livelihood since it will not only be cheap and sustainable but also generate employment. Water hyacinth in a graceful solution for the developing countries where other mineral and chemical fertiliser that are extortionate and to remove the problem of water hyacinth and quality of soil.

DEVELOPMENT OF SINGLE EYEBUD TECHNOLOGY (SEBT) FOR RAPID MULTIPLICATION OF QUALITY PLANTING MATERIALS IN BN HYBRID

**Hanamant M. Halli^{*1&2}, V. K. Wasnik¹, Sanjay Kumar¹,
Ravi Prakash Saini¹, Prabha Singh¹ and V. K. Yadav¹**

¹ICAR-Indian Grassland and Fodder Research Institute, Jhansi-284003 (UP), India

²ICAR- National Institute of Abiotic Stress Management, Pune- 413 115, Maharashtra, India

ABSTRACT

Bajra Napier Hybrid (BNH) has emerged as one of the most important perennial forage crops in the country for the arable lands due to its high yielding potential (600 t ha⁻¹ yr⁻¹ green fodder) and nutritional value (8.7-10.2% crude protein, 28-30.5% crude fiber, 10-11.5% ash content, 42.5-44% ADF, 64-66% NDF and 55-58.6% IVDMD). Despite increasing demand, poor establishment issues in BNH grass have not yet been solved. Moreover, under the conditions of soil and climate, stem cuttings do not root well and therefore lodge badly resulting in poor establishment and lower yield. In this context, initiated a study (2019-2021) at ICAR-IGFRI Jhansi to standardise the SEBT in BNH. Single eye buds were obtained from a year-old ex-plants and planted in plastic root trays (avg. length 8 cm, dia. 2.7 cm & vol. 45.80 cm³) consisting of growth media; cocopeat:FYM:soil @ proportion of 60:30:10 and kept under room temperature for 10 days (28-30°C & 80-85% RH). Among growth hormones (IAA, IBA and ethrel), IBA soaking @ 100 ppm for 15-20 minutes found effective for rooting (75-82.5%) after 20 days of planting. Finally, 21 days old seedlings were planted at field on beds (1 × 2 m) with spacing of 30 × 30 cm. Field data after 15 days of transplanting revealed that survivability percentage of seedlings was highest with IBA @ 100 ppm (80-85%) compared to control (30-40%). The successful establishment of seedlings with IBA was mainly due to improved rooting and seedling vigour. This breakthrough in technology could address multiplication and transportation issue of BNH planting material as SEBT can reduce the use of planting material (80-90%), which further ensures the green fodder availability to livestock. Thus, single bud technology could be one of the most viable and economical planting materials in reducing the cost of production and transportation. Certainly, this venture will open new vistas for entrepreneurship development among the new entrepreneurs and taking them as start-up.

DIFFERENTIAL EXPRESSION ANALYSIS OF DEFENSE-RELATED CANDIDATE GENES ASSOCIATED WITH DOWNY MILDEW (*SCLEROSPORA GRAMINICOLA*) RESISTANCE IN PEARL MILLET

**Praveen Kumar Yadav^{1*}, P. Shashikumara¹, M. Ashajyothi²,
Brijesh K. Mehta¹, H.S. Mahesha¹, Shahid Ahmed¹ and S. Chandra Nayaka³**

¹ICAR-Indian Grassland and Fodder Research Institute, Jhansi

²ICAR-Central Agroforestry Research Institute, Jhansi

³Department of Studies in Biotechnology, University of Mysore, Mysore

ABSTRACT

Pearl millet (*Pennisetum glaucum* L.) is an important nutritious cereal and fodder crop adapted to a wide range of environmental conditions, and majorly grown in low rainfall areas of Sub-Saharan Africa and Indian subcontinent. Downy mildew caused by *Sclerospora graminicola* is the most destructive disease in pearl millet which can lead to 20-40% yield loss, and sometimes complete failure of seed set in heavily infected plants. This enforced researchers to identify the genes associated with downy mildew resistance in pearl millet. In present study, downy mildew resistant genotype IP18292 and susceptible genotype Tift-23-D1-B2-P1-P5 were inoculated with zoospores of *sclerosopora graminicola*. The sampling was done at different time points of 0, 6, 12, 18, 24, 36 and 48 h of post inoculation for disease reaction response and gene expression analysis. The resistant genotype showed hypersensitive response after 18 h of post inoculation, which was not observed in susceptible genotype. Defense-related candidate genes including transcription factors (MYB and bZIP), defense related enzymes (LOX, PAL and RBO), pathogenesis-related proteins (BGLU, Rnase and CHI) and signaling molecules (LRRPK and MAPK) were selected for differential expression analysis between resistant and susceptible genotype. The expression levels of all the candidate genes were comparatively higher in resistant genotype compared to susceptible genotype at different time points indicating their possible role in pearl millet resistance against downy mildew causing oomycete, *Sclerospora graminicola*. Further, among all the genes studied, the expression level of LOX was highest followed by MAPK, PAL, MYB and BGLU in resistant genotype than susceptible genotype across different time points. The results indicate that overexpression of LOX, MAPK, PAL, MYB and BGLU genes is associated with increased protection against *Sclerospora graminicola* infection in pearl millet. These genes can be used as markers for selection and breeding of downy mildew resistance in pearl millet cultivars.

**DIFFERENTIAL RESPONSE OF TWO ENDOPHYTIC
BACTERIAL STRAINS INOCULATION IN AMELIORATION
OF AS INDUCED STRESS OF *BACOPA MONNIERI* L.**

Pratibha Tripathi* and Puja Khare

Crop Production and Protection Division
CSIR-CIMAP, Lucknow (U.P.)

ABSTRACT

Arsenic is a carcinogenic metalloid and its release in the environment is of global concern. Arsenic contamination negatively influences the certain metabolic activities in plants and even death under severe stress conditions. In the present study, effect of two arsenic (AsV) reducing endophytic bacterial strains, CIMAP-A4 and BAC-7, in reducing As induced phyto-toxicity in *B. monnieri* L. was deciphered under greenhouse conditions. Both the strains were IAA producers under normal conditions, but under As stress, only CIMAP-A4 could produce an appreciable amount of IAA. Inoculation of both the endophytes showed plant growth promotion (PGP) under As stress but strain CIMAP-A4 was more efficient than BAC-7 in reducing As stress as evident from improved tolerance index, arsenate reductase activity, plant nutrient uptake (Zn, Mg, Ca) and non-protein thiol synthesis and may be the reason for its higher ameliorating effect. This endophyte CIMAP-A4 was identified as *Paenibacillus* sp. on the basis of 16s rRNA gene sequence analysis. Here, we conclude that PGP traits along with As reduction potential are crucial factors for selecting a microbe for the success of bioremediation and mitigation of As-induced stress in plants, severely affecting its growth and yields.

**DIVERSITY AND ABUNDANCE OF INSECT POLLINATORS IN
TWO DIFFERENT AGRICULTURAL LANDS IN KUMAUN HIMALAYA,
UTTARAKHAND, INDIA**

Deeksha Arya* and Deepika Goswami

Department of Zoology
Kumaun University, Nainital, India

ABSTRACT

The insects are the most dominant and important animals on the earth and affect human life directly or indirectly. Insects play an important role in performing ecological processes in agriculture. The present study was carried out for one year from March 2019 to February 2021 to explore the diversity of insect pollinators on Agriculture of Kumaun Himalaya Uttarakhand was made by collecting them in Agroecosystem located at Paharpani and Betalghata area of Nainital. More than 500 individuals were observed during the study period belonging to the order Hymenoptera, Lepidoptera, Coleoptera, and Diptera. Insects were collected by using a sweeping method and were preserved for further identification with the help of various taxonomic keys. The present study focused on identifying pollinator species in the agricultural ecosystem, and is expected to provide baseline information to plan future research in the field of pollination.

DIVERSITY AND DISTRIBUTION OF ETHNOMEDICINAL PLANTS OF UTTARAKHAND HIMALAYA

Sunil Joshi

ICAR Central Agroforestry Research Institute
Jhansi, Uttar Pradesh

ABSTRACT

Uttarakhand, also known as 'Dev Bhoomi,' is a Himalayan natural environment rich in majestic natural beauty, a large variety of medicinal plants, and traditional medicinal knowledge. Medicinal plants and their products have been a primary source of medicine and highly nutritious resources around the world since prehistoric times. Ethno-medicinal information on medicinal plants and their uses by indigenous cultures is useful not only for the conservation of traditional knowledge and biodiversity, but also to promote community health care, and might serve in drug development. It is a rich State of ethnomedicinal point of view, as rich in floristic as well as in ethnic diversity with varied climate zone. Medicinal and aromatic plants have been used in various forms since the dawn of mankind. Medicinal plants and their products have been a primary source of medicine and highly nutritious resources around the world since prehistoric times. Anthropogenic pressure, grazing, construction, tramping, road construction, irregular construction, and natural threats are all truly present inside the Uttarakhand Himalayan region. The medicinal plant is traditional uses for cutting, wounds, and various diseases in curing aliment and they are income generated plants. Most people use for medicine roots, leaves, fruit, etc as medicine. The information will be a contribution of Local people, Vaidyas, etc. The current study of Uttarakhand distribution and traditional uses of the 57 ethnomedicinal plants, comprises 33 families and 36 different genera and they used for various diseases were documented. Different habitats such as herb(41%), shrub (26%), trees (33%), which were further classify according to the plant part used such as : leaf (23%), root (18%), fruit (9%), flower (7%), bark & fruit (8%), whole plant (9%), bark (4%), seed (4%), bulb (2%), and others (16%).

ECOSYSTEM MANAGEMENT AND SUSTAINABLE DEVELOPMENT

**Ram Prakash, Rajesh Kumar, Shivanand
Maurya, Kaptan Baboo and Ravi Verma**

Department of Agronomy, A.N.D.U.A.T. Ayodhya (U.P.)

ABSTRACT

Ecosystem management is widely proposed in the popular and professional literature as the modern and preferred way of managing natural resources and ecosystems. Scientists glowingly describe ecosystem management as an approach that will protect the environment, maintain healthy ecosystems, preserve biological diversity, and ensure sustainable Development. Critics off at the concept as a new label for old ideas.

This will increase the energy consumption and CO₂ emissions at equivalent rates. The Effects of various policy options aimed at reducing energy consumption and CO₂ emission were analysed using a scenario approach. The scenario analysis shows that efficiency improvements can reduce future energy consumption and CO₂ emissions by 26%. If the model split is promoted in favour of public transport modes (rail and public road transport), about 45% reduction in energy requirements and CO₂ emissions is expected.

India, sustainable strategy means one that is economically, environmentally and socially sustainable. This calls for rapid economic growth to deal with poverty and human development. However, the relatively meagre energy resources of the country pose a huge challenge. The paper identifies various technical options, their potential roles and alternative policy measures to realize them in a cost effective manner.

India has committed to reduce emissions with a goal to increase renewable energy production to 175 Gig watts (GW) by 2022. Achieving this objective will involve rapidly increasing the deployment of solar and wind energy, while at the same time addressing the related challenges of the financing requirements, environment impacts, and power grid integration. Developing energy on lands degraded by human activities rather than placing new infrastructure within natural habitats or areas of high production agriculture would reduce cumulative impacts and minimize land use conflicts.

EFFECT OF CLIMATE CHANGE ON AGRICULTURAL PRODUCTION OF BUNDELKHAND REGION

Priyanshi Garg and Vinit Kumar

Institute of Environment and Developmental Studies
Bundelkhand University, Jhansi

ABSTRACT

Bundelkhand is a geographical area comprising various districts of Uttar Pradesh and Madhya Pradesh. Bundelkhand region has been identified as a unit for the purposes of planning and development by Central and State Governments. It comprises of the districts of Jhansi, Lalitpur, Jalaun, Hamirpur, Mahoba, Banda, Chitrakoot, Datia, Tikamgarh, Niwari, Chhatarpur, Panna, Sagar and Damoh. Agriculture is the predominant occupation in Bundelkhand region. Factors which are required for good agricultural production are availability of natural factors like soil (pH, structure, composition, moisture retention, absence of growth inhibiting substances), climate (temperature, rainfall, sunlight and wind) and water (availability of groundwater, irrigation, pH, salinity). Other factors include availability of nutrients, skilled labour and quality seeds. Topographical factors like relief of the area, proper tillage and transport facilities also affect production. Climate change is caused due to increase in green house gases like CO₂, which in turn results in production of seeds with low nutrient values and proteins. Rise in temperature affects humidity and precipitation. Change in pH levels of soils also affects the production of crops. By studying the effects of climate change on factors affecting agricultural production we can formulate better strategies and methods to prevent loss of production.

**EFFECTS OF COMPOSTED AND UNCOMPOSTED LEAVES OF
AGERATINA ADENOPHORA ON GERMINATION, GROWTH AND
YIELD OF *LENS CULINARIS* (MEDIC.)**

Kavita Khatri¹, Bhawna Negi¹, Kiran Bargali¹, Surendra S. Bargali¹

¹Department of Botany, DSB Campus
Kumaun University, Nainital, Uttarakhand, India

ABSTRACT

In the agricultural fields invaded by *Ageratina adenophora*, slashing of above-ground plant parts is performed to minimize the harmful effects of this weed on the crops. As, agricultural fields are among the most susceptible areas for *A. adenophora* invasion, farmers usually slash the aerial parts of this weed to minimize the losses. But, the impact posed by the slashed residues on the crop production is ignored. Therefore, the present study was performed to check the response of a leguminous crop lentil (*Lens culinaris* Medic.) to *A. adenophora* allelopathy. Fresh, dry senesced and composted leaves were added to 1 kg soil in different concentrations (control - C₀; 10 g/kg - C₁; 20g/kg - C₂; 40 g/kg - C₃ and 80 g/kg - C₄, respectively) and germination, growth and productivity parameters of lentil were measured. The results showed that composting of *A. adenophora* reduced the inhibitory potential of weed residues incorporated into the soil. The composted leaves promoted seed germination, plant height, biomass and crop yield in concentration dependent manner, whereas, fresh leaf treatment and dry leaf treatment at higher concentration inhibited the performance of lentil. Compared to control, maximum crop productivity was recorded at C₄ (2.4 times high), followed by C₃ (2.1 times), C₁ and C₂ (1.6 times each) in compost treatment. Lentil plants were severely affected by dry senesced leaf treatments and hardly produced any pods and seeds. These results suggested that, composting of *A. adenophora* residues could help to reduce the agricultural losses and minimize the allelopathic potential of this weed for the healthy environment and economy.

EFFECT OF CROP GEOMETRY AND NITROGEN DOSES ON GROWTH, YIELD, AND NUTRIENT CONTENT AND UPTAKE IN TRANSPLANTED RICE

^{1*}Brijesh Kumar, ²S K Prasad, ³Magan Singh and ⁴Deepak Kumar

^{1,4,3}ICAR-National Dairy Research Institute, Karnal (Haryana)

²Institute of Agricultural Sciences

Banaras Hindu University, Varanasi, Uttar Pradesh

ABSTRACT

Rice (*Oryza sativa* L.) is the world's most significant cereal crop, as it is the staple food for 70% of the world's population. Rice is farmed on 161.1 million hectares across the world, with a total yearly production of 751.9 million tonnes. After China, India is the world's second-largest rice producer. Rice is grown in India under a wide range of conditions, with the kharif season accounting for the majority of production. Rice is grown on roughly 43.2 million hectares in India, with a yield of 112.91 million tonnes and a productivity of 27.8 quintal per hectare. Rice production cannot be maintained until soil fertility is reduced as a result of the nutrient mining system caused by non-stop cropping. Nitrogen is an essential component for rice's growth, development, and metabolism. Excess nitrogen use degrades rice quality and causes nitrogen loss and soil acidification. Crop geometry is important for optimizing rice productivity since it aids in the use of solar radiation as well as nutrients absorption in the rice crop. Plant density, along with nitrogen availability, is one of the most important factors affecting rice productivity. The experiment was place at the Agricultural Research Farm of the Banaras Hindu University's Institute of Agricultural Sciences in Varanasi. The experiment was set up in a factorial randomised block design with three replications and two factors: crop geometry levels ($15 \times 15 \text{ cm}^2$, $20 \times 11.25 \text{ cm}^2$, $25 \times 9 \text{ cm}^2$) and four nitrogen doses (0, 75, 150, 225 kg N ha⁻¹). Swarna Sub-1 rice variety was employed in the experiment. Crop geometry ($20 \text{ cm} \times 11.25 \text{ cm}$) and nitrogen rates of 150 kg N ha⁻¹ indicate considerably improved crop growth, production, and nutrient absorption.

**EFFECT OF CROP GEOMETRY AND NITROGEN MANAGEMENT ON
YIELD AND PRODUCTIVITY OF PEARL MILLET
(*Pennisetum glaucum* L.) UNDER GUAVA
BASED AGRI-HORTI SYSTEM**

Srishti Dipriya Minz¹, S.K. Prasad², K.S. Pant¹

¹Department of Silviculture and Agroforestry,
Dr Y S Pamar University of Horticulture and Forestry, Nauni, Solan. HP.

²Department of Agronomy, Institute of Agricultural Sciences,
Banaras Hindu University, Varanasi. UP.

ABSTRACT

The experiment aimed to study the effect of crop geometry and nitrogen management on yield and productivity of pearl millet (*Pennisetum glaucum* L.) grain under guava based agri-horti system. The experiment was conducted at Agricultural research farm of RGSC, Banaras Hindu university, in the year 2019-20. The treatment consisted of three different crop geometry (45 × 15, 40 × 20 and 30 × 20 cm) and four different nitrogen management (0% RDN, 100% RDN by urea, 75% RDN by urea + 25% RDN by FYM and 50% RDN by urea + 50% RDN by FYM). The experiment was conducted in Randomized block design (factorial) with three replications. Findings of the study demonstrated that significantly maximum growth parameters viz., plant height, leaf area index, crop growth rate, relative growth rate, maximum yield and yield attributes viz., panicle length, panicle girth, grain panicle⁻¹ test weight, grain yield, biological yield and harvest index were recorded in the crop geometry 40cm × 20cm with application of 100% RDN by urea. Similarly higher nutrient content, uptake and stoichiometry was obtained in the crop geometry 40cm × 20cm with application of 100% RDN by urea. We conclude that the crop geometry 40cm × 20 cm and application 100% RDN by urea enhance the yield, nutrient content and stoichiometry of pearl millet in comparison to the other treatments.

**EFFECT OF DIFFERENT LEVELS OF NPK AND
VERMICOMPOST ON GROWTH OF OKRA
[ABELMOSCHUS ESCULENTUS L.] VAR. KASHI KRANTI**

Sanwar Mal Yadav¹, Tarence Thomos¹, Lekhraj Yadav² and Vinod Kumar Yadav¹

¹Department of Soil Science and Agricultural Chemistry

²Department of Entomology

Sam Higginbottom University of Agriculture, Technology and Sciences
Prayagraj, U.P., India

ABSTRACT

The field experiment was carried out at soil science research farm of Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj during summer season 2018-19. The design applied was 3x3 factorial randomized block design having three factors with three levels of NPK @ 0, 50, and 100 % ha⁻¹, three levels of Vermicompost @ 0, 50 and 100% ha⁻¹ respectively. The result obtained with treatment T₅-[NPK@50% + Vermicompost @100%] that showed the highest growth regarding, gave the best results with respect to plant height 115.66 cm, number of leaves plant⁻¹ 49.31, No. of fruit plant⁻¹ 36.33. The combined use of NPK resulted in significant increase on enrichment of soil fertility status. It was also revealed that the application of NPK with Vermicompost were excellent source for fertilization than fertilizers for growth. The treatment (T₅) also showed greater growth followed by other treatments.

**EFFECT OF DIFFERENT LEVELS OF NPK AND S, ON GROWTH,
YIELD OF SOYBEAN (*GLYCINE MAX L. MERRILL.*) UNDER GUAVA
(*PSIDIUM GUAJAVA L.*) BASED AGRI-HORTI SYSTEM”**

Ankit Pandey* Avijit Sen¹ and Makhan Singh Karada²

^{1,2}Department of Agronomy
Banaras Hindu University, Varanasi (U.P.)

ABSTRACT

A field experiment carried out to study the “Effect of different levels of NPK and S, on growth, and yield of soybean (*Glycine max L. Merrill*) under guava (*Psidium guajava L.*) based Agri-Horticulture system” in the agriculture research farm of Rajiv Gandhi South Campus, Banaras Hindu University Barkachha Mirzapur Uttar Pradesh. Soybean was a major crop grown in agroforestry systems. A study was carried out during (*Kharif*) rainy season 2018-19 in a 12- year-old guava based Agri-Horti system with five treatments viz., T₁ Control (no fertilizer), T₂ (N: 20 kg, P₂O₅: 40 kg, K₂O: 30 kg, and S: 10 kg ha⁻¹), T₃ (N: 30 kg, P₂O₅: 40 kg, and S: 20 kg ha⁻¹), T₄ (N: 40 kg, P₂O₅: 80 kg, K₂O: 50 kg, and S: 30 kg ha⁻¹), T₅ (N: 50 kg, P₂O₅: 100 kg, K₂O: 60 kg, S: 40 kg ha⁻¹) respectively, and every treatment was replicated four times in Complete Randomized Block Design. The results reveal that the maximum growth and yield of soybean recorded with T₅ N (50 kg ha⁻¹) + P₂O₅ (100 kg ha⁻¹) + K₂O (60 kg ha⁻¹) + S (40 kg ha⁻¹), and the minimum was observed with T₁ (Control). Inter cropping of soybean crop under guava which provide additional income to the farmers and system is socially and economically viable and sustainable.

EFFECT OF DIFFERENT ORGANIC MANURES ON YIELD OF CHILLI (*CAPSICUM ANNUM* L.) IN BUNDELKHAND REGION OF U.P.

**Safik Ahamad*, Prashant Deo Singh, Anand Singh, Amit K Singh,
Manjangouda S.S. Avijit Ghosh, Sunil Kumar, Prashant Kumar and Praveen Kumar Yadav**

ICAR-Indian Grassland and Fodder Research Institute
Jhansi, U.P., India

ABSTRACT

The present investigation entitled “Effect of different organic manures on yield of chilli (*Capsicum annum* L.) in Bundelkhand region of U.P.” was carried out the organic research farm karguwanji Institute of Agricultural Sciences, Bundelkhand University, Jhansi (Uttar Pradesh) during Rabi season of the year 2019-2020. The experiment was laid out in a randomized complete block design with three replications comprising 8 viz. T₀-Control, T₁- Farm yard manure, T₂- Poultry manure, T₃-Vermicompost, T₄-Neem cake, T₅-Farm yard manure (50%) + Vermicompost (50%), T₆-Farm yard manure (50%) + Poultry manure (50%) and T₇- Farm yard manure (50%) + Neem cake (50%). The result showed that the treatment T₆ FYM (50%) + Poultry manure (50%) gave maximum and significantly. Days to 1st flowering (39.66 days), Number of fruit per plants (132.33), Fruit length (8.63 cm), Fruit diameter (1.92 cm), Average fruit weight (1.59g), Fruit yield (7832.55 kg/ha) and Dry fruit weight (31.57g). Application of T₆ FYM (50%) + Poultry manure (50%) significantly superior to other treatments.

EFFECT OF DIFFERENT PRIMING TREATMENTS ON QUALITY NURSERY PRODUCTION OF CHINA ASTER CVS 'POORNIMA' AND 'KAMINI'.

Shabnam Pangtu, Puja Sharma, Prashant Sharma and Shilpa Kamal

Department of Floriculture and Landscape Architecture
Dr. YS Parmar University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh, India

ABSTRACT

The present investigation was carried out at Dr. YS Parmar University of Horticulture and Forestry, Nauni, Solan (H.P) on cvs 'Poornima' and 'Kamini' in nursery under open field conditions in randomized block design (factorial) comprising eight seed priming treatments viz., control, hydropriming with water, priming with GA₃ (50, 100 and 150 ppm) and Biopriming with *Trichoderma viride* @ 1×10^4 cfu/ml, 1×10^5 cfu/ml and 1×10^6 cfu/ml. The findings revealed that maximum speed of germination (18.97, 21.58), germination percentage (83.17, 86.33 %), root length (2.87, 2.93 cm), shoot length (6.39, 6.59 cm), seedling length (9.26, 9.52 cm), seedling dry weight (227.67, 248.30 mg), seed vigour index-I (769.89, 822.19), seed vigour index-II (18,934.33, 21,436.62); minimum time taken to seed germination (12.72, 11.33 days) and days required to reach 4-6 leaf stage (23.70, 22.33 days) were recorded with the priming treatment GA₃ (100 ppm) in both cultivars 'Poornima' and 'Kamini', respectively. Hence, it is concluded that seeds of cv. 'Kamini' treated with GA₃ (100 ppm) for 24 hrs obtained the best results for most of the desirable for the quality nursery production of the China aster.

EFFECT OF DIFFERENT SILVI-HORTI-AGRICULTURAL SYSTEMS ON SOIL CHEMICAL PROPERTIES AND AVAILABLE NUTRIENTS UNDER RAINFED PLATEAU CONDITION OF JHARKHAND

Kumari Beauty^{*1}, Bikash Das², Sushanta Naik² and Mahesh Kumar Dhakar²

^{*1}FRCER, Prayagraj, U.P., FRI, Dehradun, India

²ICAR Research Complex for Eastern Region, Research Centre, Ranchi, Jharkhand, India

ABSTRACT

The study was carried out at ICAR Research Complex for Eastern Region, Research Centre, Ranchi, Jharkhand, India during 2018-2019. The investigation was undertaken in 4 years old established silvi-horticultural system of agro-forestry. The study was laid out in split plot design with four treatments and four replications. Results revealed that the growth and development of filler crops showed significant effect on the silvi-horti-agricultural system. The growth performance of the main crop, filler crop and inter crops varied from one system to another under silvi-horti-agricultural system. Soil samples from different tree based systems (Mahogany + Mango + Aonla + Ragi/Rice, Mahogany + Mango + Peach + Ragi/Rice, Mahogany + Mango + No filler) and Control (Ragi/Rice) were taken at 0-30 cm and 30-60 cm depths. The soil moisture retention value was observed significantly higher under silvi-horti-agricultural systems (42.03%) in comparison to the fallow system. EC of soil decreased with increasing soil depth under sole crops as well as silvi-horti-agricultural system. Maximum reduction in EC was recorded in peach based combinations. Silvi-horti-agricultural system showed significantly higher reduction in pH than sole crops at surface layer (0-30 cm). Organic carbon content in the soil under silvi-horti-agricultural system (0.45%) was significantly higher than sole crops (0.38%). The organic carbon content decreased with increasing soil depth. The available N, P and K ($215.86 \text{ kg N ha}^{-1}$, $36.24 \text{ kg P ha}^{-1}$ and $277.99 \text{ kg K ha}^{-1}$ respectively) over control ($157.51 \text{ kg N ha}^{-1}$, $24.95 \text{ kg P ha}^{-1}$ and $227.65 \text{ kg K ha}^{-1}$ respectively) and exchangeable Ca ($43.86 \text{ mg/100g soil}$) and Mg ($23.23 \text{ mg/100g soil}$) were recorded highest at surface layer of mango + mahogany + peach system in sole crops. The available N, P and K decreased with the increase in depth. Hence tree based systems enhanced soil organic matter content, available nutrients and improved soil properties.

**EFFECT OF DIFFERENT NITROGEN LEVELS AND ROW SPACINGS ON
GROWTH AND YIELD OF *SESAMUM INDICUM* L. (SESAME) UNDER
AGELE MARMELOUS L. (BEAL) BASED AGRI- HORTI SYSTEM**

Kuwar Yeshvir Arya¹, V. K. Srivastava² and S.K. Verma³

Department of Agroforestry, College of Horticulture & Forestry
Acharya Narendra Deva University of Agriculture & Technology Kumarganj
Ayodhya Uttar Pradesh

ABSTRACT

A field study was conducted during Kharif, season 2019-20 at Agricultural Research Farm, Rajiv Gandhi South Campus Banaras Hindu University, Barkachha, Mirzapur, (Uttar Pradesh) to study the response of four nitrogen levels (0 kg N/ha, 20 kg N/ha, 40 kg N/ha and 60 kg N/ha) and two row spacings (30 cm and 45 cm) under rainfed condition. The experiment was conducted in a Factorial Randomized Design with 8 treatments and 3 replications. Result revealed that row spacing 45 cm recorded more number of branches, capsules, dry matter plant⁻¹, 1000 grain weight and higher grain yield than the row spacing 30 cm. Application of 40 kg N/ha produced significantly maximum grain yield along with the higher values of plant height, branches plant⁻¹, dry matter plant⁻¹ was with 60 kg N/ha. Increasing N levels upto 40 kg N/ha resulted in significantly higher grain yield, yield attributes. Through increased the levels of nitrogen up to 60 kg N/ha increased the maximum oil content (41.84 %) in 45 cm but not up to the level of 40 kg N/ha, whereas, '40 kg N/ha' (39.70 %) and '20 kg N/ha' (39.05) produced, respectively. Although highest nitrogen levels was found superior over medium and lowest Nitrogen levels and produced maximum gross returns, net returns and benefit cost ratio.

EFFECT OF EUCALYPTUS (*EUCALYPTUS TERETICORNIS*) TREE MANAGEMENT PRACTICES PRODUCTIVITY OF WHEAT

Vinita Bisht¹, Y.Y. Sumthane², K.S. Bangarwa³ and Annu⁴

^{1,2,4}Banda University of Agriculture and Technology, Banda (U.P.)

³Department of Forestry, CCS Haryana Agricultural University, Hisar (Haryana), India

ABSTRACT

The present study was conducted to evaluate the performance of wheat varieties under different spacings of eucalyptus (3×3 m, 6×1.5 m and $17 \times 1 \times 1$ m) at the age of 7 years in 2013-14 and 2014-15, respectively. Growth and biomass attributing parameters of wheat varieties (WH-1105, WH-542, HD-2967, HD-943 and DPW-621-50) reduced significantly under different spacings of poplar in comparison to sole crop (devoid of tree). Paired row planting of poplar was found to be best *w.r.t.* wheat growth and biomass production followed by 6×1.5 m and $17 \times 1 \times 1$ m. Among wheat varieties, HD-2967 was observed shade tolerant variety and showed significantly higher plant height, dry matter accumulation, biological yield, harvest index (%) and attraction index (%) in all the spacings at different stages of growth and at harvest under study during 2013-14 and 2014-15. The maximum reduction in biological yield over control was recorded in wheat variety WH-1105 (86.7%) under 3×3 m spacing which indicates that variety WH-1105 is very sensitive to shade. However, other varieties (WH-542, DPW-621-50 and HD-943) showed moderate decrease in wheat biological yield in all the spacings of eucalyptus during both the years of experimentations.

EFFECT OF EUCALYPTUS CLONES ON THE PRODUCTIVITY OF FODDER COWPEA UNDER AGRI-SILVICULTURE SYSTEM OF SEMI-ARID REGION OF HARYANA

Ashish Kumar*, R. S. Dhillon, Vishal Johar and Manish Kumar

Department of Forestry
CCS Haryana Agricultural University, Hisar (Haryana)

ABSTRACT

The field experiment was conducted to evaluate the effect of eucalyptus clones (C-7, C-83, C-413, and C-288) on the productivity of fodder cowpea crop under an agri-silvicultural system in the semi-arid region of Haryana. Cowpea crop was sown under a one-year-old, pre-established plantation of eucalyptus clones under 7 × 3 m spacing. The growth parameters of eucalyptus were recorded at the beginning and end of the cropping season (Kharif 2016-17) whereas, the growth and yield attributes of cowpea crop were recorded at monthly intervals. Among the clones, C-413 displayed the maximum growth in relation to tree height, basal diameter, and diameter at breast height (DBH) while C-288 reported the maximum for crown width. However, the growth and yield attributes of cowpea crop were significantly affected by Eucalyptus clones C-7 and C-413 in comparison to the sole cropping (control) system. The maximum green and dry fodder yield and crude protein yield of cowpea were recorded under the C-83 clonal plantation. However, the green and dry fodder yield of cowpea under Eucalyptus clones still reported a yield reduction ranging from 23 to 41 % and 23 to 35 % respectively, as compared to the sole cropping (devoid of trees) system. The minimum and maximum reduction in fodder yield were recorded under C-83 and C-413 clones respectively.

**EFFECT OF FERTILIZERS AND BIOFERTILIZER ON YIELD ATTRIBUTES
OF GREEN GRAM [*VIGNA RADIATA* (L.) WILCZEK] UNDER GUAVA
(*PSIDIUM GUAJAVA* L.) BASED AGRI-HORTI SYSTEM IN
VINDHYAN REGION OF EASTERN UTTAR PRADESH**

Rashav Chahal* and Ajay Kumar Baheliya

Department of Agroforestry
Acharya Narendra Deva University of Agriculture and Technology,
Kumarganj, Ayodhya, Uttar Pradesh

ABSTRACT

A field experiment was conducted in Factorial Randomized Block Design during kharif 2018 farm, Rajiv Gandhi South Campus, Barkachha, Mirzapur (RGSC), Banaras Hindu University (U.P.) to effect of fertilizer and biofertilizer on growth and yield attributes in green gram (*V. radiata* L.) under guava (*P. guajava* L.) based agri-horti system. The twelve year old guava (*P. guajava* L.) orchard was planted in August 2006 as spacing of 7m x 7 m. Seven treatment combination viz., control, Rhizobium culture, phosphorus solubilizing bacteria, press mud, Rhizobium culture plus fertilizer, phosphorus solubilizing bacteria plus fertilizer, press mud plus fertilizer. Application of press mud plus fertilizer performed better by recording number of pod per plant (35.6), length of pod (11 cm) and test weight (35.1 g) yield attributes viz., grain yield (1090.25 kg ha⁻¹) and Stover yield (2808.01 kg ha⁻¹) However, significantly superior to the rest of the treatment over the control.

EFFECT OF GROWING MEDIA ON SEED GERMINATION AND GROWTH PARAMETERS OF *SANTALUM ALBUM* SEEDLINGS

Pankaj Lavania, A.S. Kale, Prabhat Tiwari and K. Gullamani

Rani Lakshmi Bai Central Agriculture University, Jhansi

ABSTRACT

Sandalwood is the fragrant heartwood of species of genus *Santalum* (family –Santalaceae). In India, the genus is represented by *Santalum album* Linn. Its wood, known commercially as “East Indian Sandalwood” and essential oil from it as “East Indian Sandalwood Oil” are among the oldest known perfumery materials. sandal is indigenous to peninsular India as its history of recorded occurrence dates back to at least 2500 years. In India *Santalum album* is found all over the country, with over 90% of the area in Karnataka and Tamil Nadu covering 8300 sq. kms. In Karnataka, it grows naturally in the southern as well as western parts over an area of 5000 sq. kms. In Tamil Nadu, it is distributed over an area of 3000 sq. kms. and dense population exists in North Arcot and Chitteri hills. The other states where sandal trees are found are Andhra Pradesh, Kerala, Maharashtra, Madhya Pradesh, Orissa, Rajasthan, Uttar Pradesh, Bihar and Manipur. *S. album* is a small evergreen tree, a partial root parasite, attaining a height of 12 to 13 meters and girth of 1 to 2.4 meters with slender drooping as well as erect branching. Leaves are opposite and decussate, and sometimes show whorled arrangement. Flowers are purplish brown, unscented and are borne in axillary or terminal cymose panicles. Flowers are tetra or pentamerous. Trees growing on stony or gravelly soils are known to have more highly scented wood. It grows best where there is moderate rainfall of 600 to 1600 mm. It grows well in early stages under partial shade but at the middle and later stages shows intolerance to heavy overhead shade. The good colour indicator like as grey purple to black sandal fruits fresh from the tree or fallen on the ground are collected during March-April. In the Seed Processing, depulping of fresh seed achieved by soaking and rubbing of pulp in water.

A study was conducted to see the effect of growing media on seed germination of eucalyptus with following treatments like as T1. RED SOIL : SAND: FYM (1:1:1), T2. RED SOIL: SOIL : FYM (1:1:1), T3. SOIL: SAND: FYM (1:1:1), T4. RED SOIL: SAND: FYM (2:1:1), T5. RED SOIL: SAND: FYM (1:2:1), T6. RED SOIL: SAND : FYM (1:1:1) T7. SAND: SOIL : FYM (1:1:1) and T8. Red soil. Seeds were treated with gibberellic acid @ 0.5 % for 12 hrs. Further, clean with fresh water and drying of seed was done in shade. Sowing of seed was done in root trainers. Watering twice a day, morning and evening.

Periodical observations were recorded to count the germination. The maximum germination (51.1 %) was recorded with under treatment T.4 RED SOIL: SAND: FYM mixed in proportion of 2:1:1 ie. and it was followed with treatment T.8 under red soil which recorded 48.9 per cent germination. Minimum seed germination count was found in T.2 Red soil: soil : FYM (1:1:1). and one year seedlings have 24 leave and 24 cm shoot length under treatment T.4.

**EFFECT OF INTEGRATED NUTRIENT MANAGEMENT ON
SOIL HEALTH PARAMETERS OF SWEET ORANGE
(*CITRUS SINENSIS OSBECK*) CV. MOSAMBI**

Komal Yadav¹ and Shankar Lal Yadav

Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya
Gwalior, M..P.

ABSTRACT

A trial was conducted to study the Effect of integrated nutrient management (INM) on growth, yield and quality parameters of sweet orange (*Citrus sinensis Osbeck*) cv. Mosambi was carried out during (June 2019–Nov. 2019) and (June 2020 - Nov. 2020). The experiment was conducted at Experimental area, Agrotechnology park of Krishi Vigyan Kendra, College of Agriculture, Gwalior, (M.P.). The nutrient status of the soil like pH, EC, nitrogen, phosphorus and potassium were significantly improved with application of combination of fertilizers. Minimum soil pH and EC (7.79, 7.67 and 0.296, 0.179 respectively) was obtained with application of the RDF (50%) + vermicompost (15 kg) + PSB (80 ml) + Azotobactor (80 ml). Maximum Nitrogen (176.1, 195.2 kg ha⁻¹), Phosphorus (13.38, 14.45 kg ha⁻¹) and Potassium (208.3, 252.5 kg ha⁻¹) was obtained with application of the RDF (50%) + vermicompost (15 kg) + PSB (80 ml) + Azotobactor (80 ml), whereas the minimum parameters were found associated with RDF (25%) + vermicompost (20 kg) (T₃).

EFFECT OF INTEGRATED NUTRIENT MANAGEMENT PRACTICES ON GROWTH, YIELD AND QUALITY OF BARLEY

¹Sandeep Kumar and ²Meena Sewhag

¹ICAR-NDRI, Karnal, Haryana

²Regional Research Station (CCS HAU, Hisar), Rohtak, Haryana

ABSTRACT

Barley (*Hordeum vulgare* L.) is the world's fourth most important cereal after wheat, rice and maize. During the 2020-21 *Rabi* season, barley covered 0.61 million hectares area in India. In terms of production, wheat and barley together accounts for about 36 per cent of the India's total food grains production as per the 4th Advance Estimates released by the Directorate of Economics and Statistics (DES), Ministry of Agriculture and Farmers Welfare (MoA&FW), India. In the world of food grains, the nutrient-dense barley was grown on 50.90 million hectares, yielding 153.47 million tonnes each year (United States Department of Agriculture). In the past few years, about two thirds of barley crop has been used for feed, one-third for malting and about 2 per cent directly for food. Many problems inclusive of declining of soil organic matter, deterioration in the produce quality, salinity and sodicity issues, pests and sicknesses prevalence and growth in soil pollution like heavy metals has evolved due to imbalanced and indiscriminate use of high analysis chemical fertilizers. Use of organic manure, biofertilizers and chemical fertilizer in appropriate proportion assume complementary and supplementary response to each other in crop production. Biofertilizers are beneficial to plant growth as well as lowering the expense of chemical fertilizers. Nitrogen fixation, phosphorus solubilization, and the creation of growth-promoting bacteria are all natural processes that biofertilizers use to provide nutrients. By the use of these sources in suitable proportion count on complementary and supplementary response to crop production. To solve all of these issues, integrated nutrient management strategies not only provide a balanced amount of macro and micronutrients to reach the desired yield, but they also improve soil physical qualities, soil structure, and environmental sustainability.

EFFECT OF INTEGRATED NUTRIENT MANAGEMENT ON SEEDLING GROWTH AND BIOMASS OF SANDALWOOD (*Santalum album* L.)

Govind, V.M. Prajapati and M.B. Tandel

Department of Silviculture and Agroforestry
College of Forestry, ACHF, NAU, Navsari, Gujarat, India

ABSTRACT

The investigation entitled “Effect of integrated nutrient management on seedling growth and biomass of Sandalwood (*Santalum album* L.)” was undertaken during the year 2018-2019 at the Net House Complex, College of Forestry, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat, India. The experiment was laid out in CRD comprising *Leucaena leucocephala* as host plant and 12 INM treatments of different organic, inorganic, biofertilizers and their combinations application along with control (T_0). Among different integrated nutrient management treatments, seedling height, collar diameter, number of leaves per plant, fresh and dry weight of shoot, leaves and whole plant were recorded maximum in T_{10} (1 g of NPK and VERM @ 25 g/seedlings). Moreover, fresh and dry weight of root and root length were registered maximum in T_4 (Vermicompost @ 50 g/seedlings). The seedlings without integrated nutrient treatment (T_0 : Control) found poorest for all parameters under study. However, root: shoot ratio was noted maximum in T_3 (Vermicompost @ 25 g /seedlings).

**EFFECT OF OAT (*AVENA SATIVA* L.) AND EGYPTIAN CLOVER
(*TRIFOLIUM ALEXANDRINUM* L.) INTERCROPPING AND
ZINC MANAGEMENT ON FORAGE YIELD**

**Muskan Porwal^{1*}, Sita Ram Kantwa², Badal Verma⁴,
Singh SS¹, Prabhu Govindasamy³, and Srinivasan Ramakrishnan²**

¹Rani Lakshmi Bai Central Agricultural University, Jhansi, India

²ICAR-Indian Grassland and Fodder Research Institute, Jhansi, India

³ICAR-Indian Agricultural Research Institute, New Delhi, India

⁴Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, India

ABSTRACT

A field experiment was carried out during the rabi season of 2020-2021 to study the effect of nano zinc and oat + berseem inter cropping on fodder yield in the research farm of Rani Lakshmi Bai Central Agricultural University, Jhansi (U.P.). The experiment was laid out in triplicate following a split-plot design with eight treatments comprising two cropping systems in the main plot [sole cropping of oats (CS₁) and intercropping of oats with Egyptian clover (4:2) (CS₂)]; and four nutrient management practices in subplot [control (NM₁), recommended dose of fertilizers (NM₂) (120 kg ha⁻¹N: 60 kg ha⁻¹ P: 40 kg ha⁻¹ K), recommended dose of fertilizers with zinc sulphate (NM₃) (20 kg ha⁻¹) and recommended dose of fertilizers with nano zinc (NM₄) (250 ppm through seed priming for 24 hrs.)]. Oat variety 'Kent' along with berseem variety 'Bundel berseem-2' was sown during the last week of November. The results showed that the oat + berseem intercropping (CS₂) with the application of a recommended dose of fertilizers with nano zinc (NM₄) resulted in higher soil available N and Zn uptake by 19.6% and 62.8%, respectively, as compared with the other treatments. The improvement of available N and greater uptake of Zn led to higher Crop Growth Rate (CGR), Leaf Stem ratio (L:S) and Leaf Area Index (LAI) under intercropping + RDFnZn treatment. Intercropping + RDFnZn treatment significantly produced highest green fodder yield (57.3 t ha⁻¹) as compared to the rest of the treatments.

EFFECT OF PACKAGING MATERIAL ON NUTRITIONAL QUALITY AND SHELF LIFE OF READY-TO-EAT FOODS

Priyanka Prasad¹ and Anita Kochhar²

¹Centre for Rural Development and Technology, Indian Institute of Technology Delhi

²Department of Food and Nutrition, Punjab Agricultural University Ludhiana

ABSTRACT

The study assessed the nutritional quality and shelf life of ready-to-eat foods stored in different packaging materials.

Methods: The flour of potato, wheat, green gram, and spinach, with other ingredients, were blended and processed into two RTE foods (a sweet premix and cookies). The developed foods were packed into four different packaging material namely glass container, glass container + aluminium zip lock packet, glass container + plastic zip lock packet, plastic container and stored at $28 \pm 2^\circ\text{C}$ for three months. The packaged food products were evaluated for nutritional quality before and after three month storage period. To evaluate the shelf life of food products microbial growth count was taken fortnightly for the storage duration. The data was analysed by paired t test and one way analysis of variance.

Results: The developed RTE foods were evaluated on 9 point hedonic scale for sensory attributes of appearance, colour, flavour, taste, texture and over all acceptability by standard method. Highest significant ($p < 0.05$) increase in moisture content of both foods was recorded after storage period (90th day) in plastic container. A non-significant decrease in lysine and tryptophan content of both the food products in different packaging material was found after storage period of three months. The iron, calcium, and zinc content of developed RTE foods were reduced, however, a significant ($p < 0.05$) difference in mineral content was found among different packaging material after storage period of three months. The in vitro protein and carbohydrate digestibility differed significantly ($p < 0.05$) among different packaging material. The highest bacterial, yeast and mold count was observed in foods stored in plastic packaging followed by glass container + plastic zip lock packaging.

Conclusion: Highest acceptability was found for RTE food products stored in glass container after storage period of 90 days.

EFFECT OF POLYPLOIDY ON EXPRESSION OF APOMIXIS IN GUINEA GRASS

Girija Choudhary^{1*}, K.K. Dwivedi², L.K. Dwivedi³, Maneet Rana² and Kalpana Verma³

¹Rani Laxmi Bai Central Agriculture University, Jhansi

²ICAR-Indian Grassland and Fodder Research Institute, Jhansi

³Bundelkhand University, Jhansi

ABSTRACT

Apomixis is the process of asexual seed formation through bypassing of meiotic reduction and egg cell fertilization. The essential feature of apomixis is that an embryo is formed autonomously by parthenogenesis from an unreduced egg of an embryo sac generated through apomeiosis. Progenies generated via apomixis are viable and having genotype same as their maternal parent. Exploitation of apomixis is revolutionary for crop breeding as it could be exploited to indefinitely propagate superior hybrids having complex gene sets. This technology is beneficial for agriculture production system as it would reduce costs and breeding times and also avoids many complications associated with sexual and vegetative methods of reproduction. Apomixis and polyploidy are interrelated phenomenon and ploidy levels are known to affect the expression levels of apomixis. The candidate gene Somatic Embryogenesis Receptor-like Kinase (SERK) is a tyrosine kinase that switches aposporous initial cell to form and develop embryo sacs in somatic cells. SERK is expressed in nucellar cells and promotes autonomous embryo development in apomictic species. Guinea grass is characterized with extraordinary flexibility to accommodate excessive genome dosage (2x-11x) and producing functional gametes. Availability of sexual as well as apomictic forms within the same ploidy levels makes it a suitable system to generate desired populations to undertake inheritance and molecular biology studies. Ploidy dependent expression of apomixis and its component traits were studied in the eight members of guinea grass ploidy series (3x to 9x and 11x). Gene expression study shows differential expression of SERK gene in various ploidy levels of apomictic guinea grass.

EFFECT OF PRE-SOWING SEED TREATMENTS ON GERMINATION, GROWTH AND VIGOUR OF *MELIADUBIA* (CAV.).

Alok Kumar Singh^{1*}, J.K. Singh², Atul Gupta¹, K.S. Pant¹ and Bipin Kumar Singh³

¹Department of Silviculture and Agroforestry,
Dr Y S Pamar University of Horticulture and Forestry, Nauni, Solan.HP.

²Department of Agronomy, Institute of Agricultural Sciences,
Banaras Hindu University, Varanasi. UP.

³Department of Agroforestry, Acharya Narendra Deva University of Agriculture and Technology,
Kumarganj, Ayodhya, U.P.

ABSTRACT

Meliadubia Cav. is a tree species of high economic, industrial and medicinal value commonly known as Malabar Neem. Recently this tree species is gaining more attention and popularity due to its multipurpose and fast-growing nature. But the natural seed germination of the specie is very less. So, there is need to explore the suitable pre-sowing seed treatment for the enhancement of germination. With this information the research was carried out to find out the effects of different seed treatments on germination and initial seedling growth parameters of a multipurpose tree, *Meliadubia* at horticultural nursery of RGSC, Banaras Hindu University, India, in the year 2019-20. Seeds were subjected to eight different treatments viz., soaking in tap water for 24 hrs, soaking in boiling water at 80°C for 10 minutes, Soaking the seed in cow-dung slurry (7 days), scarification with 50% H₂SO₄ (5 minutes), soaking the seeds in 200 ppm GA₃ for 24 hours, Soaking the seed in cow-dung slurry (7 days) + scarification with 50% H₂SO₄ (5 minutes), soaking the seeds in 200 ppm GA₃ for 24 hours + scarification with 50% H₂SO₄ (5 minutes). The experiment was conducted in Randomized block design with four replications. Germination of the seeds started from 29-33 days after sowing and ends upto 55-61 days. The results revealed that cow dung slurry treatment for seven days had significantly enhanced germination and seedling growth. The highest germination percent (39.5 %) was observed in the soaking of seeds in cow dung slurry for seven days followed by GA₃ @ 200 ppm (33%). The seeds with hot water treatment were not germinated in any replication. The highest germination value and germination energy was also obtained in the soaking of seeds in cow dung slurry for seven days which was significantly varied from the control and other treatments. Similarly, the seedling growth attributes also followed the same trend of higher value in cow dung slurry treatment. Therefore, soaking of seeds in cow dung slurry for seven days found more effective in germination and production of quality seedling of *Meliadubia* in the nursery.

EFFECT OF PROBIOTIC TREATMENT ON EXPRESSION OF MRNA OF PROGLUCAGON IN GASTROINTESTINAL TRACT IN DIABETIC RATS

Sumiran Srivastava

Department of Biochemistry, Bundelkhand University, Jhansi, India

ABSTRACT

Background: *Lactobacillus* and *bifidobacterium* are generally reported as major gut microflora having, beneficial effect such as antidiabetic, antimutagenic, anti-inflammatory immunomodulatory, antiobesity and protection from cardiovascular disease. Diabetes is largest growing metabolic disorder characterized by dyslipidemia, insulin resistance, glucose intolerance and decrease incretins level. Glucagon like peptide-1 (GLP-1) is a gastrointestinal incretin hormone, secreted from enteroendocrine L-cells and regulates blood glucose level through stimulation of insulin hormone secretion from islets of pancreatic β -cells and also reduce appetite by acting on brain. GLP-1, encoded by the proglucagon gene and produced by post translational proteolytic cleavage. It is reported that incretins level are decreased in diabetic condition so in this study we want to explore the role of these two selected probiotic strains in improvement the level of GLP-1 and mRNA expression of proglucagon gene in diabetic rats.

Method: Diabetes in rats was induced by an intraperitoneal injection of streptozotocin (45mg/kg). Rats were divided randomly into six groups and treated with acarbose (10mg/kg) or *Lactobacillus casei*, *Bifidobacterium bifidum* alone and combination of both (1×10^7) CFU/ml, orally by gavage. In addition a normal control and diabetic control group were used for comparison. The change in the level of GLP-1 in serum and intestine were measured. Expression of mRNA of proglucagon gene was measured by real time PCR method.

Result: Diabetic rats showed significant reduced the expression of proglucagon gene in diabetic rats in compare to healthy rats. Treatment with oral administration of *L. casei* and *B. bifidum* alone and combination significantly increase the expression of proglucagon gene.

Conclusion: The result of this study indicate that *L. casei* and *B. bifidum* has significant hypoglycaemic potential in diabetic rats by increasing GLP-1 level through increasing proglucagon gene expression and GLP-1 improved pancreatic beta cells function simultaneously increase insulin secretion.

**EFFECT OF ROOTING MEDIA, IBA AND TRICHODERMA ON
GROWTH, SUCCESS AND SURVIVABILITY OF STEM
CUTTINGS OF POMEGRANATE (*PUNICA GRANATUM* L.)**

Ramesh Chand Kantwa, Priyamveda Sonkar, P.K.S Gujar and J. Bhandari

Department of Fruit Science, College of Horticulture, Mandsaur,
Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalyaya, Gwalior, Madhya Pradesh, India

ABSTRACT

The present study was carried out to investigate “Effect of Rooting media, IBA and *Trichoderma* on Growth, Success and Survivability of stem cuttings of Pomegranate (*Punica granatum* L.)”. The study revealed that the treatments comprised combinations of soil, sand and vermicompost with varying levels of IBA and *Trichoderma*. The result indicated that IBA @ 2500 ppm is found to be the most effective for better survivability of cuttings. Among different growing composition of media *i.e.* (Soil + Sand + Vermicompost + IBA @ 2500 ppm) of treatment (T9), was found to be the best for maximum shoot, root parameter, success and survival of hardwood cuttings of pomegranate. While the minimum shoot, root parameter, success and survivability of hardwood cuttings were observed in treatment T1 (Soil + FYM).

EFFECT OF SUPPLEMENTATION OF DIGESTIBLE THREONINE ON CARCASS CHARACTERISTICS OF COMMERCIAL BROILERS

D. Rambabu*, V. Ravinder Reddy, S.V. Rama Rao, J. Narasimha and M. Shashi Kumar

Department of Poultry Science, College of Veterinary Science,
P.V.N.R Telangana Veterinary University,
Rajendranagar, Hyderabad, Telangana state, India.

ABSTRACT

An experiment was conducted on 250 day-old commercial broiler chicks (Ven Cobb) for six weeks duration to study the effect of supplementation of digestible threonine on carcass characteristics and visceral organs of commercial broilers. A growth trial of 6 weeks duration in broilers was conducted in a completely randomized design (CRD), comprising five dietary treatments and each treatment had ten replications with each replicate consisting of five chicks. The experimental diets were formulated with the graded concentration of digestible threonine 75, 70, 65 and 60 % of the Cobb recommendation has been tested to optimize the dietary threonine concentration for broilers. The diets were prepared by using corn and soy-bean meal as the major ingredients of the experimental diets. The protein (20, 19, 18%) and metabolizable energy (3035, 3108, 3180 k cal/kg) content maintained in the diets during pre starter, starter and finisher period respectively. The results revealed that, supplementation of varied concentrations of digestible threonine in broilers diet did not significantly ($P>0.05$) influence the slaughter parameters like dressing percentage, ready to cook yield, thigh weight, heart and gizzard weight and abdominal fat weight. The lower breast weight was ($P<0.05$) observed in broilers fed digestible threonine 0.77, 0.69 and 0.65% in pre starter, starter and finisher phases respectively (100% of the Cobb recommendation) T_1 compared to other treatment groups. The liver weight was significantly ($P<0.05$) lower in dietary groups T_4 and T_5 (65 and 60% Thr) among all other digestible threonine supplemented group in commercial broilers. However, the liver weight was comparable between control diet (T_1) and 75% of the Thr fed group (T_2). Based on the findings of the present study, it is concluded that digestible threonine requirements for commercial broilers is 0.708, 0.630 and 0.570 % (60 % of the digestible lysine) during pre-starter, starter and finisher phases respectively is sufficient to optimize the productive performance of broilers.

**EFFECT OF TREE SPACING AND FERTILIZER
APPLICATION ON MARIGOLD UNDER *MANGIFERA INDICA*
BASED AGROFORESTRY SYSTEM**

Sahil Chauhan, Rohit Kumar Vashishat, Ghanshyam Singh and Vipin Guleria

Department of Silviculture and Agroforestry
Dr. Yashwant Singh Parmar University of Horticulture and Forestry, Solan (HP)

ABSTRACT

The present investigation entitled “Effect of tree spacing and fertilizer application on marigold under *Mangifera indica* based agroforestry system.” was conducted at Regional Horticultural Research and Training Station, Jachh Distt. Kangra (HP) during 2020-2021. with the objectives to study Effect of tree spacing and effect of organic and inorganic fertilizers on marigold under *Mangifera indica* (Amarpali cultivar) based agroforestry system. Experiment was laid out in Randomized Block Design with nine organic manuredoses viz. FYM40t/ha+ Nitrogen300kg, FYM40t/ha+ Nitrogen400kg, FYM40t/ha+ Nitrogen500kg, FYM50t/ha+ Nitrogen300kg, FYM50t/ha+ Nitrogen400kg, FYM50t/ha+ Nitrogen 500 kg, FYM60 t/ha + Nitrogen 300 kg, FYM 60 t/ha + Nitrogen 400 kg, FYM 60 t/ha + Nitrogen 500 kg and control per tree Spacing and three tree spacing viz. $2 \times 2 \text{ m}^2$, $2.5 \times 2.5 \text{ m}^2$, $3 \times 3 \text{ m}^2$. Study revealed that growth and flower production parameters of Marigold were suppressed under the close spacing. Whereas, flower parameters were recorded to be highest under the $3 \times 3 \text{ m}^2$ spacing of *Mangifera indica* (cv-Amarpali). Under close spacing flowering was initiated 15-20 days earlier and had a prolonged duration of flowering. FYM and Nitrogen showed a remarkable effect on growth and flower production parameters on Marigold as compared to control. Among organic manure doses FYM 60 t/ha + Nitrogen 300 kg dose was found to be the best dose. Growth and flower production parameters of under crop were also found to be highest in $3 \times 3 \text{ m}^2$ tree spacing It will also open new vistas for the research to evaluate the performance of flower crop under tree canopy.

**EFFECT OF TROPOSPHERIC OZONE AND OZONE PROTECTANTS ON
PLANT GROWTH, PHYSIOLOGY AND YIELD OF CAULIFLOWER
(*BRASSICA OLERACEA* VAR. *BOTRYTIS*) AT HIGH ALTITUDE
REGION OF WESTERN GHATS**

Boomiraj K.^{1*}, Sethupathi N.², Sudhakaran M.³ and Jayabalakrishnan R. M.¹

¹Environmental Sciences, Tamil Nadu Agricultural University, Coimbatore

²CESCRA, Indian Agricultural Research Institute, ICAR, New Delhi

³Environmental Sciences, J.K.K Munirajah College of Agricultural Science, TN Palayam, Erode

ABSTRACT

Tropospheric Ozone (O₃) is one of most important secondary air pollutants and it is high negative impacts on crops throughout the world. IPCC, 2001 identified that surface ozone is third important greenhouse gas after CO₂ and methane but also, has a deleterious impact on growth and yield of both agricultural and horticultural crops with a long lasting impact in most parts of the world. The anthropogenic emissions of O₃ precursors such as nitrogen oxides and Volatile Organic Compounds (VOC) across Asia also increased, in particular over the Indian and Chinese regions (Ohara et al., 2007). An experiment was conducted at Indian Space Research Organization's (ISRO) Climate Change Observatory is located at Woodhouse house farm, Horticultural Research Station (TNAU), Ooty (Latitude 11.4°N, longitude 76.7°E and altitude of 2520 m above MSL) in the Western Ghats of Nilgiris Biosphere Reserve during October 2017 to March 2018 to quantify the impact of elevated ozone and ozone protectant spray on plant growth, nutrients, biochemical and yield properties of cauliflower. Elevated ozone exposure significantly reduced plant height, number of leaves, curd size, curd weight, chlorophyll a,b & total chlorophyll contents and increased the catalase and per oxidase activities in cauliflower (*Brassica oleracea* var. *botrytis*). Meanwhile, ozone nullified the tropospheric ozone effect on growth, physiology, development and yield of cauliflower and among them panchagavya performed well followed by neem oil and ascorbic acid. Future research may be focused to study the tropospheric ozone impact s on different crops by documenting the symptoms and identify the best ozone protectants to nullify the tropospheric ozone impact for ensuring sustainable agriculture.

**EFFECTS OF COMPOSTED AND UNCOMPOSTED LEAVES OF
AGERATINA ADENOPHORA ON GERMINATION, GROWTH AND
YIELD OF *LENS CULINARIS* (MEDIC.)**

Kavita Khatri¹, Bhawna Negi¹, Kiran Bargali¹ and Surendra S. Bargali¹

¹Department of Botany, DSB Campus
Kumaun University, Nainital, Uttarakhand, India

ABSTRACT

In the agricultural fields invaded by *Ageratina adenophora*, slashing of above-ground plant parts is performed to minimize the harmful effects of this weed on the crops. As, agricultural fields are among the most susceptible areas for *A. adenophora* invasion, farmers usually slash the aerial parts of this weed to minimize the losses. But, the impact posed by the slashed residues on the crop production is ignored. Therefore, the present study was performed to check the response of a leguminous crop lentil (*Lens culinaris* Medic.) to *A. adenophora* allelopathy. Fresh, dry senesced and composted leaves were added to 1 kg soil in different concentrations (control - C₀; 10 g/kg - C₁; 20g/kg - C₂; 40 g/kg - C₃ and 80 g/kg - C₄, respectively) and germination, growth and productivity parameters of lentil were measured. The results showed that composting of *A. adenophora* reduced the inhibitory potential of weed residues incorporated into the soil. The composted leaves promoted seed germination, plant height, biomass and crop yield in concentration dependent manner, whereas, fresh leaf treatment and dry leaf treatment at higher concentration inhibited the performance of lentil. Compared to control, maximum crop productivity was recorded at C₄ (2.4 times high), followed by C₃ (2.1 times), C₁ and C₂ (1.6 times each) in compost treatment. Lentil plants were severely affected by dry senesced leaf treatments and hardly produced any pods and seeds. These results suggested that, composting of *A. adenophora* residues could help to reduce the agricultural losses and minimize the allelopathic potential of this weed for the healthy environment and economy.

EFFECTS OF DIFFERENT WATER REGIMES ON MULTIPLICATION AND REPRODUCTION OF *MELOIDOGYNE GRAMINICOLA* IN RICE

Rohit Kumar*, Vinod Kumar, Anil Kumar and SS Mann

Department of Nematology
CCS Haryana Agricultural University, Hisar, Haryana

ABSTRACT

Rice (*Oryza sativa* L.) is the third most important cereal crop in the world, just behind wheat and maize, playing a strategic role in solving food security issues. Rice root-knot nematode, *Meloidogyne graminicola* are serious pests of rice, being, probably, the most economically important plant-parasitic nematode in rice. *M. graminicola* is an obligate sedentary endoparasite adapted to flooded conditions. Until recently, *M. graminicola* was present mainly in irrigated rice fields in India. In a screen house experiment, effects of different water regimes (irrigation after 24 hours, irrigation on alternate days, saturated condition, flooded condition) on the population development of *M. graminicola* in rice were evaluated under pot conditions, Department of Nematology, CCS HAU, Hisar during kharif season, 2020-21. Steam sterilized sandy loam soil was filled in 2 kg soil capacity earthen pots. Seeds of the rice (variety Pusa 1121) were soaked in tap water for 24 h and sprouted seeds were sown in pots. One week after germination, one plant was retained per pot and inoculated with 2000 freshly hatched J2 of *M. graminicola*. The pot without nematode was taken as check for each water regimes. Maximum and significantly higher plant growth parameter of rice were recorded in flooded condition followed by saturated condition, irrigation after 24 hours and irrigation on alternate days. Nematode multiplication and reproduction factors such as number of galls/seedling, number of females/seedling and final nematode population in the soil were significantly highest in irrigation on alternate days followed by irrigation after 24 h, saturated condition and flooded condition. Hence, it is concluded from the present investigation, nematode favor alternate wetting and drying for growth and development.

EFFECTS OF PRE-SOWING SEED TREATMENTS ON GERMINATION AND GROWTH BEHAVIOUR OF *TERMINALIA BELLIRICA* (ROXB.)

Shilpa^{1*}, Vimal Chauhan² and Umakanta Dash³

^{1, 2}Department of Silviculture and Agroforestry

Dr Y S Pamar University of Horticulture and Forestry, Nauni, Solan, H.P.

³Department of Silviculture and Agroforestry, Kerala Agricultural University, Thrissur

ABSTRACT

Terminalia bellirica Roxb. (Bahera) belongs to the family Combretaceae and its different parts have been used for various purposes but due to the presence of thick fleshy pulp of fruits, hard seed coat and inappropriate use of forest products due to population pressure results in poor natural regeneration and low availability of quality seeds. Therefore, the objective of present study were to determine the most suitable pre-sowing seed treatment for better seed germination, growth and vigour of *Terminalia bellirica* (Roxb.) seedlings. The study was carried out at the Experimental Farm, Department of Silviculture and Agroforestry, Dr Y.S Parmar University of Horticulture and Forestry, Nauni, Solan (HP) during 2019-2020. The experiment was laid under polyhouse condition in complete randomized design (CRD factorial) with three replications. The seeds were subjected to seven pre-sowing seed treatments (T) i.e. T₁ (control), T₂, T₃, T₄, T₅ (seeds soaked in beejamrutha for 3, 4, 5 and 6 weeks), T₆ and T₇ (seeds soaked in cow urine for 1 and 2 weeks) and the pre-treated seeds were sown into different growing media. The results revealed that significantly maximum germination percent (67.33 %), germination value (3.53), germination energy (50.00 %) and the minimum germination period of 33.67 days were obtained when the seeds were treated with T₃ treatment (seeds soaked in beejamrutha for 4 weeks). Similarly, maximum seedling growth parameters (seedling height, collar diameter, number of leaves and number of roots) and biomass parameters (root and shoot dry weight, vigour index) were also obtained for the seedlings grown in T₃ treatment, followed by T₄ treatment combination.

EFFICACY OF PRE AND POST EMERGENCE HERBICIDES IN WEED MANAGEMENT IN SOYBEAN

Bharat Lal Meena¹ and Gajendra Nagar²Harkesh Meena³and Devendra Kumar⁴

Department of Agronomy, SKN Agriculture University, Jobner¹,
Agriculture University, Kota²,
UBKV Kooch Behar (WB)³ and RLBCAU, Jhansi (UP)⁴

ABSTRACT

A field experiment was conducted during kharif, 2019 at Agricultural Research Station, Ummedganj, Kota. Dominating weed flora of the experimental field consisted of *Cynodon dactylon* L., *Eleusine indica* L., *Echinochloa crusgalli* and *Echinochloa colona* among grassy weeds, *Boerhaavia diffusa* L., *Convolvulus arvensis* L., *Commelina benghalensis* L., *Digera arvensis* Forsk., *Celosia argentea* L. among broad leaved weeds and *Cyperus rotundus* L. is the only weed in the sedge category. The results showed that all weed control treatments recorded significantly higher values of growth parameters plant height, branches plant⁻¹, dry matter accumulation and yield attributes viz. pods plant⁻¹, seeds pod⁻¹, seed yield plant⁻¹ and seed index as compared to weedy check. Two hand weeding at 20 and 40 DAS recorded significantly lower weed density, weed dry weight, maximum weed control efficiency and significantly improved the growth characters, yield and yield attributing characters followed by post emergence application of Sodium acifluorfen 16.5% + Clodinafop propargyl 8% (premix) @ 165 + 80 g a.i. ha⁻¹ at 20 DAS.

EFFICIENT MANAGEMENT OF AVAILABLE NUTRIENT RESOURCES FOR IMPROVING PRODUCTIVITY OF CORIANDER (*CORIANDRUM SATIVUM* L.)

Rahul Ojha

Department of Agronomy
Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalyaya College of Agriculture, Gwalior (M.P.)

ABSTRACT

A field experiment was conducted during *rabiseason* of 2018-19 at College of Agriculture, Research Farm, Gwalior (M.P.) to find out Efficient management of available nutrient resources for improving productivity of coriander (*Coriandrum sativum* L.). The experiment consisted of twelve treatments viz., T₁ (Control), T₂ (100% RDF), T₃ (50% RDF + 5 tonnes FYM/ha), T₄ (50% RDF + 5 tonnes FYM/ha + 0.5% spray of NPK (18:18:18) at vegetative stage), T₅ (75% RDF + 5 tonnes FYM/ha), T₆ (75% RDF + 5 tonnes FYM/ha + 0.5% spray of NPK (18:18:18) at vegetative stage), T₇ (50% RDF + 5 tonnes FYM/ha + 0.5% spray of ZnSO₄ at vegetative stage), T₈ (75% RDF + 5 tonnes FYM/ha + 0.5% spray of ZnSO₄ at vegetative stage), T₉ (50% RDF + 5 tonnes FYM/ha + 500 ppm spray of thiourea at vegetative stage), T₁₀ (75% RDF + 5 tonnes FYM/ha + 500 ppm spray of thiourea at vegetative stage), T₁₁ (50% RDF + 5 tonnes FYM kg/ha + Azotobactor + PSB) and T₁₂ (75% RDF + 5 tonnes FYM kg/ha + Azotobactor + PSB) were laid out in randomized block design with three replications. The recommended dose of fertilizers (60:30:20 kg NPK ha⁻¹) was applied in the form of urea, SSP and muriate of potash as per treatments. The observations were recorded on growth, yield, quality and nutrients uptake studies.

The results revealed that all the growth parameters like, plant height, number of branches, dry matter per plant, AGR, CGR and RGR were significantly influenced with different treatments where in the treatment T₁₂ (75% RDF + 5 tonnes FYM kg/ha + Azotobactor + PSB) was recorded significantly higher values for growth parameters over other treatments followed by treatment T₆ (75% RDF + 5 tonnes FYM/ha + 0.5% spray of NPK (18:18:18) at vegetative stage) and T₈ (75% RDF + 5 tonnes FYM/ha + 0.5% spray of ZnSO₄ at vegetative stage) for most of the parameters. Similarly all attributing parameters like, no. of umbellets/plant, no. of umbellets/umbel, no. of seeds/umbellets, seed yield and stover yield were influenced with different treatments where in the treatment T₁₂ (75% RDF + 5 tonnes FYM kg/ha + Azotobactor + PSB) which was significantly superior over other treatments, followed by treatment T₆ (75% RDF + 5 tonnes FYM/ha + 0.5% spray of NPK (18:18:18) at vegetative stage) and T₈ (75% RDF + 5 tonnes FYM/ha + 0.5% spray of ZnSO₄ at vegetative stage). Similarly, the harvest index and test weight was also significantly influenced with different treatments and highest values for these parameters were observed with treatment T₁₂ (75% RDF + 5 tonnes FYM kg/ha + Azotobactor + PSB), followed by T₆ (75% RDF + 5 tonnes FYM/ha + 0.5% spray of NPK (18:18:18) at vegetative stage) and T₈ (75% RDF + 5 tonnes FYM/ha + 0.5% spray of ZnSO₄ at vegetative stage). While, all qualitative parameters like, protein content, protein yield, NPK content and NPK uptake in both seed and stover, were significantly influenced with different treatments where in the treatment T₁₂ (75% RDF + 5 tonnes FYM kg/ha + Azotobactor + PSB) was recorded highest protein content, protein yield, NP content and NP uptake, which was significantly superior over other treatments, followed by T₆ (75% RDF + 5 tonnes FYM/ha + 0.5% spray of NPK (18:18:18) at vegetative stage). Whereas, the highest K content and K uptake in both seed and stover was observed under treatment T₆ (75% RDF + 5 tonnes FYM/ha + 0.5% spray of NPK (18:18:18) at vegetative stage) which was significantly superior over control, followed by T₁₂ (75% RDF + 5 tonnes FYM kg/ha + Azotobactor + PSB). The highest net returns and benefit: cost ratio was secured with the treatment T₁₂ (75% RDF + 5 tonnes FYM kg/ha + Azotobactor + PSB) which was highly superior over absolute control and followed by treatment T₆ (75% RDF + 5 tonnes FYM/ha + 0.5% spray of NPK (18:18:18) at vegetative stage), which might be due to lower cost of cultivation and higher seed and stover yields.

ELUCIDATING FLORAL DEFORMITIES AND DETERMINING CYTOPLASM TYPES IN CAULIFLOWER: MAKING HYBRID BREEDING REMUNERATIVE

Saurabh Singh^{1,2}, SS Dey², Raj Kumar², Arjun Ola¹, Maneesh Pandey¹ and Devesh Tiwari¹

¹Department of Vegetable Science, College of Horticulture and Forestry
Rani Lakshmi Bai Central Agricultural University, Jhansi, U.P.

²Division of Vegetable Science, ICAR-Indian Agricultural Research Institute, New Delhi, India

ABSTRACT

Cauliflower (*Brassica oleracea* var. *botrytis* L.) is an important member of cole group of vegetables grown in the Indian subcontinent. The cultivation of hybrids is remunerative in cauliflower and cytoplasmic male sterility (CMS) is an important genetic mechanism for hybrid breeding. The CMS in angiosperms is mainly the consequence of mitonuclear intergenomic conflict and different cytoplasms are associated with an array of floral deformities. Therefore, it is essential to distinguish different cytoplasm types in cauliflower. The mitotype-specific mt-DNA markers are instrumental in differentiating cytoplasm types in angiosperms. The prevalence of autoplasmic and alloplasmic mitonuclear intergenomic incompatibilities yields complex floral malformations. In this context, the utility of mitochondrial-DNA markers was illuminated in determining cytoplasm types in snowball cauliflowers and revealed the epistatic effects of mitonuclear conflict affecting floral phenotypes. The genomic DNA isolation of cauliflower cytolines was done by CTAB method. The PCR amplification with the primers specific to *orf-138* revealed the presence of *Ogura* cytoplasm in the CMS lines of Indian cauliflower. The mt-SSRs (*BnTR4* and *orf125*) depicted the polymorphism within the *orf-138* sequence. The InDels (insertion/deletions) of 51 nucleotides were found to be linked with such cytoplasmic genetic variations as revealed by polymorphic sequence analysis. The influence of the cytoplasm on varying nuclear-genetic backgrounds caused floral deformities like reduction in the size of petals and sepals, fused flowers, splitting of style, flowers devoid of non-functional stamens, and conversion of stamens to petaloid structures. These deformities caused dysplasia of floral reproductive organs and reduced the nectar volume and seed yield. The current investigation has identified useful marker to identify the cytoplasmic lines with floral malformations. The study opened new horizons to develop ideal CMS lines and making hybrid breeding in cole vegetables remunerative to improve the economic status of farmers.

EMPIRICAL ANALYSIS ON WILLINGNESS TO PAY FOR JHANSI FORT: AN EVIDENCE FROM UTTAR PRADESH

V. David Chella Baskar¹ Kavitha² Sooraj³ Sana⁴ Sundar Pal⁵

Rani Lakshmi Bai Central Agricultural University, Jhansi, Uttar Pradesh^{1,3,4,5}
Karunya Institute of Technology and Science, Coimbatore, Tamil Nadu²

ABSTRACT

The study has examined the willingness to pay for Jhansi fort in Uttar Pradesh. The study has utilized primary data collected from different commuters' using random survey method. In order to analyze the willingness to pay for the park, binary logistic regression was used. The results of the study has indicated that the willingness to pay for the park was influenced positively and also significantly by monthly income and negatively by cost spent inside the park and occupation status of the visitors. Garrett ranking on suggestions for the betterment of park indicates that the visitors have given rank one for maintenance of the park, rank two for enhancing the facilities and rank three for safe drinking water

ENHANCING ADOPTION OF AGRO FORESTRY IN THE NORTH WESTERN AGRO ECOLOGICAL ZONE OF TAMIL NADU

R. Sangeetha¹, N. Suganthi² and V. Karthick³

Centre for Agricultural and Rural Developmental Studies
Tamil Nadu Agricultural University, Coimbatore

ABSTRACT

The present study was undertaken in North Western Zone of Tamil Nadu, to analyze the factors determining the agro-forestry and problems faced by them in adoption of agroforestry practices. Within the North Western Zone, Dharmapuri district was selected purposively. Multi-stage random sampling design was used for the selection of the sample in the study area. At the first stage, out of five developmental blocks, Palacode and Pappireddipatti were selected randomly where agroforestry practices were more predominant. In the next stage, three villages with the major agroforestry practices were selected from each selected block. At the final stage, 50 farmers from each selected villages were selected who were involved in agroforestry practices. In totality, a sample of 300 households was drawn for the study. Data analysis was done by using simple percentages, Ordinary Least Squares (OLS) multiple regression analysis, perception index and weighted score method. Most of the farmers in study area have positive perception towards adoption of agroforestry practices. The goal of this study was to determine the characteristics that influence the adoption of agroforestry by small and marginal farmers. Crop diversification, Increasing soil fertility, Improve soil and water conservation, Long time taken to get income from forestry, high returns and Reduce chances of crop failure were the major motivational factor, whereas small landholding size, lack of awareness and poor knowledge, poor market accessibility, lack of subsidy, credit facility, lack of good quality planting material and longer gestation period of trees were the major problems faced by the farmers in the study area. Thus, study suggested that farmers can be encouraged to practice agroforestry through improved mobilizing farmers to join groups, improving the quality and coverage of extension services, consideration of gender issues and intensifying agro forestry training among farmers with low levels of education groups and distribution of quality planting material to farmers.

ENVIRONMENTAL MANAGEMENT PRACTICES FOR SUSTAINABLE DEVELOPMENT

Sanjeeb Kumar Das

Department of Botany, Regional Institute of Education
Sachivalaya Marg, Bhubaneswar, Odisha

ABSTRACT

This paper explores the role of environmental management practices on sustainable development. To promote corporate environmental management practices and green economic development, governments enact legislation aimed at curtailing damage to the environment, in addition to government regulation; some firms apply voluntary self-regulatory measures to limit their impact on local environments. This paper will critically review literature on current environmental management practices and their role on sustainable development. Based on the literature review of different sections of society, preliminary findings suggest that current environmental management practices have dissimilar effects on sustainable development. These practices in the fields of health and law are more indicative of policy based practices, while those in engineering and industry are more hands on. This paper concludes by recommending that these environmental management practices be harmonized across the different sectors of society which will result in improved sustainable development and promote green economic development.

ESTIMATES OF GENETIC VARIABILITY PARAMETERS IN LINSEED (*LINUM USITATISSIMUM* L.) GENOTYPES

Ashok Kumar Meena, M. K. Ghasolia and Laxman Singh Saini

College of Agriculture, Ummedganj, Agriculture University, Kota (Rajasthan)
Department of Plant Breeding and Genetics
Sri Karan Narendra Agriculture University Jobner, Jaipur, Rajasthan, India

ABSTRACT

Linseed (*Linum usitatissimum* L.) is one of the most important Rabi oilseed crop after rapeseed and mustard. It originated in Mediterranean and the southwest Asian regions. Linseed has somatic chromosome number $2n = 30$ and varies from "16 to 86" in other species. The experiment was conducted at College of Agriculture, Ummedganj, Agriculture University, Kota (Raj.) during Rabi 2019-20. The experiment consisted thirty-six genotypes including checks and it was conducted with three replications in Randomized Block Design (RBD).

The phenotypic coefficient of variation (PCV) was higher than genotypic coefficient of variation (GCV) for all the character studied. GCV and PCV were highest for number of capsules per plant followed by number of primary branches per plant. Heritability was high for all the characters except number of seeds per capsule, protein content and seed yield per plant. Greater magnitude of heritability coupled with moderate to high genetic advance as per cent of mean was observed for number of capsules per plant, number of primary branches per plant, plant height, seed yield per plant and 1000 seed weight revealed that simple selection can be led to fast genetic improvement of the linseed genotypes under the study.

ESTIMATION OF BIOMASS POTENTIAL AND CARBON SEQUESTRATION UNDER DIFFERENT AGROFORESTRY SYSTEMS IN VINDHYAN REGION

Nasam Midhun Kumar¹, U. P. Singh², Alok Kumar Singh¹ and Purumandla Vennela Reddy²

¹Department of Silviculture and Agroforestry
Dr Y S Pamar University of Horticulture and Forestry, Nauni, Solan, H.P.

²Department of Agronomy, Institute of Agricultural Sciences,
Banaras Hindu University, Varanasi, U.P.

ABSTRACT

The present study was conducted to compare the biomass potential, carbon sequestration, of black gram and sesame varieties under open farming and Guava and bael-based agroforestry system. Field experiment was carried out during Kharif 2018 and Rabi 2018-19 seasons at Rajiv Gandhi South Campus, Barkachha, Mirzapur U.P India. The experimental plots were laid out in randomized complete block design (RCBD) with three associate farming systems, open farming, Guava and bael based agroforestry system, in which incorporating of agricultural crops like Black gram with two varieties (Shekar-1, Shekar-2) and Sesame with two varieties (T4, T78) with three replications. Above ground, below ground and total biomass, carbon stock, carbon sequestration, were significantly higher in shekar-1 (black gram) under bael based agroforestry system. Based on the above investigation it can be concluded that fruit-based land-use systems viz. Guava, bael-based agri-horti system are not only biologically productive but have more carbon density, CO₂ sequestration potential, net profit, higher benefit cost ratio and total benefits than field- crop based system at RGSC, BHU. On the other hand, in order to achieve better monetary return and environmental benefits, it is necessary to promote Biomass potential, Carbon sequestration, soil carbon sequestration and economical yield of land use systems from the carbon mitigation potential and economic point of view over the traditional field crops-based land use system.

**ESTIMATION OF CORRELATION AND PATH
COEFFICIENT ANALYSIS IN RICE (*ORYZA SATIVA* L.)**

Ravi Kishan Soni*¹ and N. R. Kol²

¹College of Agriculture, Ummedganj-Agriculture University, Kota, (Rajasthan)

²Agriculture Research Station, Agriculture University, Kota, (Rajasthan)

ABSTRACT

The investigation was conducted to assess correlation and path analysis for seed yield in rice during Kharif season 2020 at Agriculture Research Station, Ummedganj, Kota. The experimental material, which consisted of 55 different rice treatments, was laid out in a three-replication randomized complete block design. Grain yield per plant was significantly positive correlated with the number of panicles per plant, number of spikelets per panicle, test weight, kernel length, L/B ratio and elongation ratio at the phenotypic and genotypic levels. Number of panicles per plant, number of spikelets per panicle, test weight (g), kernel length, L/B ratio and elongation ratio all had the most direct positive effect on grain seed yield per plant (mm).

ESTIMATION OF GENETIC DIVERGENCE IN MICRONUTRIENT RICH WHEAT (*TRITICUM AESTIVUM* L.) UTILISING D²- STATISTICS

Ashish Sheera¹ and Tuhina Dey²

¹Division of Plant Breeding & Genetics
SKUAST - Jammu, Jammu & Kashmir, India

ABSTRACT

Wheat varieties with enhanced iron and zinc content are one of the most sought objectives in the present world to alleviate micronutrient malnutrition. An experiment was designed to develop micronutrient rich wheat lines in the genetic background of rust resistance. To study the genetic divergence in the micronutrient rich lines of bread wheat (*Triticum aestivum* L.) forty nine zinc/iron rich genotypes along with three commercial varieties with stripe rust resistance were grown in Randomized Complete Block Design in 3 replications and analysed using D²-Statistics. Fifty two lines were placed in five clusters with most of the micronutrient rich lines lying in Cluster I except for HP-44, HP-49, HP-14 and HP-13 which were placed in cluster II, III, IV and V respectively indicating them to be more divergent than the rest. Further HD-3086, RSP-561 and JAUW-683 were in the cluster I indicating them to be less diverse with respect to traits under study. Forty five of the forty nine high Zn and Fe lines were clubbed in one cluster as two of the ten traits studied i.e., zinc and iron were high for all these lines and not diverse. The traits that contributed most towards divergence were grain yield per plant (25 percent) followed by number of tillers per plant (20.7 percent) and 1000 grain weight (14 percent) zinc and iron add little contribution of 8 and 7 percent respectively to the total divergence hence could not classified the genotypes into different cluster based on inter-cluster distance Cluster III and Cluster V had the greatest inter-cluster distance, followed by Cluster III and Cluster IV, Cluster II and Cluster V, and Cluster II and Cluster IV.

ESTIMATION OF GENETIC DIVERGENCE IN PROMISING ADVANCE CHICKPEA LINES (*CICER ARIETINUM*)

Niyati Jain* and Anita Babbar

Department of Plant Breeding and Genetics
Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (M.P.) India

ABSTRACT

A study was undertaken to analyze genetic diversity in 30 promising chickpea advance lines during Rabi season 2018-19 under Randomized Completely Block Design with three replications at JNKVV using Mahalanobis D^2 Statitics for 15 quantitative traits. Mahalanobis D^2 statistics is a powerful tool widely used by breeders in quantifying the degree of divergence at genotypic level. It identifies the superior and divergent parental genotypes for formulating the crossing programme. On the basis of D^2 values, 30 chickpea advanced lines were grouped into 4 clusters, cluster I was the largest among all the clusters comprising of 26 genotypes followed by cluster II had 2 genotypes, while cluster III and cluster IV each had 1 genotype. Maximum percentage contribution towards genetic divergence observed for biological yield per plant followed by total number of pods per plant and 100 seed weight. Cluster I showed highest intra cluster value followed by cluster II, whereas Cluster III and IV were mono genotypic. The highest inter cluster divergence was observed between genotypes of cluster II and cluster IV, followed by cluster I and cluster IV and cluster II and cluster III. High heterotic combinations will be obtained when genotypes of these distinctly placed clusters were crossed and would give high heterosis/ heterotic segregants. Cluster III and cluster IV had highest mean value maximum number of characters. Based on result JG 2016 – 1614, JG 11 \times JG 14 and ICC 552241 \times JG 11 are recommended for hybridization, as these were grouped in diverse clusters.

**EVALUATE GROWTH PARAMETERS OF DIFFERENT SPICES
CROP UNDER POPLAR BASED AGRI - SILVICULTURE SYSTEM
IN EASTERN UTTAR PRADESH**

**Yogesh Kumar Agarwal^{1*}, Hemant Kumar², Rajiv Umrao³,
Anubha Srivastav¹ and Neelam Khare²**

¹Forest Research Centre for Eco-rehabilitation, Prayagraj (U.P.)

²College of Forestry, SHUATS, Prayagraj (U.P.)

³College of Forestry, BUA&T, Banda (U.P.)

ABSTRACT

Performance evaluation of different spices crops was carried out under Poplar based Agri-Silviculture systems at College of Forestry, SHUATS, Prayagraj to find out their best combination for growth and yield resulting suitability of economic feasibility of spices crops. Poplar based agroforestry models have significant effect on plant height of selected intercrop at harvest. Plant height observed for Fennel, Ajowain, Coriander, Fenugreek, Mentha, Kalonji, Chilli and Cumin are 61.23, 60.38, 62.65, 54.97, 49.21, 39.37, 51.72, 23.56cm respectively at maturity of crops. Number of branches observed for Fennel, Ajowain, Coriander, Fenugreek, Mentha, Kalonji, Chilli and Cumin are 16.07, 15.67, 17.60, 11.40, 12.33, 14.20, 15.73 and 7.93 respectively. Number of leaves observed for Fennel, Ajowain, Coriander, Fenugreek, Mentha, Kalonji, Chilli and Cumin are 74.57, 70.27, 81.80, 72.73, 79.67, 75.47, 59.27 and 56.20 respectively. Number of umbel/plant observed in Fennel, Ajowain, Coriander and Cumin are 19.87, 37.33, 28.27 and 15.20 respectively. Number of umbels/umbel observed in Fennel, Ajowain, Coriander and Cumin are 21.33, 20.27, 21.53 and 10.73 respectively. Number of seed/umbels observed in Fennel, Ajowain, Coriander and Cumin are 22.80, 18.87, 19.93 and 11.00 respectively. Number of pod/plant observed for Fenugreek and Kalonji are 64.20 and 25.93 respectively. Number of seed/pod observed for Fenugreek and Kalonji are 19.93 and 11.40 respectively. Number of fruit/plant observed for Chilli is 23.13 respectively. Test weight observed in Fennel, Ajowain, Coriander, Fenugreek, Kalonji, Chilli and Cumin are 5.35, 0.79, 6.65, 7.93, 2.03, 4.06 and 5.03 respectively. Yield observed for Fennel, Ajowain, Coriander, Fenugreek, Mentha, Kalonji, Chilli and Cumin are 7.55, 6.77, 5.78, 8.33, 58.87, 3.13, 40.72 and 2.25 respectively. An economic analysis is most prime objective for finding economic suitability of any cropping system on the farmer's as well commercial point of view. Benefit cost ratio of crops differ significantly under poplar based agroforestry model and ranged between 0.02-4.27 poplar based model respectively.

EVALUATION OF BIOLOGICAL FACTORS OF INDOOR PLANT SPECIES IN ARID REGION, INDIA

Rajbala Soni^{1*}, Rajesh Dhankar² and Surender Verma³

Deptt. of Environmental Science, Vaish College of Engg., Rohtak, Haryana
Deptt. of Environmental Science, Maharishi Dayanand University, Rohtak, Haryana
Deptt. of Pharmaceutical Sciences, Kurukshetra University, Kurukshetr, Haryanaa

ABSTRACT

The present study was carried at Rohtak, Haryana, India to determine the changes in physiological and biological parameters of ornamental indoor plants-Chlorophytumcomosum (Spider plant) vs. Chlorophytum comosum variegatum (Species of Spider plant)under normal and stress conditions. Parameters like total chlorophyll content, ascorbic acid concentration, relative water content, pH of the leaf extract and carotenoids were measured at different time intervals as at 1st day, after 7 days and after 20days intervals by following the standard methods. Comparative study was done under these parameters and Air pollution tolerance index (APTI) of the indoor plants was calculated. Chlorophytum comosum variegatum is very sensitive in door plant species among tested plants which followed by Chlorophytum comosum.

EVALUATION OF CHICKPEA (*CICER ARIETINUM*) ITS NUTRITIONAL ASPECTS AND ITS PROCESSING

Mamta Rathore¹ and H.G. Prakash² and D.P. Singh³

^{1,2}Department of Agricultural Biochemistry

³Department of Vegetable Science,

C.S. Azad University of Agriculture and Technology, Kanpur, Uttar Pradesh

ABSTRACT

In the world of pulse this crop is mostly cultivated crops in ancient time. It is a rich source of micronutrients, dietary fiber and protein content. In 2006 government declared this year as an International pulse year. Chickpea adds significant amount of nitrogen to soil and organic matter to improve the soil fertility and health aspects. Chickpea is grown in semi-arid areas, consider as drought tolerant and many cultivars with various levels of tolerance to drought have been produced. Worldwide chickpea in 2018 was 17.19 million tones which account for 18.63% of total pulse production. In chickpea, the chief phytochemicals comprise of flavonoids, phenolic acids, lignin, stilbenes and carotenoids. In chickpea, phytochemical are phenolic compounds, specifically 5-deoxyiso flavonoids and have important role in providing defensive action against pathogens and also help in nitrogen fixation by acting as chemical signal. As compared to other pulse protein like pea and soybean protein chickpea protein has highest thermal expansion value, stability and forming capacity chickpea also higher emulsion stability index. Chickpea consider as a suitable vehicle for developing the replacement beverage because it is a rich source of nutrition. Individual suffering from lactose intolerance plant based beverage are beneficial for those people. The viability of probiotic bacterial culture increased by chickpea

EVALUATION OF COWPEA GENOTYPES FOR AGRO-MORPHOLOGICAL TRAITS AND FORAGE NUTRITIONAL QUALITY

**Banwari Lal Yadav, Gitanjali Sahay, Reetu Verma,
Brijesh Kumar Mehta, Nilamani Dikshit and K. Sridhar**

ICAR-Indian Grassland and Fodder Research Institute
Jhansi, U.P.

ABSTRACT

Cowpea is a multipurpose crop with food, feed and forage value. Besides, it is also used for green manuring and as cover crop. It can be grown throughout the tropics and sub-tropics of the world. In the present investigation, 157 cowpea genotypes were evaluated for fifteen agro-morphological traits at ICAR-IGFRI, Jhansi in augmented block design. Analysis of variance revealed significant variation for all the agro-morphological traits. The green forage yield ranged from 63.3-720.0 g among the 157 cowpea genotypes. Based on the green forage yield, next we have selected nine genotypes possessing higher forage yield than checks (BL-1 and BL-2) for five forage nutritional traits viz., acid detergent fibre (ADF), neutral detergent fibre (NDF), total ash, crude protein and lignin content. The field experiment for quality evaluation was conducted in randomized complete block design with three replications. ADF ranged from 34.36-49.77%, while NDF, total ash, crude protein and lignin content varied from 51.63- 63.52 %, 7.02-19.03%, 15.26-19.29% and 6.64-13.91 %. BL-1 showed maximum value of ADF, NDF and lignin content while IC20678 showed highest value of crude protein content. Total ash content was recorded highest in EC724773. The genotypes with higher green forage yield along with high forage nutritional value over checks holds the promise to meet the ever increasing demand of green fodder in the country.

EVALUATION OF F₇ PROGENIES OF BARLEY FOR FORAGE BIOMASS YIELD

A.K. Singh*, Reetu Verma and Mahesha, H.S.

ICAR-Indian Grassland and Fodder Research Institute
Jhansi, U.P.

ABSTRACT

Barley (*Hordeum vulgare* L.) is an important rabi season, early maturing cereal crop of India, mainly used as feed, fodder and malting barley. In a field experiment, a total of 26 F₇ progenies from F₅-derived lines of eight single crosses following bulk breeding method were grown in rabi season of 2021-2022 at the central research farm of IGFRI, Jhansi to evaluate families mainly for green fodder yield at 50-60 days after sowing (DAS), biomass yield at the mid-dough stage (silage stage). The field experiment was thus conducted with three sets of trials in a RBD with four replications and 6 checks viz. RD-2715, RD-2552, RD-2899, RD-2668, HUB-113 of barley and JHO-822 of oat. Each plot consisted of 9 rows of 6.4m length and 22.5 cm apart and seeds were sown at the rate of 80 kg seed/ha. All plants of nine-row plots (2.10m x 2.025m) from the plot size 6.4m x 2.025m were cut for the two sets of trials and weighed on plot basis. The result of cut green fodder yields at 58 DAS indicated that among the 6 checks, RD-2715 had the highest GFY (175.0 q/ha), while the mean GFY of 32 entries tested was 158.50 ± 6.747 q/ha. Five families of the cross NDB-1545/K-1185 had high cut GFY (192.8-257.5 q/ha). The result of the biomass yields at mid-dough stage (94 to 105 DAS) indicated that check RD-2715 had the highest biomass yield (583.2 q/ha) among 6 checks. The mean biomass yield of 32 entries tested was 560.14 ± 14.224 q/ha. A total of 12 families of the 5 crosses had higher biomass yield (589.1-687.4 q/ha). Among 32 entries tested, check RD-2715 recorded 6.20 q/ha/day biomass yield at the silage stage, while 12 families recorded higher biomass yield at the silage stage (6.20-7.31 q/ha). There was a huge difference between biomass yield at mid-dough and vegetative stages (285-495.5 q/ha) in evaluated entries, which can be utilized for breeding for high fodder and grain yield.

EVALUATION OF MICROBIAL AND SOIL ENZYMATIC SHIFT IN THIAMETHOXAM TREATED MANGO (*MANGIFERA INDICA* CV. AMRAPALI) RHIZOSPHERE

¹Pradeep Kumar Shukla, ²Anup Kr. Bhattacharjee, ²Govind Kumar and ¹Rishi Saxena

¹Department of Microbiology, Bundelkhand University, Jhansi, U.P.

²ICAR-Central Institute for Subtropical Horticulture, Rehmankhura, Kakori, Lucknow, U.P.

ABSTRACT

Due to indiscriminate use of thiamethoxam to control different pests the soil quality and nutrients status of the soil deteriorated drastically. To reclaim the soil with thiamethoxam pollution, thiamethoxam (T_1 : 0.2 g L⁻¹, T_2 : 2.0 g L⁻¹ and control) treated rhizospheric soil samples were collected from mango (cv. Amrapali) and analysed for microbial enumeration, soil enzymatic shift and residue persistence by using microbial methods and HPLC. At 0 to 60 days time intervals bacterial population shifted from 46×10^6 to 48×10^6 CFU mL⁻¹, 40×10^6 to 52×10^6 CFU mL⁻¹ and 40×10^6 to 59×10^6 CFU mL⁻¹ on NA medium in control, T_1 and T_2 treatments, respectively. Whereas fungal population shifted from 25×10^4 to 20×10^4 CFU mL⁻¹, 20×10^4 to 17×10^4 CFU mL⁻¹ and 15×10^4 to 16×10^4 CFU mL⁻¹ on RBC agar in control, T_1 and T_2 , respectively, at same time intervals. Data from soil enzymatic shift for DHA and FDA revealed that no shifting was occurred in control soil at 0 to 60 days while in treated soil it was slightly changed from 0.164 μ g g⁻¹ to 0.168 μ g g⁻¹ in T_1 and in T_2 from 0.155 μ g g⁻¹ to 0.157 μ g g⁻¹. FDA changed from 0.761 μ g g⁻¹ to 0.717 μ g g⁻¹ in T_1 but no significant change was observed in T_2 . HPLC data revealed that thiamethoxam degraded from its initial deposit of 5.62 mg kg⁻¹ at zero days to 0.60 mg kg⁻¹ after 60 days in T_1 and 41.17 mg kg⁻¹ at zero days to 2.10 mg kg⁻¹ in T_2 . After 60 days of application in soil, 89.32 and 94.90 per cent of thiamethoxam degradation was observed in lower and higher concentrations, respectively. The dissipation rate followed pseudo first-order kinetics in soil with calculated half-life (DT_{50}) value of 23.10 days in lower and 13.86 days in higher concentration. The aim of this study is to analyse fate of thiamethoxam in soil and its impact in soil microbial and soil enzymatic shift.

EVALUATION OF PEARL MILLET GERMPLASM FOR FORAGE YIELD AND COMPONENT TRAITS

**Satyender Singh^{2*}, Praveen Kumar Yadav¹, Brijesh K. Mehta¹,
H.S. Mahesha¹ Shahid Ahmed¹ and P. Shashikumara¹**

¹ICAR-Indian Grassland and Fodder Research Institute, Jhansi

²Bundelkhand University, Jhansi

⁴ICAR-Indian Grassland and Fodder Research Institute, SRRS, Dharwad

ABSTRACT

Pearl millet is an important crop for food, feed, fodder and environmental security. Here, we evaluated the 168 germplasm along with three checks (two forage bajra cultivars: Giant bajra and Baif bajra 1) in term of fodder yield, and component traits. Experiments were conducted in alpha lattice design with two replications at IGFRI, Jhansi. ANOVA revealed significant genotype variation ($P \leq 0.05$) among the bajra genotypes for fodder yield and its component traits. The range for biomass and plant height varied from 0.7g/plot to 11.3gm/plot and 43cm to 384cm respectively indicating wide range of variability. Correlation coefficient analysis indicated that the traits viz., plant height, number of tillers, leaves per plant, leaf areas and dry matter yield may be considered as important traits during the selection for improvement of forage yield in Bajra. Total eight lines shown high regeneration potential hence they can be utilized for deriving multicut genotypes. For single cut, total six lines shown higher GFY of 11.5% (IGBV1), 21.2% (IGBV2), 19.6% (IGBV3), 26.4% (IGBV4), 14.1% (IGBV5) and 10.7% (IGBV6) more than the national check cultivar Giant bajra. The genotypes IGFB149, IGFB127, IGFB147 and IGFB152 were identified as blast resistant having disease scale of 3 and five in breeds IGFB150, IGFB118, IGFB167 and IGFB195 found to be blast susceptible lines having disease scale of 7. The study concluded that bajra germplasm possess high variability for forage yield component traits which can be exploited for development of high biomass pearl millet cultivars.

EVALUATION OF SOIL PHYSICAL PROPERTIES OF FARMER'S FIELD OF JAIPUR DISTRICT, RAJASTHAN, INDIA

Vinod Kumar Yadav, Tarence Thomas and Sanwar Mal Yadav

Department of Soil Science and Agricultural Chemistry
Sam Higginbottom University of Agriculture, Technology and Sciences
Prayagraj, U.P., India

ABSTRACT

A lab experiment was conducted for an evaluation of soil physical properties of farmer's field of Jaipur district of Rajasthan. A certain depth wise soil samples were collected from various depth viz. 0-15 cm, 15-30 cm and 30-45cm. The analysis of the soil samples manifested that the soil samples fall under loamy sand to sandy loam. The soil color varied from Dark brown (10 YR 3/3) to yellowish brown (10 YR 5/4). Soil having bulk density range from 1.40 to 1.52 Mg m⁻³ with the mean value of 1.46 Mg m⁻³ and particle density range from 2.44 to 2.57 Mg m⁻³ with the mean value of 2.50 Mg m⁻³. The pore space ranges from 39.08% to 43.53% with the mean value of 41.30%. The value of sand, silt and clay in the soils varied from 72.20% to 80.20%, 10.20% to 16.50% and 8.30% to 13.60%. The results obtained thus indicate that the study soils mainly fit for cultivation of pearl millet, ground nut, cowpea, wheat, barley, mustard, coriander and fenugreek. On the basis of analysis, it was found that using organics with in – organics to managed present and future deficiencies of nutrients in these soils and also improve soil health for future generation.

E-WASTE IMPACT ON AGRICULTURAL CROPS IN BUNDELKHAND REGION

Pallavi Kumari¹, Vinit Kumar¹, Anshu Dhaka² and Amit Kumar³

¹Institute of Environment & Development Studies, Bundelkhand University Jhansi (UP)

²DN(PG) College Meerut (UP)

³Department of Agroforestry, Bundelkhand University, Jhansi (UP)

ABSTRACT

E-waste" is a popular, informal name for electronic products nearing the end of their "useful life. Electronic waste or e-waste is one of the emerging problems in developed and developing countries worldwide. When improper disposal of e-waste in regular landfills or in places where it is dumped illegally, both heavy metals and flame retardants can seep directly from the e-waste into the soil, causing contamination of underlying groundwater or contamination of crops that may be planted nearby or in the area in the future. When the soil is contaminated by heavy metals, the crops become vulnerable to absorbing these toxins, which can cause many illnesses and doesn't allow the farmland to be as productive as possible. When large particles are released from burning, shredding or dismantling e-waste, they quickly re-deposit to the ground and contaminate the soil as well, due to their size and weight. The amount of soil contaminated depends on a range of factors including temperature, soil type, pH levels and soil composition. These pollutants can remain in the soil for a long period of time and can be harmful to microorganisms in the soil, plants and agriculture crop. Ultimately, human, animals and wildlife relying on nature for survival will end up consuming affected plants, causing internal health problems.

EXPLOITING GENETIC DIVERSITY OF MULBERRY (*MORUS* SPECIES) FOR SUSTAINABLE LIVESTOCK PRODUCTION IN INDIA

**Kamini^{1*}, Sheeraz Saleem Bhat², Maneet Rana¹,
Anup Kumar¹, A K Handa³ and R P Nagar⁴**

¹ICAR-Indian Grassland and Fodder Research Institute, Jhansi, Uttar Pradesh, India

²ICAR-IGFRI, RRS, Srinagar, Jammu and Kashmir, India

³ICAR-Central Agroforestry Research Institute, Jhansi, Uttar Pradesh, India

⁴ICAR-IGFRI, WRRS, Avikanagar, Rajasthan, India

ABSTRACT

Mulberry or *Morus* species (Family: Moraceae) are ecologically as well as economically important multipurpose fast growing tree species of India. Mulberry can grow across various climatic zones from tropical to temperate regions with excellent adaptability on various types of soil, moisture conditions, topography and altitude (sea level to 4000 m amsl). Mulberry leaves are rich in crude protein (15.31 to 30.91%); macro & micro-nutrients, antioxidants, vitamins, flavonoids and being a galactagogue can be utilized under various agro-climatic zones of India for sustaining livestock productivity. Further, Mulberry leaves show high dry matter digestibility, palatability and can be conserved as a dried leaves or by converting into silage. Research across the world has also proved that Mulberry leaf supplementation increase milk yield and growth performance in livestock. Therefore the need of the hour is to promote cultivation of Mulberry species under various agro-climatic zones for enhancing the declining productivity of Indian livestock and to sustain rural economy. For promoting Mulberry for fodder production in India, identification of superior genotypes of mulberry in terms of adaptability, growth performance, fodder yield and nutritional traits under various agro-climatic zones is of paramount importance. Moreover, there is existence of huge inter and intra specific genetic variation among Mulberry species for adaptability, leaf morphology, leaf biomass production potential, nutritional composition and other traits which can be exploited for identification of superior genotypes of mulberry for fodder production. ICAR-IGFRI has already initiated research on this aspect and has collected mulberry species germplasm which is being screened for identification of superior genotypes of Mulberry for quality fodder production under various agro-climatic zones of India. Huge variation for growth, survival and morphological traits etc. among Mulberry species germplasm has been observed which shall be showcased during presentation.

EXPLORING GEOMORPHIC PROCESSES AND MARTIAN GALE CRATER TOPOGRAPHY ON MARS USING CTX AND HIRISE EXPRESS IMAGE DATASET

Pavan Kumar*, Manmohan Dobriyal and A.K. Pandey

College of Horticulture and Forestry
Rani Lakshmi Bai Central Agricultural University, Jhansi

ABSTRACT

Exploration of Martian surface and the crater deposition has recently attracted scientific community. We hypothesized the existence of important topographic features of different origin on the Martian surface. It was observed that Gale Crater (GC) has a thick sediment deposition mainly of fluvial and aeolian origin. This study has utilized spatially referenced topographic dataset i.e. Context Camera (CTX) images acquired from the Mars reconnaissance orbiter for exploring geomorphic processes and topography of Gale Crater. The High Resolution Imaging Experiment (HiRISE) images were used to examine the identified geomorphic features. CTX and HiRISE images have proved useful for geomorphic and topographic mapping of the Mars planet. Results revealed the presence of both fluvial and aeolian processes and their respective associated landforms in the Crater. Yardangs produced by erosion and ripple and dunes formed by the depositional work of wind were also identified in the Crater. The fluvial channels, inverted channels and fan shaped deposits further signified ongoing aqueous activity on the Gale Crater. Rock particles, sand and silt in the crater were found to have been transported and deposited by flowing water on its floor. Presence of different sedimentary structures and valley revealed ancient sedimentary deposition due to action of water. Our study confirms the previous studies that presence of H₂O sub surface volatiles. The concept and findings of this study will escalate knowledge about the surface features of Gale Crater. However, more coherent investigation is needed for modelling and understanding the processes and landforms of the crater.

**FACTORS AFFECTING CARBON SEQUESTRATION IN
QUERCUS LANUGINOSA FOREST OF ASKOT
WILDLIFE SANCTUARY, WESTERN HIMALAYA**

Soni Bisht, K. Bargali*, S. S. Bargali and Y. S. Rawat

Botany Department, DSB Campus, Kumaun, University, Nainital, Uttarakhand

ABSTRACT

According to the Kyoto treaty every industrialized country should develop a transparent and verifiable methodology for assessing the magnitude and evolution of the carbon stored in forest ecosystems. The biomass of living trees comprises the main sequestered carbon pool in forest ecosystems. The objective of this study is to present the amount of carbon fixed by one of the over exploited oak species (*Quercus lanuginosa*) with restricted distribution in Askot Wildlife Sanctuary Western Himalaya, India. Data on live biomass and soil were collected in thirty quadrats of 10x10 m size at three distinct altitudes ranging from 1900-2100 m asl. A total of 236 individuals with a diameter of ≥ 31 cm was measured in three forest sites and standing biomass was estimated following growing stock volume equations. The mean aboveground and belowground carbon stock was 475.8 ± 84.9 and 119.8 ± 18.1 Mg C ha⁻¹, respectively. The average carbon stock in the soil was 19.1 ± 0.5 Mg C ha⁻¹. The total tree carbon stock showed significant ($P < 0.01$) positive correlation with soil carbon ($R^2 = 0.71$) and nitrogen ($R^2 = 0.99$). Soil nitrogen exhibited substantial positive correlation ($R^2 = 0.99$, $P < 0.01$) with basal area, indicating that nitrogen enhances tree growth and forest biomass stock. Carbon stock had a significant positive and negative relationship with basal area and diversity, respectively. The study suggests that the old-growth individuals of this oak species should be maintained in the study area since they have a high carbon accumulation potential. However, to understand the dynamics of the carbon sequestration in *Q. lanuginosa* forest, more research is needed to estimate the carbon stock of shrubs, herbs, litter and soil microbes.

FINANCIAL ANALYSIS AND RISK BEARING CAPACITY OF ACACIA SENEGAL BASED MULTI-COMPONENT AGROFORESTRY MODEL FOR CLIMATIC RESILIENCE IN SEMI-ARID TROPICS

**Rajendra Prasad^{1*}, B. Alam¹, A.K. Handa¹, A. Arunachalam¹,
Vikas Kumar², Ashok Shukla¹ and Prashant Singh¹**

¹ICAR-Central Agroforestry Research Institute, Jhansi, Uttar Pradesh, India

²ICAR-National Institute of Agricultural Economics and Policy Research, New Delhi, India

ABSTRACT

Agroforestry is being advocated for multiple benefits including supply of fuel, timber, fodder and food; non-timber forest products (natural resins and gums (NRGs)); carbon sequestration, improvement in soil health and increase in resilience against climatic uncertainties. However, its adoption by the farmers is lagging behind across the globe including India for want of scientific evidences for high economic efficiency and better returns. Many agroforestry models that are recognized as viable farming systems and are widely promoted lack documentation of economics and financial estimates. Hence, present study was conducted at ICAR-Central Agroforestry Research Institute (CAFRI), Jhansi to provide economic analysis of 10-year-old Acacia senegal based multi-component agroforestry model (agri-horti-silviculture), to assess its risk bearing capacity against climatic uncertainties for agricultural resilience, and motivate farmers for adopting agroforestry on their farms. The multi-component agroforestry model based on gum-arabic (A. senegal) and fruit-yielding plant species (Aegle marmelos, Citrus limon and Carissa carandas) was established in 2009 under ICAR Network Project "Harvesting, Processing and Value Addition of Natural Resins and Gums". For intercropping that commenced from 2009, the cropping sequence: Phaseolus mungo/ Vigna radiata – Lens culinaris/ Brassica campestris/ Triticum aestivum for summer-winter seasons was adopted. The benefit:cost ratio (BCR), net present value (NPV), internal rate of return (IRR) and payback period (PBP) were used as measures of economic efficiency of the model. Findings revealed that this multi-component agroforestry model attained B:C ratio around 1.0 in 3rd year and despite failure of summer crops due to abnormal monsoon rain, the B:C ratio remained 1.26 (7th year) and 1.60 (8th year) reflecting its risk bearing potential and climatic resilience. In 10th year, the model offered B:C ratio of 2.15. As the age of the model progressed, in general, there was a decline in per cent share of returns from crops in total returns and after 10 years the share of crops reduced up to 20% which was fully compensated by tree/woody components. After 10 years, per hectare discounted total cost, total returns and net returns were Rs. 202442, Rs. 240656 and Rs. 38214, respectively with B:C ratio of 1.19. The IRR was 18.29% which was well above the rate of capital as 12%. The PBP was found as 8.41 years. Conclusively, the economic analysis of the A. senegal based multi-component agroforestry model suggests that it has potential to minimize risk of failed monsoon and can produce usufructs on sustainable basis. It can successfully be adopted by the farmers of semi-arid region for responding to challenges of climate change and food insecurity.

**FIRST MINERAL ANALYSIS FROM THE
MEDICINAL PLANT *HYMENAEEA MARTIANA* HAYNE (JATOBÁ)**

Layza Sá Rocha and Valter Aragão do Nascimento

aGroup of Spectroscopy and Bioinformatics Applied Biodiversity and Health (GEBABS)
Federal University of Mato Grosso do Sul, Campo Grande
/MS, Brazil, 549, Campo Grande, 790709-00, Brazil.

ABSTRACT

Hymenaea martiana Hayne (Jatobá) is a plant that belongs to the family Fabaceae (Leguminosae) which it is considered a medicinal plant. *Hymenaea martiana* Hayne has the popular name of Jatobá and this species can be found not only at the cerrado but also at the caatinga area and is present in Cuba, Mexico and South America [1]. According to popular knowledge, this plant can be considered medicinal due to its capacity in the treatment of a variety of diseases in Brazil and in other countries, which is mainly observed in the bark and the leaves [2]. The medicinal purposes known are antibacterial, antispasmodic, antifungal, anti-inflammatory, antioxidant, decongestant, diuretic, expectorant, fortifying, hepatoprotective and vermifuge action [2,3,4]. However, until the present study it was not able to find proper studies about their elemental composition. In the present study, micro and macroelements were studied focusing in: Al, Ca, Cr, Cu, Fe, K, Mg, Mn, Na, Ni, P, S and Zn in fresh barks and leaves and tea leaves and tea bark. First the leaves and barks underwent a process of drying and grinding followed by a Microwave digestion System (*Speedwave® four*, Berghof) and the quantification was performed by the ICP-OES (Thermo Fisher Scientific, Bremen, Germany, iCAP 6000 Duo). The results indicate that in the leaves Cu is the element of lower concentration followed by Ni. Also, Ni was the element that showed to be the lowest element in all samples. Aluminium (Al) was detected only in the leaves and bark of Jatobá. It was not detected Al, Cu and Fe in tea leaves; Al and Cu in bark tea and Cu in fresh bark. It was possible to notice that the element with higher concentration was potassium (K) in the fresh leaf, bark tea and leaf tea. Calcium (Ca) is the element of greatest quantification in the bark and Cu is the smallest element in the leaf. This study enhances that the gaps in knowledge about the quantification of the concentration of minerals in the species *Hymenaea martiana* Hayne obtained can serve as a tool to decide the dosage of preparations from this plant used for medicinal purposes.

FOOD SECURITY IN INDIA: PROBLEMS AND PROSPECTS

Shivanand Maurya¹, Rajesh Kumar², Ravi Verma¹ and Kaptan Baboo¹

¹Department of Agronomy, Acharya Narendra Deva University of Agriculture & Technology
Kumarganj, Ayodhya, Uttar Pradesh

²Department of Agronomy, Acharya Narendra Deva University of Agriculture & Technology
Kumarganj, Ayodhya, Uttar Pradesh

ABSTRACT

The concept of Food Security is multi-dimensional. Food security exists when all when all people at all times have physical and economic access to sufficient and nutritious food that meets their dietary needs and food preference for an active and healthy life. Ensuring food and nutrition security is a challenge for India given its huge population and high level of poverty and malnutrition. In the recently released Global Hunger Index, 2021 India ranked 101th out of 116 countries and this report is quite disturbing since India is one of the largest producers of food grains in the world. Still India lacks in fulfilling the basic amenities of its people. India is home of 25 per cent of hungry population. It has been well established that India has become self-sufficient in food availability. Hence India can take pride in being able to fulfill the present demand with indigenous production. Food security in India is adversely affected by several abiotic, biotic, and sociopolitical situations. The pressure of human population and land for cultivation, climate change, government policies of public distribution and marketing of food grains, and lack of a participatory approach—all are contributing to slow down the availability of foods. The situation has to be remedied by all possible means and citizens must be assured of food security. This review summarizes several strategies for crop production and food distribution and emphasizes the need for a second Green Revolution.

FOREST GENETIC RESOURCES OF NON-TIMBER SPECIES IN ARID AND SEMI ARID REGION

Swati Shedage

Rani Lakshmi Bai Central Agricultural University, Jhansi

ABSTRACT

Forests have evolved over millennia in their natural ecosystems to become the world's most important and valuable renewable natural resources. Genetic variety in prospective trees has been defined as Forest Genetic Resources (FGRs). Forest genetic resources directly or indirectly sustain human livelihoods and provide raw materials for a variety of forest-based enterprises. This chapter focuses on the FGRs of the arid and semiarid regions, which have a wide range of land formations, soils, fauna, plants, water balances, and human activities. Cultivating trees that have the potential to generate lucrative non-timber goods is the primary source of revenue in this difficult climatic situation. Arid and semi-arid regions have a diverse gene pool of tree species. Increased pressure and ongoing desertification are threatening the gene pool of tree species in arid and semi-arid environments. These regions' FGRs are not sufficiently documented, and there is no way to access and use them effectively. This paper intends to establish a framework for documenting, better understanding, protecting, and understanding the utility of non-timber forest genetic resources (NTFGR) in dry and semi-arid regions. It focuses on dry and semi-arid tree species that have the potential to yield non-timber value, with the goal of increasing awareness and understanding of Forest Genetic Resources.

***FUSARIUM OXYSPORUM* F.SP. *LYCOPERSICI*:
CAUSAL AGENT OF FUSARIUM WILT OF TOMATO**

Nitisha Gahlot and R. N. Bunker

Department of Plant Pathology, MPUAT, R.C.A. Udaipur (Rajasthan)

ABSTRACT

Tomato (*Lycopersicon esculentum* Mill.) is considered as most important tropical vegetable crop which belongs to the family *Solanaceae*. In India, it is cultivated in about 8.52 lakh hectares area with an annual production of 210.03 lakh metric tonnes. *Fusarium* wilt caused by *Fusarium oxysporum* f.sp. *lycopersici* affect all tomato growing areas all over the world and causes 30-40% yield loss and under favorable conditions losses increased to 80%. In India, the disease was first reported by Butler, 1918 from Pusa, Bihar as *Fusarium oxysporum* f.sp. *lycopersici*. *Fusarium oxysporum* is a soil borne pathogen that enters through the roots and disrupts the plant's vascular system. As infection increases, water flow become impeded in water conducting vessels, causing yellowing and wilting of the leaves. This causes the plant's leaves to droop and eventually die. Browning of vascular system in infected stems and larger than normal leaf petioles, are clear sign of infection. The fungus produces three types of asexual spores, microconidia, macroconidia and chlamydospore. It is able to survive in soil in the form of chlamydospores for many years. Due to prolonged survival of pathogen in soil as a saprophyte and as resistant propagules (chlamydospores) it is difficult to control through conventional methods. Chemical's negative effects on soil, plant health and crop products have prompted plant pathologist to search for eco-friendly strategies for plant disease management. Various disease management strategies have been implemented to combat and eradicate pathogen. Cultural, regulatory, physical, chemical and biological approaches are among them. As a result, an integrated management strategy is the better solution to maintain plant health.

**GENETIC VARIABILITY AND IDENTIFICATION OF GERMPLASM
ACCESSIONS FOR HIGH GRAIN YIELD AND POWDERY MILDEW
RESISTANCE IN BLACK GRAM [*VIGNA MUNGO* (L.) HEPPER]**

Harshitha. M, Shanthala. J, A. Mohan Rao, D. L. Savithramma and K. Karuna

Department of Genetics and Plant Breeding
University of Agricultural Sciences, Gandhi Krishi Vignana Kendra (GKVK), Bangalore

ABSTRACT

Black gram, one of the important pulses, has a remarkable extent of usage for daily consumption that partly fulfills per day protein requirements of human beings. However, it is limited by its less availability of genetic variability coupled with narrow genetic base, which is further restricted by the presence of the most destructive disease powdery mildew (*Erysiphe polygoni*) causing a yield loss of 90 per cent. Hence, genetic interventions is considered as substantial approach to minimize losses caused by the disease. With this back ground, an investigation was carried to identify black gram accessions resistant to powdery mildew with high yield potential. Two sets of 100 black gram germplasm accessions were evaluated for seed yield and response to powdery mildew disease infestation under natural condition using infector row technique during Kharif 2020 at the experimental plots of K block, University of Agricultural Sciences, GKVK, Bangalore. The results revealed that, there is a substantial variability for quantitative traits evaluated. KU-1-662 shown to have highest seed yield, IC-436773, IC-436758, VBN-3, TU-98-18, VBN-9, KU-11-668 and Rashmi were promising for multiple quantitative traits. Higher estimates of heritability and narrow differences between the estimates of PCV and GCV indicated effectiveness of selection for seed yield and their component traits. Out of 100 accessions evaluated for response to powdery mildew disease, five accessions were highly resistant and eight accessions were resistant. M-414, RFU-1303, KU-12-35 and IC-281977 were identified as highly resistant genotypes coupled with comparable seed yield. These accessions after further confirmation of responses to disease could be utilized as donor parents in breeding program for development of black gram varieties resistant to powdery mildew coupled with high yield.

**GENETIC VARIABILITY, HERITABILITY AND GENETIC
DIVERGENCE IN TOMATO (*SOLANUM LYCOPERSICUM* L.)**

Om Prakash¹, and Vijay Bahadur²

²Department of Horticulture

Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad (UP) India

ABSTRACT

The present investigation entitled “Genetic Variability, Heritability and Genetic divergence in Tomato (*Solanum lycopersicum* L.)” was conducted in randomized block design with 26 genotypes of tomato in three replications. The objectives were to assess the relative performance, estimation of genetic parameters and genetic divergence for fruit yield its components. On the basis of mean performance of 26 genotypes of tomato, TOINDVAR-3 (4.91) was found superior in terms of fruit yield /plant (kg). On the basis of Analysis of variance significant difference was recorded for the entire fruit yield and its components indicating presence of large amount of variability in the genotypes. The magnitude of GCV and PCV was found highest for fruit shape index (35.28&37.46). The heritability estimates were found to be high (more than 70%) for plant height (cm) at 120 DAT (92.00) and fruit shape index (89.00). The high genetic advance was obtained for plant height (cm) at 120 DAT (53.88). Maximum number of genotypes was grouped into cluster 3rd which included 10 genotypes. The intra-cluster distance varied from 22.40 to 69.21. The maximum intra cluster distance was shown by cluster 6 (69.21). In the contribution of each character to divergence showed plant height (cm) at 120 DAT contributes highest (41.23) to divergence.

GENETICS OF HEAT TOLERANCE IN WHEAT (*TRITICUM AESTIVUM* L.)

Shivani Upadhyay

Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya
Gwalior, Madhya Pradesh

ABSTRACT

Global climate change has led to increase in the overall temperature since few decades. As, wheat is one of the major cereal crop grown worldwide and sustains to be the most consumed staple food grain of almost 2.5 billion of the world's population (Ramadas et al., 2019), the impact of rising temperature is of huge concern for the wheat growing regions of the world. Wheat production seems to be declining by as much as 6% for every 1°C rise in temperature (Asseng et al., 2011). Such extreme weather condition known as heat stress (HS) is becoming more frequent and severer globally. HS alters the important physiological and biochemical activities of the plant (Hasanuzzaman et al., 2013). Heat tolerance is a complex trait that is controlled by multiple genes making it difficult for breeders to perform efficient selection. To assess the genetic basis of heat tolerance in promising genotypes, successful molecular strategies have proved to be of great significance. Identification of molecular markers linked to heat tolerance serves as a basic tool for marker assisted selection (MAS). QTL analysis based on high density linkage mapping for several quantitative traits like thousand grain weight (TGW) and grain number per ear (GNE) is quite useful (Pandey et al., 2019). Identification of QTLs associated with heat susceptibility index (HSI) of yield components in Recombinant Inbred Lines (RIL) populations proved to be significant (Mason et al., 2010). Advances in determining the underlying mechanisms contributing in heat tolerance play a pivotal role in determining plant's response to heat stress.

GEOGRAPHICAL DISTRIBUTION OF FISH DIVERSITY IN UPPER, MIDDLE AND LOWER STRETCHES OF THE RIVER GANGA

Syed Shabih Hassan

Department of Fisheries Resource Management, College of Fisheries
Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana–(Punjab) India

ABSTRACT

The Ganga, which emerges from an ice cave in Gangotri in the Himalayas at an altitude of 4100 metres above mean sea level and empties into the Bay of Bengal, is the lifeline of the Indian subcontinent. The Ganga is India's largest river basin, draining a huge number of Indian states. The Ganga has traditionally been a significant source of diversified fish harvest composition in India. The Ganga River supports a diverse range of vegetation and animals, including a diverse fish species. A field survey was conducted in twelve different places between Haridwar and Farakka, covering a distance of 1500 kilometres. Fishing intensity and variety were found to be modest between Haridwar and Bijnor, with a total of 34 species encountered throughout the survey. The water quality of the Ganges is improved at Kanpur by the confluence of a few small tributaries, resulting in a rise in fish diversity (56 species) and quantity (15 times that of the upper parts) in the river. Both the number of species (69) and the number of fish caught increased at Allahabad (twice that of Kanpur). The fish capture was most represented in Allahabad, where a substantial component of the fishery was encountered. A total of 78 fish species have been identified in the Ganga stretch of Varanasi, 84 in Buxar, 106 in Patna, 113 in Bhagalpur, and 124 in Farakka, due to engagement of a greater number of fishers in fishing and increasing fish capture diversity. As a result, an increasing trend of all the characteristics of a fish population is regularly observed upstream and downstream of the Ganga River system. A shift in the distribution pattern of a few fish species was also seen in some regions of the river, including the reduction of commercially important carp species. The fish habitat data provides information on the state of the river stretch and the morphometry of the water bodies in the research area. The level is aimed to examine the aquatic ecosystem in relation to fish habitats at a corridor level. The data includes GIS stream networks, which are comparable to those used for waterbodies. To highlight the spatial proximity of various land uses to the Ganga, river waterbodies were created using Landsat satellite interpretation. Barrages, dams, fish ladders, fishpass/fishways, associated floodplains/wetlands, and temporary lentic water bodies in the Ganges were all located using the database. The Ganges fishery, as well as the socio-economic position of riverside fishermen, is hurt by the river's changing course, siltation, diminishing water level, and fish productivity, which includes the appearance of low-value fishes. The data can be used to track biodiversity in the Ganga and plan future conservation efforts.

GERMINATION OF *ALEXANDRINUM TRIFOLIUM* L. CULTIVARS UNDER SALT STRESS

Jyoti Khanduri¹, Vimlendu Bhushan Sinha², Indra Rautela³ and Manish Dev Sharma¹

¹Department of Biotechnology, School of Basic and Applied Sciences
Shri Guru Ram Rai University, Patel Nagar, Dehradun, Uttarakhand, INDIA

²Department of Biotechnology, School of Engineering and Technology
Sharda University, Greater Noida, Uttar Pradesh, India

³Department of Biotechnology, School of Applied and Life Sciences
Uttaranchal University, Dehradun, Uttarakhand

ABSTRACT

Trifolium alexandrinum L. is a leguminous plant having magnificent nutritional contents that may be used to feed cattle. Different variables influence germination, one of which is the water absorption capability of seeds during early germination. *T.alexandrinum* cultivars BB1, BB2, and BB3 were selected for this study, and their seeds were germinated under NaSO₄ stress, 0 mM, 25 mM, 50 mM, 75 mM, 100 mM, and 150 mM were the salt concentrations used in the study. The study found that the salt concentrations of 0 mM, 25 mM and 50 mM had no noticeable impact but that when the salt concentrations were increased, the rate of germination dropped and therefore the whole plumule and cotyledonary leaf was also influenced.

GOOD AGRICULTURAL AND COLLECTION PRACTICES FOR QUALITY HERBAL MEDICINAL PRODUCTS

Yasmeen Shamsi

Department of Moalajat, Jamia Hamdard, New Delhi

ABSTRACT

Herbal medicines have been used for thousands of years to treat various diseases and well-proven health benefits and have few or no adverse effects, so they are being used for medication purposes in the developed and developing countries. Herbal medicines, have been increasingly used worldwide during the last two decades. Unfortunately, the number of reports of patients experiencing negative health consequences caused by the use of herbal medicines has also been increasing. Analysis and studies have revealed a variety of reasons for such problems. One of the major causes of reported adverse events is directly linked to the poor quality of herbal medicines, including raw medicinal plant materials. Hence, developing high-quality herbal products must particularly emphasize standardization through qualitative and quantitative quality controls on single herbs and multiple herbs of the prescription formulas by using the most advanced scientific technology, especially toxicity profile testing.

For the commercial production of herbal drugs, cultivation of raw materials/medicinal plants should be carried out in line with the terms of good agricultural and collection practices (GACP). GACP for medicinal plants is only the first step in quality assurance, on which the safety and efficacy of herbal medicinal products directly depend upon, and will also play an important role in the protection of natural resources of medicinal plants for sustainable use. Safer herbal drugs can only be produced by following GACP during the cultivation of medicinal plants and enforcing its components for post harvest processing and handling. Clean soil, supply, sanitation, and surfaces are the four integral structural components of GAPs.

A brief insight into guidelines for good agricultural and collection practices for better yield of raw drugs will be presented in the conference.

GROWTH AND YIELD OF ASHWAGANDHA (*WITHANIA SOMNIFERA* L. DUNAL) UNDER MANDARIN BASED AGROFORESTRY SYSTEMS IN HADOTI REGION OF RAJASTHAN

Prakash¹ and Prahlad V. C.²

¹Department of Silviculture and Agroforestry
Dr Y S Pamar University of Horticulture and Forestry, Nauni, Solan, H.P.

²Department of Silviculture and Agroforestry
College of Horticulture & Forestry, Jhalawar, Agriculture University Kota. Rajasthan

ABSTRACT

A field experiment was conducted from September 2018 to April 2019 to study "Growth and yield of Ashwagandha (*Withania somnifera* L. Dunal) under Mandarin-based Agroforestry Systems in the Hadoti Region of Rajasthan" at the Instructional farm, Fruit Science, College of Horticulture and Forestry, Jhalawar, Agricultural University, Kota (Rajasthan). Seven-year-old plantations of mandarin (*Citrus reticulata* Blanco.) at 6 x 6 m spacing were used for intercropping of four varieties of Ashwagandha (*Withania somanifera* L. Dunal) as an intercrop, viz., JA-20, JA-134, RVA-100, and AA-1' planted at 60 x 60 cm were selected for the present study. The analysis of variance showed significant differences among intercropping of Ashwagandha under the Mandarin-based agroforestry system as well as sole cropping for all the growth and yield parameters of Ashwagandha. Significant maximum plant heights, collar diameter, and number of branches at different intervals of 30 DAS, 60 DAS, 90 DAS, 120 DAS, 150 DAS, and harvesting time were recorded in the T10 (Ashwagandha var. JA-20 Sole). The maximum root length, root diameter, and total number of roots per plant of Ashwagandha were found in T11 (Ashwagandha var. JA-134 Sole), followed by T10 (Ashwagandha var. JA-20 Sole), which were also significant. The maximum root yield (fresh and dry) and seed yield were found in the treatment T11 (Ashwagandha var. JA-134 Sole). It was also significant. The highest vegetative growth and reproductive growth were found in T10 (Ashwagandha var. JA-20 Sole), followed by T11 (Ashwagandha var. JA-134 Sole). The growth and yield parameters of Ashwagandha plants under a sole cropping system were higher than those of Mandarin based agroforestry systems. JA-134 and JA-20 varieties of Ashwagandha performed better among all four varieties of Ashwagandha intercropped under the Mandarin based Agroforestry system as well as sole. Therefore, these two varieties of Ashwagandha (JA-20 and JA-134) can be grown preferably as an intercrop with a spacing of 60 x 60 cm among four varieties in the Mandarin Orchard.

GUM EXUDATION IN *ACACIA SENEGAL* IN RELATION TO RAINFALL AND SOIL MOISTURE IN BUNDELKHAND REGION OF CENTRAL INDIA

Rajendra Prasad*, B. Alam, A.K. Handa, A. Arunachalam, Ashok Shukla and Prashant Singh

ICAR-Central Agroforestry Research Institute, Jhansi, Uttar Pradesh, India

ABSTRACT

The process of gum exudation in *Acacia senegal* is not fully understood and the researchers are making efforts to establish whether gum exudation is a normal metabolic activity or a response to the physical damage or fungal infection or disease. However, one fact is incontrovertible that any kind of stress either physiological or physical induces gummosis. Monsoon rain and soil water or soil moisture that remains in the soil after withdrawal of rain supports growing plants; and regulates cellular primary physiological functions including secondary metabolism. The availability of soil water appears to have significant bearing on gum exudation in dry season. To prove this hypothesis for Bundelkhand, typical semi-arid region of Central India, a study was aimed to assess the relationship between natural gum exudation in *A. Senegal* with soil moisture content (%) of agroforestry system in both rainfed and irrigated conditions. From the several agroforestry models established at ICAR-CAFRI, Jhansi under Network Project on Harvesting, Processing and Value Addition of Natural Resins and Gums, two *A. senegal* based agroforestry models, one each from rainfed and irrigated conditions, were selected for this study. Rhizospheric soil samples were collected at two soil depths (0-15 and 15-30 cm) from selected trees of *A. Senegal* in each model. The samples were taken at every 15 days interval throughout the year and its moisture content (%) was determined gravimetrically. The gum exudation in *A. Senegal* trees was monitored. Correlation between gum yield (g/tree) and all parameters related to rainfall as well as soil moisture content was worked out. Findings revealed that positive but non-significant correlation existed between soil moisture ($r=0.236$) and mean gum yield and number of trees exuding gum under irrigated field condition. Total annual rainfall in preceding year showed direct influence on the number of trees with multiple exudations in a year ($r=0.763$). Contrary to the irrigated conditions, in rainfed models, total gum yield exhibited better degree of positive correlation with soil moisture content ($r=0.559$). Further, number of trees exuding gum also increased with soil moisture as evidenced by significant positive correlation ($r=0.676$) between the two. Significant positive correlation also existed between total gum yield and number of trees with multiple exudations in a year ($r=0.957$). Rainfall in preceding month of the same year had direct effect on mean gum yield. The soil moisture content has triggered multiple exudations as revealed by significant positive correlation between soil moisture and number of trees with multiple exudations in a year. From the study, it can be concluded that better monsoon years are likely to yield more gums from *A. senegal* because of better soil moisture conditions.

HEAVY METALS RISK ASSESSMENT OF CONTAMINATED VEGETABLES AT SELECTED SITES IN DELHI NCR

Sandeep Kumar, Shiv Prasad and Sunita Yadav

Division of Environment Science
ICAR-Indian Agricultural Research institute, New Delhi

ABSTRACT

Water scarcity for vegetable production around the cities is a sizzling problem in the present scenario. Water shortages drive the farmers towards alternate ways to fulfil their needs. The wastewater used by farmers is highly laden with toxic heavy metal loads due to the discharge of industries and other anthropogenic activities. Therefore, the long-term application of wastewater poses harmful effects on the soil and vegetable. Most of the vegetable crops grown in these areas are prone to accumulating these toxic metals. Contamination of the food chain with heavy metals is recognized as one of the leading environmental pathways of human exposure leading to potential health risks. This study was carried out in Delhi to evaluate vegetables' heavy metals toxicity risk assessment. Six vegetables, namely, *Spinacia oleracea* L., *Brassica juncea* L., *Abelmoschus esculentus* L., *Solanum lycopersicum* L., *Daucus carota* L., and *Solanum tuberosum* L., were analyzed for five potentially toxic heavy metals (As, Cd, Cr, Hg and Pb) to assess the contamination load. In irrigation water samples, the presence of Cd crossed the permissible limit at Mehrauli and Najafgarh areas. Cd content was detected more than allowable limits except for spinach. At all the sites, transfer factor (TF) and health risk index (HRI) were noted maximum in spinach (0.99) and okra (0.99). The maximum target hazard quotient (THQ) values calculated in spinach (1.184) with the highest contributed by As. The present study suggests that soil and irrigation water should be continuously monitored to check the transfer of toxic metals into the vegetables to minimize the adverse health impacts on consumers.

ICE CONTENT DURING FREEZING OF KULFI – A MATHEMATICAL ANALYSIS

Kiran Nagajjanavar¹ and Rekha Menon Ravindra²

¹College of Horticultural Engineering and Food Technology, Haveri

²SRS of ICAR-NDRI, Bangalore

ABSTRACT

Kulfi is an indigenous dairy dessert prepared by immersion freezing of a mix composed of concentrated milk and sugar. The water contained in the *kulfi* matrix is either in the state of free water or as bound water and only free water can undergo possible state transitions such as ice crystallization. Hence, the knowledge of the total ice content during freezing of *kulfi* would provide important basic information to visualize and understand the morphological and physical behavior of *kulfi* during the freezing process. *Kulfi* mix was prepared by condensing Cow /Buffalo/Mix milk to various levels i.e. 1.5: 1 and 2.5:1 and the ice content was determined as a function of temperature by a mathematical model based on Raoult's law. It was found that the decrease in the temperature (from freezing point to -30°C) exponentially increased the ice mass fraction for all the *kulfi* samples studied at different concentration levels. The rate of ice formation was found to be faster during the initial stages of freezing accounted to the easy availability of free water in the mix; the rate of ice formation stagnated to a near constant value at the later stage of freezing. The availability of free water and its influence on ice fraction was also reflected as the decrease in ice mass fraction with increase in concentration (1.5:1 to 2.5:1) of the product formulation across all combinations evaluated for the study.

IDENTIFICATION AND QUANTIFICATION OF SOME NATURAL COMPOUNDS OF *PINUS GERARDIANA* LEAF EXTRACT AND ITS ANTIMICROBIAL AND ANTIOXIDANT ACTIVITIES

Gajender Singh¹; Ruhi Pathania²; Mohd. Azhar Khan²;
Rajiv K. Tonk³; Deepak Kumar^{1*} and Ashutosh K. Dash^{1*}

¹Department of Pharmaceutical Chemistry
School of Pharmaceutical Sciences, Shoolini University, Solan, India

²Applied Sciences and Biotechnology
Shoolini University, Solan, Himachal Pradesh, India

³Department of Pharmaceutical Chemistry, School of Pharmaceutical Sciences, Delhi
Pharmaceutical Sciences and Research University (DPSRU), New Delhi, India

ABSTRACT

Pinus gerardiana (chilgoza) is an evergreen tree, in India with numerous health benefits including anti-septic, anti-fungal, anti-bacterial, antioxidant, anti-inflammatory, anti-viral, antineuralgic, choleric, diuretic, expectorant, hypertensive properties. The plant is classified as endangered and enlisted in Red Data Book, hence it should be uncovered before its extinction. The leaf part of the plant is extracted and six natural compounds including quercetin, caffeic acid, β -sitosterol, catechin, lupeol and p-coumaric acid were identified and quantified from it. Mass spectroscopy analysis assumed the presence of twenty-one different compounds. The primary identification of the compounds was done from natural product data bases. Secondary identification using HPLC retrieved the presence of nineteen compounds. HPTLC analysis confirmed and quantified the presence of six major compounds. The quantity of catechin (2.86%w/w of extract) was found to be maximum followed by Caffeic acid (2.06%w/w of extract) in the DCM/Methanol leaf extract. Different extracts were analyzed for the antioxidant and antimicrobial activities. Antimicrobial activity was performed using zone of inhibition method for eight different leaf extracts of *Pinus gerardiana*. Among the extracts hydroalcoholic extract showed good potency in terms of zone of inhibition (14.33 ± 0.25 mm) against *S. aureus* whereas acetone extract showed good potency (16.01 ± 0.81 mm) against *S. mutans*, ethylacetate extracts showed good potency (16.33 ± 0.47 mm) against *E. coli*, ethylacetate extracts showed good potency (17.35 ± 0.58) against *K. pneumoniae* and n-hexane extracts showed good potency (16.33 ± 0.38) against *P. aeruginosa*. Chloramphenicol was used as standard. Antioxidant activity was done by DPPH method. Ascorbic acid was taken as control in the antioxidant study. IC₅₀ values were calculated from the known protocol. Methanol extract showed good antioxidant activity ($51.3 \pm 3.1 \mu\text{g/ml}$) whereas n-hexane showed the least ($189.5 \pm 1.30 \mu\text{g/ml}$).

IDENTIFICATION AND UTILIZATION OF GENES FOR ENHANCING NITROGEN USE EFFICIENCY IN RICE

Pranab Kumar Mandal and Amitha Mithra Sevanthi

ICAR-National Institute for Plant Biotechnology
Pusa Campus, New Delhi

ABSTRACT

Growing rice with less nitrogen but without compromising the yield can not only reduce the cost of cultivation but also save the environment. Two extensively studied, contrasting rice genotypes, known for moisture and heat stress susceptibility and tolerance are IR 64 and Nagina 22 (N22) respectively. However, it was the field data from IIRR, Hyderabad which revealed that these two genotypes are also contrasting for nitrogen use efficiency. Interestingly N22 showed poor and IR64 showed higher NUE. We started experimenting with these two varieties both in the field as well as in the laboratory to identify genes related to NUE. The nitrogen stress response of both the genotypes was studied initially, and then a comparative transcriptome analysis was conducted for these two genotypes, under chronic nitrogen stress. This study revealed differences in chloroplast and starch metabolism-related genes between N22 AND IR64. Parallely, 280 RIL lines developed earlier from these two genotypes were field-grown under optimum as well as N-stress conditions for consecutive two years, and they were extensively phenotyped. Combining this phenotyping data along with the genotyping data, we found a few QTLs for important NUE-related traits. Since Nitrogenous fertilizers are water-soluble, and water is the most important resource in the growing media, we once again conducted the transcriptome analysis after imposing both water and nitrogen stress separately and in combinations. We then integrated the dual stress transcriptomes and major QTLs from these two contrasting genotypes and identified a number of key stress-responsive genes in rice. Many of the genes were found to be negative regulators, which have been taken up for knocking out through genome editing. A few genes were found novel and uncharacterized, which have been taken up for their functional validation. We feel this combined approach would finally lead to the development of rice varieties, which will require less nitrogen and give substantial yield; at the same time, these genes can also be used in other crops for enhancing NUE.

IDENTIFICATION OF LONG NON-CODING RNAs IN PEARL MILLET (*Pennisetum glaucum* (L.))

Baibhav Kumar^{1, #}, Animesh Kumar^{1, #}, Sarika Jaiswal^{1, *},
Mir Asif Iquebal¹, U B Angadi¹, Rukam S Tomar², Anil Rai¹ and Dinesh Kumar¹

¹Centre for Agricultural Bioinformatics
ICAR-Indian Agricultural Statistics Research Institute, New Delhi, India

²Department of Biochemistry and Biotechnology
Junagadh Agricultural University, Junagadh, Gujarat, India

ABSTRACT

Pearl millet (*Pennisetum glaucum* L.) is affected by drought stress affecting crop productivity and survival. Long non-coding RNAs (lncRNAs) is reported to play a vital role in response to drought stress. lncRNAs represent major part of non-protein coding RNAs and are present prevalently. These are involved in various biological processes, which may functionally act as RNA rather getting transcribed as protein. We targeted genome-wide identification of lncRNAs in pearl millet from root and leaf tissues subjected to drought stress. A total of 879 lncRNAs were identified, out of which 209 (leaf control, leaf treated), 198 (leaf treated, root treated), 115 (leaf control, leaf treated) and 194 (root control, root treated) were differentially expressed. Two lncRNAs were found as potential target mimics of 3 miRNAs from the miRBase database. Gene ontology study revealed that drought responsive lncRNAs are involved in biological processes like 'metabolic process' and 'cellular process', molecular functions like 'binding' and 'catalytic activities' and cellular components like 'cell', 'cell part' and 'membrane part'. lncRNA-miRNA-mRNA network shows that it plays a vital role in stress responsive mechanism through their activities in hormone signal transduction, response to stress, response to auxin and transcription factor activity. Only four lncRNAs were found to get a match with the lncRNAs present in plant lncRNA database CANTATAdb, which shows its poor conserved nature among species. Such study will increase our understanding of expression behavior of lncRNAs as well as its underlying mechanisms under drought stress in pearl millet.

IMPACT OF ALUMINIUM TOLERANCE ON PROTEIN SYNTHESIS, CHLOROPHYLL CONTENT AND ALUMINIUM UPTAKE IN *DOLICHOS* BEAN SEEDLING

Mohd Talha Ansari¹, A.K. Pandey², A.S. Mailappa^{3*}, Siddhartha Singh⁴

¹College of Horticulture and Forestry

Central Agricultural University, Pasighat, Arunachal Pradesh, India

²Rani Lakshmi Bai Central Agricultural University, Jhansi, Uttar Pradesh, India

^{3,4}College of Horticulture and Forestry

Central Agricultural University, Pasighat, Arunachal Pradesh, India

ABSTRACT

Soil acidity coupled with aluminium (Al) toxicity is a limiting factor for crop production. Nutrient deficiency is major problem under acidic condition which effects growth and yield, drastically. The present investigation was carried out in pot containing soil to study the mechanism of aluminium tolerance in *Dolichos lablab*. Genotypes tolerant to Al (VRSEM-207) and the susceptible to Al (VRSEM-941) were taken. The seedlings were given varying level of aluminium treatments (0, 15, 30 and 45 mg/kg soil) and were uprooted at 28 days. From the present investigation it was revealed that increasing Al treatment significantly reduced biomass, chlorophyll content and protein content in sensitive genotype whereas there was little or no significant effect on the tolerant genotype. The tolerance in the genotype was due to up-regulation of protein synthesis, stable chlorophyll content and reduced aluminium uptake. Therefore chlorophyll stability index, protein content and Al uptake can be used for screening for aluminium tolerance in *dolichos* bean and other legumes.

IMPACT OF BIOFERTILIZERS APPLICATION ON GROWTH AND YIELD ATTRIBUTES OF *TRIGONELLAFOENUM* (CV. AJMER FENUGREEK-1)

Umesh Pankaj*, Arjun Lal Ola and A. K. Pandey

College of Horticulture and Forestry
Rani Lakshmi Bai Central Agricultural University, Jhansi, India

ABSTRACT

In the present scenario, high agriculture production and soil nutrient manipulation are mainly dependent on the synthetic chemical-based fertilizers, which cause a serious risk to human health and the environment. Bio-fertilizer has been identified as another solution for improving soil and crop productivity in sustainable farming. The exploitation of soil beneficial microbes as bio-fertilizers with the suitable host plant has an prominence in agricultural sector due to their potential role in food safety and sustainable crop production. Keeping in view the current and future situation, the study was conducted to check the performance of different bacterial bio-fertilizers on the fenugreek. Fenugreek (*Trigonella foenum-graecum* L.) is one of the important leafy vegetable and rich sources of vitamins, minerals and dietary fiber. These bio-fertilizers having plant growth-promoting attribute such as growth promoting hormone (auxin) production, nitrogen fixing ability, phosphate and potassium solubilisation are at the forefront of sustainable agricultural practices. The liquid bio-fertilizers viz., i. Bio-phos⁺ (PSB); ii. Bio-grow (plant growth promoter); iii. Bio-potash (KSB); iv. Bio-NPK (consortium of N₂-fixer, PSB and KSB), were obtained from the ICAR-National Bureau of Agriculturally Important Microorganisms (NBIM), Mau Nath Bhanjan, India was used for the seed treatment of fenugreek. The seven treatments viz. control (no amendment); Bio-phos⁺; Bio-grow; Bio-potash; Bio-NPK; consortium of Bio-NPK + Bio-grow and farmer's practices (NPK + 10t FYM) were arranged in randomized block design (RBD) and replicated thrice. Enhanced plant height, fresh leaves yield, chlorophyll and carotenoid content, leaves dry weight and protein content were observed with the treatment of Bio-NPK as compared to control and farmer's practice.

IMPACT OF DRIP FERTIGATION WITH WATER-SOLUBLE FERTILIZER GRADES AND PRORISE PACKAGE ON NUTRITIONAL STATUS, FRUIT YIELD AND QUALITY OF POMEGRANATE

Ashis Maity^{1*}, R.A. Marathe¹, A. Jeyabal² and Jyotsana Sharma¹

¹ICAR-National Research Centre on Pomegranate, Solapur (MS)

²Fertis India Pvt. Ltd., Nagarjuna Hills, Hyderabad, India

ABSTRACT

Practicing soil application of straight fertilizer coupled with high pH of soil has led to poor productivity of pomegranate over the period. With the intensive use of drip irrigation system in pomegranate production for its higher water application efficiency and introduction of various water soluble fertilizer grades named as zetol select and supplements such as actin (comprising of endophytes and endomycorrhizae), dormulin (nutritional product meant for biotic and abiotic stress relief) and multi-C (water soluble organic C) combinedly named as ProRise package by M/s. Fertis India Private Limited, Hyderabad, it was pertinent to elucidate the impact of fertigation with water soluble fertilizer (WSF) grades and ProRise package on pomegranate productivity and quality. Present study focused on evaluating the effect of fertigation with WSF grades and ProRise package on soil fertility, tree's nutritional status, fruit yield and quality and disease incidence in pomegranate. Two years field experiments were conducted on fully grown pomegranate orchard cv. Bhagawa with various WSF grades and ProRise package and compared with farmers' practice of applying straight fertilizer to the soil. The results showed that fertigation with WSF grades significantly lowered the soil pH and improved soil organic C content. Use of WSF grades set II (comprising of N-P₂O₅-K₂O: 6-40-10, 9-17-21, 5-10-35) at 75% of recommended fertilizer dose (RFD) plus ProRise package led to significant increase in available P and K content of soil while set I (comprising of 6-45-6, 8-21-21, and 8-6-38) at 75% of RDF with ProRise package resulted significant increase in soil available N content at fruit maturity. Trees' nutritional status revealed that fertigation with WSF grades with or without ProRise package significantly increased foliar concentration of K and Mg during flowering. And substantial increase in foliar concentration of N, K, and Ca was recorded in trees fertigated with WSF grades set II and treated with ProRise package, while WSF grades set I & II with or without ProRise package resulted significant increase in foliar concentration of Mg and Fe. As a result significantly higher fruit yield was obtained with WSF grades set I & II at 75% of RFD plus ProRise package. However, fertigation of WSF grades set II at 75% of RFD plus ProRise package resulted in production of highest fruit yield with perceptible improvement in various fruit quality attributes such as fruit size (per cent fruits weighing more than 300 g), aril per cent, ascorbic acid, anthocyanin, non-reducing sugar content in fruit and nutritional quality such as K, Mg and Fe content in fruit. It was also observed that trees fertigated with WSF grades set I at 75% of RFD plus ProRise package recorded the least incidence of Cercospora fungal spots on fruit. So, it can be inferred that fertigation with WSF grades set II at 75% of RFD plus ProRise package could substantially increase pomegranate productivity with perceptible improvement in fruit nutritional quality and higher benefit-cost ratio.

IMPACT OF ENVIRONMENTAL POLLUTION AND CLIMATE CHANGE ON FISHERIES

P. Ravi Sekhar and Y. Savithri

Dept. of Zoology
Government College for Men (Autonomous), Kadapa, Andhra Pradesh

ABSTRACT

Fish is a major source of food for the majority of poor and vulnerable communities in the world. The sector also provides jobs to many people and is one of the most traded food commodities. Fish trade supports economic growth in many developing countries, in particular by providing an important source of cash revenue. It is clear that the higher the production level and per capita food supply from fishery products, the lower the prevalence of hunger. Small-scale fisheries and aquaculture make critical contributions to development in the areas of employment, with over 41 million people worldwide, fish constituting an important source of nutrients for the poor and often being the cheapest form of animal protein. Environmental contaminants, such as heavy metals and pesticides, are the most important toxic compounds of aquatic habitats. Heavy metals enter the aquatic environments via natural and anthropogenic pathways while the only source of pesticides is the anthropogenic usage of different types of pesticides. Fish larvae and fingerlings are the most vulnerable life stages of fish which could be severely affected by pesticides as non-target organisms as well as by heavy metal pollution. The most important tissues affected by these pollutants are the gill, kidney and liver. Climate change has both direct and indirect impacts on fish stocks that are exploited commercially. Direct effects act on physiology and behavior and alter growth, development, reproductive capacity, mortality, and distribution. Indirect effects alter the productivity, structure, and composition of the ecosystems on which fish depend for food and shelter. Climate change will exacerbate existing physical, ecological, and socioeconomic stresses on coastal zone. Physical Changes includes Water Surface Temperature Rise, Sea Level Rise, Increasing Water Salinity, Ocean Acidification, Biological Changes includes Changes in Primary Production, Changes in Fish Distribution. The frequency and intensity of extreme climate events is likely to have a major impact on future fisheries production in both inland and marine systems. It is recommended that increased and sustained investments in market development, fisheries governance and provision of economic incentive mechanisms are crucial in order to minimize the potential impacts of climate change on fisheries and food security and increase the resilience of many poor fisher communities.

IMPACT OF ICT TOOLS ON THE SUPPLY CHAIN PERFORMANCE OF APPLES IN UTTARAKHAND

**Aanchal Sharma Lamba^{*1}, Ajay Sharma²,
Deepak Kholiya³ and Rahul Raj⁴**

Graphic Era Hill University, Dehradun

ABSTRACT

Apple is one of the major temperate fruits grown in Uttarakhand. In India, apples are grown majorly in the following mountainous states i.e., Himachal Pradesh, Jammu & Kashmir and Uttarakhand. The supply chain of apples in Uttarakhand is crumbling due to the presence of plethora of complexities across the whole supply chain. These complexities further result into poor price realization to the ultimate apple growers and exorbitant prices paid by the end consumers. Implementation of Information & Communication Technology tools on supply chain is considered as one of the fundamentals as it has the potential to provide up to date information in terms of cultivation practices, free access to market information, credit facility availability, government schemes, seed selection, use of fertilizers, demand and supply trends, customer's tastes and preferences to the farming community.

The objective of this study is to examine the effect of implementation of ICT Tools on the supply chain performance of apples in Uttarakhand. A survey was conducted covering 400 respondents (growers) associated with apple supply chain in Uttarakhand. Factor analysis was first employed to reduce the number of factors to be considered in the complete process of research analysis without losing the significance of the explanatory power of all the variables present in the study. Regression analysis was then carried out to comprehend the association between the dependent variable (supply chain performance) and the independent variable (implementation of information & communication technology). The end results show that the implementation of ICT Tools have a significant impact on the overall supply chain performance of apples in Uttarakhand. The authors have also identified the relative significance of the information & communication technology tools and the practical and theoretical implications of the inferences of the research study.

IMPACT OF IMPLEMENTATION OF INFORMATION COMMUNICATION & TECHNOLOGY TOOLS ON THE SUPPLY CHAIN PERFORMANCE OF APPLES IN UTTARAKHAND

**Aanchal Sharma Lamba*¹, Ajay Sharma²,
Deepak Kholiya³ and Rahul Raj⁴**

Graphic Era Hill University, Dehradun, Uttarakhand

ABSTRACT

Apple is one of the major temperate fruits grown in Uttarakhand. In India, apples are grown majorly in the following mountainous states i.e., Himachal Pradesh, Jammu & Kashmir and Uttarakhand. The supply chain of apples in Uttarakhand is crumbling due to the presence of plethora of complexities across the whole supply chain. These complexities further result into poor price realization to the ultimate apple growers and exorbitant prices paid by the end consumers.

Implementation of Information communication & technology tools supply chain of apples is considered as one of the prerequisites as it has the potential to provide up to date information in terms of cultivation practices, credit facility availability, government schemes, seed selection, use of fertilizers, demand and supply trends, customer's tastes and preferences to the farming community. Implementation of contemporary ICT tools will fuel the transition from industrial-based economies to knowledge-based economies. Farmers will get free access to market information and with this they will be able to get the remunerative prices.

The objective of this research study is to identify and study the effect of implementation of information communication & technology tools on the supply chain performance of apples in Uttarakhand. A survey was conducted covering 400 respondents (growers) associated with apple supply chain in Uttarakhand. Factor analysis was first employed to reduce the number of factors to be considered in the complete process of research analysis without losing the significance of the explanatory power of all the variables present in the study. Simple linear regression analysis was then carried out to comprehend the association between the dependent variable (supply chain performance) and the independent variable (implementation of information communication & technology). The end results show that the implementation of ICT Tools has a significant impact on the overall supply chain performance of apples in Uttarakhand. The authors have also identified the relative significance of the information communication & technology tools and the practical and theoretical implications of the inferences of the research study.

IMPACT OF LONG-TERM AGROFORESTRY PRACTICES ON SOIL BIOLOGICAL PROPERTIES IN SEMI-ARID CENTRAL INDIA

**Sovan Debnath*, Suresh Ramanan S., Asha Ram,
Inder Dev, Rajendra Prasad and A. Arunachalam**

ICAR-Central Agroforestry Research Institute
Jhansi, Uttar Pradesh

ABSTRACT

Plant cover under agroforestry through its effect on quantity and quality of organic matter inputs affects microbial biomass and key biological properties of soils. Therefore, it is hypothesized that long-term agroforestry practice would enhance soil biological characters compared to a conventional agricultural system. In this light, an investigation was undertaken to evaluate soil biological properties under a few predominant agroforestry-based land uses in semiarid India viz. amla + cropping (AC), ber + cropping (BC), teak + cropping (TC), melia + cropping (MC), and an agricultural (sole) cropping system (SC), which served as control. Randomized soil sampling was performed at the topsoil (0-15 cm) and subsoil (15-30 cm) from the intercropped areas (i.e., away from tree canopy area) in the field plots of the studied agroforestry practices. Analysis of soils revealed significant ($P < 0.05$) variations in the measured soil properties among the agroforestry systems at both soil depths. Teak-based agroforestry registered significantly ($P < 0.05$) higher basal microbial respiration (BMR) quantified as 192.4 and 84.1 $\mu\text{g CO}_2 \text{ g}^{-1}$ and microbial biomass carbon (MBC) 305.0 and 152.4 $\mu\text{g g}^{-1}$ at the topsoil and subsoil, respectively. Metabolic quotient (a ratio of BMR to MBC; $q\text{CO}_2$) was significantly ($P < 0.05$) higher in Amla-based agroforestry (8.9 $\mu\text{g CO}_2\text{-C ug biomass C}^{-1} \text{ h}^{-1}$) at the topsoil but in sole cropping (11.3 $\mu\text{g CO}_2\text{-C ug biomass C}^{-1} \text{ h}^{-1}$) at the subsoil. Further, an evaluation of the microbial population revealed significantly ($P < 0.05$) higher colony forming unit (CFU) of bacteria (26×10^5 and $18 \times 10^5 \text{ g soil}^{-1}$) and actinobacteria (243×10^3 and $167 \times 10^3 \text{ g soil}^{-1}$) under amla-based agroforestry both at the topsoil and subsoil, respectively. In contrast, teak-based agroforestry registered significantly ($P < 0.05$) higher population of fungi at the topsoil ($17 \times 10^4 \text{ g soil}^{-1}$) and subsoil ($9 \times 10^4 \text{ g soil}^{-1}$). It is therefore concluded that amla-based agroforestry fosters higher numbers of bacteria and actinobacteria.

IMPACT OF STONE MINING ON AGRICULTURE IN MIRZAPUR, INDIA

Kumud Dubey and Vandita

Forest Research Centre for Eco-Rehabilitation, Prayagraj, India

ABSTRACT

In the age of globalisation, a variety of economic activities, including mining, have evolved in order to keep up the country in the wave of development. Mining activities, whether small or large-scale, though have positive outcome but are environmentally damaging as well. The physical and biological characteristic of a mined region is substantially altered through the mineral extraction process. In this paper, impact of mining in Mirzapur district of Uttar Pradesh, India, was studied on agriculture of the area. It was a pre-structured questionnaire survey based study where representative respondents were selected from the nearby area of mining covering all the education classes present there. Impact of mining on agriculture was found to be mainly due to the dust generated from the stone crushers, which gets deposited on the nearby agriculture land and reduces its productivity. Movement of vehicle for transporting the mining product was also found to be an important contributor in generating the dust which eventually gets deposited in the nearby field, thus affecting the soil fertility. Soil quality is affected by mining processes which impacts the productivity of land. The processes involved in the excavation of stone and its processing alters the physical, chemical and biological properties of soil. 81% of the respondents agreed to mining having adverse impact on the agriculture of the region. 50% respondents accepted that there was decrease in agriculture production due to mining activity. 19% of the respondents mentioned increase in the crop production; this may be due to the fact that when stones are removed from the land, the cultivable land area increases. 31% of the respondents had no idea regarding the changes in crop production. The findings of the study may help in amendment of mining policy for the agricultural area.

IMPACT OF STRAWBERRY CULTIVATION ON THE SOCIO-ECONOMIC STATUS OF FARMERS: A CASE STUDY OF MOTH BLOCK OF JHANSI DISTRICT IN UTTAR PRADESH

**Satyam Bansal^{a,b}, Ashok Yadav^{b*}, Sandeep Garg^{a,b},
A. Arunachalam^b, Sushil Kumar^b, Badre Alam^b, Asha Ram^b and Inder Dev^b**

^aBundelkhand University, Jhansi, U.P.

^bICAR-Central Agroforestry Research Institute, Jhansi, U.P.

ABSTRACT

The Bundelkhand region is suffering from so many bio-physical and socio economic constraints such as aberrant climatic condition (erratic rainfall pattern); frequent drought (moisture stress periods) and labour migration problems. The traditional cropping patterns is not able to support the farmers because the crop production is either low or extremely uncertain or unstable due less returns. The traditional crops grown in the region are wheat, pea, tomato, chilli, pea and gram and so not so much remunerative. Therefore, to overcome this strawberry was introduced under the black soil conditions of Moth block of Jhansi district. 90 to 200. The price of strawberry varied from Rs. 90 to 250 and net economic returns in strawberry crops was 2 to 3 times more compare to traditional crops from half acre of land.

IMPACT OF USAGE OF AGROCHEMICALS AND OF PPE ON AGRICULTURAL WORKERS

**Deepak Kumar Pathak^{1*}, Rajeev Ranjan Patel²,
Navneet Maurya³ and Pawan Kumar Gupta⁴**

^{1,2&3}Department of Agricultural Extension BUAT, Banda (UP)

⁴Department of Agricultural Extension BUAT, Banda (UP)

ABSTRACT

Chemical pesticides are extensively utilized to control pests and illnesses in crop agriculture. The continued use of agrochemicals to combat agricultural pests and disease vectors endangers both human health and the environment. However, concerns about the negative impacts of this use on public health and the environment are growing. The negative effects of agrochemicals on the environment have prompted major concern among those who use them to protect their crops from insects and to help them thrive. Despite the fact that agrochemicals are used on a sporadic basis and that consumption levels are increasing, wildlife is becoming increasingly endangered by the detrimental impacts of these chemicals. Pesticides can enter the body through the skin, mouth, nose, lungs, and eyes when agricultural employees, particularly pesticide applicators, mix, load, transport, and spray. The majority of pesticide exposure comes through the dermal and inhalation pathways, as well as contact during mixing, loading, application from spray splashes, spray drift, and re-entry into treated crops or areas or contaminated surfaces, equipment, and materials. Clothing and protective equipment serve a crucial role in shielding the human body from potential dangers. As a result, pesticide applicators must wear PPE such as long sleeve shirts, pants, gloves, shoes with socks, goggles or face shields, helmet, and an apron. All of these PPE must be chemical resistant, meaning that no quantifiable quantity of pesticide travels through the materials used in these PPE while handling. Chemical-resistant fabrics shield the skin from pesticide contact. To avoid pesticide contamination, the lining of PPE should be composed of non-absorbent material. Agricultural workers must wear protective clothes and equipment when spraying pesticides to safeguard their health from the dangers they confront. Pesticide applicators wear PPE to protect themselves from pesticide exposure. Keywords- Agrochemicals, PPE, Human Health and Environment

IN VITRO ANTIMICROBIAL AND ANTIOXIDANT ACTIVITY OF METHANOL EXTRACT OF SWERTIA CHIRATA

Suniti Yadav and Ramesh Kumar

Department of Biotechnology and Biochemistry
Bundelkhand University, Jhansi, U.P.

ABSTRACT

Swertia chirata belongs to the family of Gentianaceae is an indigenous herb of the temperate Himalayas having immense medicinal properties. Medicinally used in the treatment of liver disorders, malaria, diabetes, chronic fever, anaemia, bronchial asthma, hepatotoxic disorders, hepatitis, gastritis, constipation, dyspepsia, skin diseases, worms, epilepsy, ulcers, scanty urine, hypertension, melancholia, and certain types of mental disorders. As a result, scientists focused on uncovering many more medicinal properties. In this study, we assessed preliminary phytochemical screening, antimicrobial and antioxidant activity of methanol extract of *Swertia chirata* leaf. The antimicrobial activity was performed by well diffusion assay at 100mg/ml conc. against *Pseudomonas aeruginosa*, *Staphylococcus aureus* and antioxidant activity at 1000µg/ml by DPPH assay. Furthermore, results show the presence of important phytochemical compounds in the leaf of *Swertia chirata*, whereas a zone of inhibition was observed against *Staphylococcus aureus*. The concentration-dependent scavenging activity was observed at 88%. The results obtained in the present study indicate that methanol extract of *Swertia chirata* can be a potential source of antioxidants and antimicrobial agents.

**IN VITRO PROPAGATION, CALLOGENESIS AND BIOMASS
ACCUMULATION IN SAUSSUREA COSTUS (KUTH)-ENDANGERED
MEDICINAL PLANT OF INDIAN HIMALAYAN REGION**

Rajnish Sharma^{1*}, Kartik¹, Kamal Thakur¹ and Bhupender Dutt²

¹Department of Biotechnology, ²Department of Forest Products,
Dr. Y.S. Parmar University of Horticulture & Forestry, Nauni, Solan (HP) India

ABSTRACT

Saussurea costus (Kuth) is an endangered medicinal plant due to its anti-inflammatory, anti-cancer, anti-ulcer and hepato protective activities. Therefore, this study was carried towards *in vitro* propagation and to explore any alternative approaches to extract the different bioactive compounds available in this medicinal herb, for which the whole plant is uprooted and due to which it has been listed as endangered in the Himalayan region. The effect of different factors (like type of explants, growth regulators, photo period and effect of elicitor) affecting callogenesis for biomass accumulation and estimation in *S. costus* using different explants was evaluated. Among the four explants viz., root, leaf, cotyledon and hypocotyl, root explant was found to be best with a maximum callus induction in minimum number of days when cultured on Murashige and Skoog (MS) medium fortified with defined growth regulators. The maximum callus induction and biomass yield were observed at 16:8 hours photoperiod. In addition, comparative study of phytoconstituents among *in vivo* (root and leaf) and *in vitro* (root callus, leaf callus, cotyledon callus, hypocotyl callus and roots from leaf explants) samples revealed that maximum alkaloid, flavonoid and terpenoid contents were found in *in vivo* root samples followed by *in vivo* leaf extracts. Likewise, *in vitro* roots resulted in higher bioactive contents than *in vitro* calli derived using all the other explants. Among the *in vitro* obtained calli, maximum alkaloid, flavonoid and terpenoid contents were observed in root calli. The phytoconstituent concentrations in *in vitro* calli derived using root and leaf explants were also enhanced when MS medium was augmented with salicylic acid as elicitor. It was concluded that root explant was found to be best for callus growth, biomass accumulation as well as extraction of phytoconstituent contents followed by leaf among all the explants. Hence, the present study could be beneficial towards scaling up the extraction of these bioactive compounds as well as in conserving this targeted medicinally important endangered herb.

INDIAN DURUM WHEAT – IMPORTANCE AND PROSPECTS FOR EXPORT

SV Sai Prasad, D Ambati and MP Rahul

ICAR-IARI, Regional Station, Indore (MP), India

ABSTRACT

In India, durum wheat comprises a small portion of the total wheat grown in India, i.e., estimated at 1.2 to 1.5 million tonne. Dry and hot environment of central parts of India viz., Madhya Pradesh, Gujarat, Maharashtra, Karnataka and Southern Rajasthan are suitable for durum cultivation. Better durum wheat with good hecto-litre value, high protein and less yellow berry incidence is predominantly produced in the Malwa region of Madhya Pradesh. The best quality durum grains are amber colour, translucent, vitreous, very hard and difficult to grind with excellent appearance and less elastic, and have yellowish flour; but more nutritious (high protein and carotene levels) and easily digestible than bread wheat. Longer grain filling period and less vegetative period is required for better grain development in the region. Its density, combined with its high protein content ($>12.5\%$), $<10\%$ yellow berry incidence and >7.0 ppm β -carotene content and gluten strength, make durum the wheat of choice for producing premium semolina, pasta, couscous and many other products, which were used in making Indian recipes i.e., ravadosa/macaroni/noodles/snack foods etc. With the rising demands for speciality foods like pasta in India and other countries, the market for durum wheat is growing in an increasing trend. Intensive research and development efforts made by Regional Research Station, Indore of Indian Agricultural Research Institute brought the durum wheat back into cultivation in Central India with very high yield potential. With intensive popularization of newly evolved durum varieties viz., HI 8627 (MalavKirti), HI 8663 (Poshan), HI 8713 (PusaMangal), HI 8737 (Pusa Anmol) and HI 8759 (PusaTejas) etc., with a yield potential of >50 q/ha and their “low-cost cultivation technology”, durum wheat production in Madhya Pradesh was improved leading to the declaration of the state as “Agri-Export Zone (AEZ)” for durum wheat along with other crops. Recently, multi-national companies of food market doing business in India are utilizing Indian durum wheat, which is comparable with its Canadian and Australian counterparts in terms of quality for processing rather than depending on the imports. The pasta industries involved in export are looking for more hectolitre weight & hardness to have better extraction rate ($\sim 68-72\%$), high protein ($\sim 13\%$), less black tip and dark crease, free from potiya (yellow berry), no Karnal bunt for good finishing and attraction of pasta products. Compared to bread wheat, higher heat tolerance of durums ensures higher yields with lesser irrigation and it helps to arrest the spread of wheat rusts in the country. Thus, it is an ideal wheat to be grown in Central and Peninsular parts of the country for “ensuring food and nutritional security”, increasing employment opportunities through fast food industry and sustainability. Increasing global demand, value addition potential, resistance to diseases, better market price are some of the key factors which make Indian durum wheat an export commodity as well as capable of catering to Indian market. It has an export potential similar to basmati rice. The potential markets for Indian durum can possibly be countries in Middle East, Mediterranean region and Africa after catering the huge demand in Indian markets. An awareness campaign is, therefore, urgently required for the growers, traders and consumers about the importance of durum wheat as high economical crop and for use as “Health Food”.

**INFLUENCE OF ZINC, BORON AND MOLYBDENUM ON
YIELD ATTRIBUTING CHARACTERS AND SEED YIELD OF
MUNG BEAN [*VIGNA RADIATA* (L.) WILCZEK]**

**Rishabh Kumar Singh, C L Maurya, V K Chourasiya
Paras Kushwaha and Harshit Gupta**

Seed Science and Technology
Chandra Shekhar Azad University of Agriculture and Technology, Kanpur

ABSTRACT

A field experiment was conducted during Zaid season of 2020 at Crop Research Farm, Chandra Shekhar Azad University of Agriculture and Technology, Kalyanpur, Kanpur, (U.P) to study the “Influence of Zinc, Boron and Molybdenum on Seed Yield Attributing Character and Seed yield of Mung Bean [*Vigna radiata* (L.) Wilczek]”. The experiment was laid out in Randomized Block Design with three replications. The experiment consisted of twenty seven treatment combinations comprising of three levels of Zinc (0, 10 and 25 kg Zn ha⁻¹), three levels of Boron (0, 5 and 10 kg Bo ha⁻¹) along with three levels of Molybdenum (0, 5 and 10 gm Mo kg⁻¹ seed treatment). The experimental results revealed that the most of the treatments significantly affect the seed yield. The basal application of Boron @ 5 kg ha⁻¹ registered value for significantly higher in yield attributes character such as number of cluster/plant (10.07), number of pod/cluster (4.72), number of pod/plant (50.59) and number of seed/pod (10.93). Significantly highest seed yield enhanced by the Boron @ 5 Kg ha⁻¹ (947.37 Kg ha⁻¹) followed by the Zinc @ 10 kg ha⁻¹ (931.40 Kg ha⁻¹) and lowest enhanced by Molybdenum @ 5 gm kg⁻¹ seed treatment (917.84 Kg ha⁻¹) as compared to control. The combined application of Zinc @ 10 kg ha⁻¹ and Boron 5 kg ha⁻¹ with the Seed treatment of Molybdenum (5 gm Mo kg⁻¹ seed) significantly improved all the yield attributing characters such as number of cluster per plant, number of pod per cluster, number of pods per plant, number of seeds per pod and seed yield ha⁻¹ of mung bean. The synergistic influence of these three micronutrients helped augmenting growth and yield of the crop.

INFORMATION AND COMMUNICATION TECHNOLOGIES (ICT) USED BY THE FARMERS IN FARMING SYSTEMS

¹Rishi Kumar Singh, ²R. K. Doharey, ³Haresh Pratap Singh,
⁴N. R. Meena, ⁵Abhinav Singh ⁶Virendra Pratap and ⁶Ritesh Singh

^{1,2,4,5, 6}ANDUAT Kumarganj, Ayodhya, U.P.
³CSAUAT Kanpur, U.P.

ABSTRACT

Agricultural sector is India's economic backbone. It is still the primary source of income and employment for the Indian population. Despite the fact that India has attained food grain self-sufficiency as a result of the green revolution, Indian farmers face numerous challenges today. One of the most significant matters is a lack of technological information at the village level. Farmers need a lot of technology, marketing, and other agricultural knowledge to be successful. It is critical to have access to the relevant information at the right time and in a simple manner. Farmers can use information and communication technology (ICTs) to get the information they need. Not just in urban areas, but also in rural areas, a wide range of ICT tools and initiatives are now available. However, efficient use of ICTs by farmers for getting agricultural information is a serious challenge, as most people use them for amusement and to pass the time. The extent to which farmers use ICTs to access agriculture information is critical for redesigning agricultural development projects that incorporate ICTs. Using ICTs to monitor climate change, scaling up good practises such as sustainable agriculture and rural development, institutional reforms, a shift to a more participatory approach, and strengthening farmers' organisations and agencies will all be beneficial. One of the most important aspects is the development of new marketing strategies for agricultural products in order to ensure that farmers receive fair prices.

INNOVATIVE EMERGING TECHNOLOGIES APPLIED IN THE EXTRACTION OF PHYTOCHEMICALS FROM NATURAL SOURCES

B. Ramya Kuber

Institute of Pharmaceutical Technology
Sri Padmavati Mahila Visvavidyalayam (Women's university), Tirupati, Andhra Pradesh, India

ABSTRACT

Phytochemicals such as phenolics, carotenoids, sterols, and alkaloids are gaining popularity because of their proven health advantages, but traditional extraction methods for some of these phytochemicals may have limits. Supercritical fluid extraction (SFE), Microwave extraction (MWE), Pulsed electric field (PEF), High-pressure processing (HPP), Ultrasonic extraction (UE), and Ohmic heating (OH) are examples of new technologies. One of the most commonly investigated approaches is supercritical fluid extraction, which has already found commercial application for several items. Carbon dioxide is the most commonly used supercritical fluid for agricultural commodities. Microwave extraction is also on the rise, with commercial applications already in place. This method employs electromagnetic radiation to transmit quick and uniform heat to the matrix, resulting in extractions with high phytochemical contents and low impurity levels. In spite of the recent attention to pulsed electric field, due to its many advantages in comparison with thermal treatments, its use is still circumscribed to a few industrial plants. Ohmic heating occurs when alternating current is passed through the matrix and heat is generated by discharge of the sample's electrical resistance. Electrical energy is dissipated into heat, which results in rapid and uniform heating and it is shown to increase the extraction of phytochemicals at low frequencies. High-pressure processing shows great potential in preserving food quality and increasing mass transfer and cell permeability, as well as enhancing diffusion. HPP eliminates the adverse effects of heat and significantly improves texture. Compared to conventional extraction methods, HPP uses high pressures and moderate temperature. The future of extraction of phytochemicals is certainly bright with the use of combined emerging technologies that will allow high-quality phytochemicals to be produced with minimal degradation.

INTEGRATED NUTRIENT MANAGEMENT (INM): MEANING, CONCEPT AND GOAL

Prabhu Lal Kantwa, A. K. Dixit and Awanish Kumar

Bundelkhand University, Jhansi
ICAR-Indian Grassland and Fodder Research Institute, Jhansi

ABSTRACT

The increasing food demands of a mounting human population and require for an environment friendly approaches for sustainable agriculture development involve significant attention when addressing the issue of enhancing crop productivity as well as soil fertility. Here we discuss about the role of integrated nutrient management (INM) in determining these concerns, which have been proposed as a promising plan for addressing such challenges. INM has comprehensive potential for the improvement of productivity and natural resource efficiency whereas also facilitating the protection of the environment ecosystems and natural resource quality. In this review we discussed about the meaning, concepts, objectives, principles and relations with soil and yield sustainability through INM. A comprehensive literature search revealed that INM enhances crop yields compared with conventional practices, increases water-use efficiency, and the economic returns to farmers, while improving grain quality and soil health and sustainability. The key objectives of integrated nutrient management (INM) system is to manage and sustain the agricultural productivity and improve the farmer's profitability with maintaining soil fertility all the way through the sensible and efficient use of inorganic fertilizers (N, P and K), organic fertilisers like; organic manures, green manures, and compost together with vermicompost, crop residues and bio-fertilizers like; *Azotobactor*, *Azospirillum*, *Rhizobium*, phosphorous solubilising bacteria (PSB), vesicular-arbuscular mycorrhiza (VAM), blue green algae (BGA) and azolla. However, this does not indicate adding together every one of all over the place; rather, a well-considered convenient and efficient mix together of various nutrient sources is required which can produce required yields and sustain soil health on long-term basis. INM system facilitates to restore and maintain soil and crop productivity, and also supports in the examination of emerging micro-nutrient deficiencies. In addition, it expresses financial system and efficiency in the use of fertilizers. In this chapter, the key components of INM system are discussed. Various approaches and perspectives for further development of INM in the near future are also proposed and discussed. Strong and convincing evidence indicates that INM practice could be an innovative and environmentally friendly strategy for sustainable agriculture worldwide.

**INTEGRATED WEED MANAGEMENT OF MUNGBEAN
(*VIGNA RADIATA*) UNDER BAEI (*AEGLE MARMELLOS*)
BASED AGRIHORTICULTURAL SYSTEM**

Saroj Amrit Priya¹ and U.P. Singh²

¹Department of Silviculture and Agroforestry,
Dr. Yashwant Singh Parmar University of Horticulture and Forestry, Nauni, Solan-.HP

²Department of Agronomy, Institute of Agricultural Sciences,
Banaras Hindu University, Varanasi. U.P

ABSTRACT

A field experiment entitled “Integrated weed management in mung bean (*Vigna radiata*) under Bael (*Aegle marmelos*) based Agri-horticultural system” was carried out during Kharif season of 2019-20 at Agricultural Research Farm, Rajiv Gandhi South Campus, Banaras Hindu University, Barkaccha, Mirzapur, Uttar Pradesh (India). The experiment has been laid out in Randomised Block Design keeping total eight weed management practices viz., Fomafafen@125g ha⁻¹ (Post Emergence), Fluazifop-p-butyl@250 g ha⁻¹ (Post Emergence), Fluazifop-p-butyl+ Fomafafen@250g ha⁻¹ (Post Emergence), Imazethapyr @100g ha⁻¹(Early Post Emergence) followed by 1 Hand Weeding, Imazethapyr@75g ha⁻¹ (Early Post Emergence) followed by 1 Hand Weeding, Pendimethalin @1kg ha⁻¹ (Pre emergence) followed by 1 Hand Weeding, weed free and weedy check were kept in sub plots with three times replicated under Bael based Agri-horticultural system. A dose of 20 kg N, 60 kg P and 40 kg K₂O ha⁻¹ has been applied for mung bean. Full dose of Nitrogen and entire dose of Phosphorous and Potassium were applied through urea, diammonium phosphate and muriate of potash, respectively. It was observed that all the herbicidal treatments showed significant effect and had minimum weed density as compared to weedy check, which had maximum weed density and weed dry weight. Amongst herbicides it was seen that Pendimethalin followed by 1 Hand weeding proved most effective in weed as compared to other weed management practices. In weed control treatments, maximum net return and Benefit: Cost ratio was obtained in Pendimethalin followed by 1 Hand weeding over other herbicidal treatments. On the basis of results summarized above, it has been concluded that the pre-emergence application of pendimethalin (1 kg ha⁻¹) followed by 1 Hand weeding can be recommended for profitable cultivation of mung bean.

INTERACTIVE EFFECT OF ELEVATED CARBON DIOXIDE AND TEMPERATURE ON PLANT NITROGEN IN SOYBEAN

**Shravani Sanyal*, B. Chakrabarti, Radha Prasanna, A. Bhatia,
S. Naresh Kumar, TJ Purakayastha, R Joshi, A Sharma**

Division of Environment Science
ICAR-Indian Agricultural Research Institute, New Delhi

ABSTRACT

Climate change is an impending threat affecting the biological system on earth. Increase in atmospheric CO₂ concentration and rise in temperature can significantly affect crop and soil. Soybean (*Glycine max* (L.) Merrill) is an important crop and rich source of protein. The following study was undertaken during the kharif season of year 2018 inside the open top chamber (OTCs) in IARI farm, New Delhi. Soybean (variety Pusa9712) was grown in pots under two different CO₂ levels: ambient and elevated and two temperature levels: ambient and elevated. Leaf N concentration decreased from 0.98% to 0.84% in elevated temperature treatment. Nitrogen concentration in soybean seeds increased under elevated CO₂ concentration while high temperature decreased the N concentration in seeds. Similar to seed N, stover N content also increased under elevated CO₂ level. Higher seed N concentration along with higher seed weight increased seed N uptake under elevated CO₂ condition. The study illustrated that soybean crop will be benefitted in terms of plant N under elevated CO₂ condition.

**INTER-LINKAGES OF NITROGEN SPECIES AND OTHER
ESSENTIAL ELEMENTS IN MONSOON RAINWATER
AT AN AGRICULTURAL SITE IN DELHI**

Sunaina and U. C. Kulshrestha

School of Environmental Sciences
Jawaharlal Nehru University, New Delhi

ABSTRACT

Atmospheric nitrogen is the main source of soil nitrogen. The natural sources of emissions for nitrogen species in the atmosphere is biological fixation and lightning and anthropogenic sources can be power plants, automobiles and biomass burning. In precipitation, nitrogen is present in the form of ammonium (NH_4^+), nitrate (NO_3^-) and dissolved organic nitrogen (DON). Wet deposition of these species adds to the nitrogen of soil systems. This study was carried out at an agricultural site in Delhi during monsoon season of 2018 and 2019 to determine DON along with major metals in order to establish their linkages of emission sources. Dissolved organic nitrogen were measured using TN/TOC analyser. Metals such as Ca, K, Mg, Fe, Cu, Mn, Zn were also measured in the samples using ICP-OES. The Ca was estimated in the samples in the range from 371.2 ppb to 9725 ppb; K from 88ppb to 10577 ppb and Mg from 116.9ppb to 3521.6 ppb. The Fe was estimated in the range from 16ppb to 2265.5ppb, Cu from 6.6ppb to 403.97ppb, Mn from 2.7ppb to 1130ppb and Zn from 10ppb to 295.6ppb. The study suggested that the DON was associated with both natural and anthropogenically emitted metals. Detailed results will be presented in the conference.

INTERNET OF THINGS (IOT) IN AGRICULTURE AND ALLIED SECTOR

Abhinav Singh, R.K Doharey, Virendra Pratap
Amritanshu Singh and Rishi Kumar Singh

ANDUA & T, Kumarganj Ayodhya, U.P.

ABSTRACT

The resurfacing of global recession has caused ripples across both the developed and the developing economies. Agriculture sector will have to be much more efficient and resilient to ensure global food security. Indian farmers are at great disadvantage in terms of size of farms, technology, trade, government policies, etc. Information and Communication Technology (ICT) can mitigate some of the problems of farmers. After the World Wide Web (of the 1990s) and the mobile Internet (of the 2000s), we are now heading to the third and potentially most “disruptive” phase of the Internet revolution—the “Internet of Things (IOT)” which is also known as “*Ubiquitous Computing*”. IOT applications encompass diverse areas including agriculture, healthcare, retail, transport, environment, supply chain management, infrastructure monitoring etc. Applications in agriculture include soil and plant monitoring, greenhouse environs monitoring and control systems, monitoring of food supply chain, monitoring of animals, etc.

Internet of Things will connect the world's objects in both a sensory and intelligent manner through combining technological developments in item identification (“*tagging things*”), sensors and wireless sensor networks (“*feeling things*”), embedded systems (“*thinking things*”) and nanotechnology (“*shrinking things*”)

**INVASIVE ALIEN PLANT SPECIES
IN-AND-AROUND ICAR-CAFRI CAMPUS IN JHANSI**

Shailja Saraogi

ICAR Central Agroforestry Research Institute
Jhansi, Uttar Pradesh, India

ABSTRACT

Anthropogenic disturbances-led biotic exchange evident as invasion by alien plant species (APS) though ranked first or second in view of region's specificity but is now interrelated tightly with environmental perturbations, e.g., habitat destruction and climate change, beyond doubt. The plants invasions have now been realized increasingly a major threat to biodiversity globally even in pristine landscape, such as, mountains and protected areas. These APS are equipped with several species or habitat specific adaptation mechanisms including the release of secondary metabolite weapons-allelochemicals that facilitate their spread in landscape and ecological dynamics. Research has indicated that besides causing harm to native biodiversity, these species influence adversely the environment, food chains, economy, human health or well-being, diminish ecological services, thus, finally the sustainable development. Based on field surveys in and around the campus of the ICAR-Central Agroforestry Research Institute (CAFRI), Jhansi, this contribution presents information on hazardous invasive plant species, viz., *Ageratum conyzoides*, *Argemone mexicana*, *Avena fatua*, *Datura metel*, *Eichornia crassipes*, *Lantana camara*, *Parthenium hysterophorous*, *Phalaris minor*, *Prosopis juliflora* and *Xanthium strumarium* to name the potential ones. The information on the impact on human health is based however on secondary sources. A management strategy to mitigate the spread of APS, hazards for natural biodiversity conservation, has been outlined for better human living.

INVESTIGATING VEGETATION DYNAMICS FOR INDIA USING A MODELLED REMOTE SENSING DATABASE

Nidhi Shukla

CSIR-National Environmental Engineering Research Institute (NEERI)
Delhi Zonal Centre

ABSTRACT

Air pollution, an issue of utmost concern, is inextricably linked with urbanization as it is usually at the cost of decreasing vegetation cover. Thus, making the maintenance of urban vegetation cover an essential component for attaining national sustainable growth. High and low vegetation (hv & lv) cover are one of the parameters to be monitored for assessment of vegetation cover over the land, wherein evergreen trees, deciduous trees, mixed forest/woodland, and interrupted forest, etc. are "high", whereas crops and mixed farming, irrigated crops, short grass, tall grass, tundra, semidesert, bogs and marshes, evergreen shrubs, deciduous shrubs, etc. are "low". These are usually monitored as Leaf Area Indexes (LAI) for high and low vegetation (hv & lv) cover. LAI-hv and LAI-lv are remotely sensed databases that have a value of 0 over bare ground. Hence, these parameters describe the land surface vegetation. The present study attempts to assess vegetation cover using ERA5 dataset which is a fifth generation ECMWF reanalysis assimilative database. It is observed that northern Indian regions, specifically the Indo-Gangetic Plains, including the national capital, Delhi, have a lower LAI for high and low vegetation cover, making them pollution-prone areas. Hence, the region is usually observed to have high air pollutant levels with the highest number of episodic events. In the case of Delhi in 2020, the LAI for high vegetation and low vegetation values were 0.67 and 1.19, respectively, while the LAI for high vegetation was greater than 2 for the southern Indian regions, thus resulting in cleaner air quality in southern India when compared with northern India.

LAND USE SYSTEMS EFFECTS ON SOIL PHYSICO-CHEMICAL PROPERTIES IN JHANSI DISTRICT OF CENTRAL INDIA

**Ravi Kalash*, Pragati Sharma, Payal Chaudhary
Pankaj Kumar and Awanish Kumar**

Institute of Agricultural Science
Bundelkhand University, Jhansi (U.P.)

ABSTRACT

Land-use alterations under poor management practices are among the major causes of decline in soil fertility and agricultural productivity in Indian agricultural systems. Therefore, the study of variations in different soil properties across land-use systems will have sound effects for homework proper soil management strategies. This study assessed the effects of land-use systems on soil physico-chemical properties in the Jhansi district, Central India. Five land-use systems, Groungnut-Wheat, Sesamum-Chaickpea, Rice-Wheat, Fellow- Mustard and Natural forest, were choosing in determining soil fertility. A total of 25 soil samples (0–15 cm soil depth) were collected randomly from five composite soil sampling across each land-use systems and examined for their analysis of soil physico-chemical properties. Results showed that the different land-use systems significant ($p < 0.05$) differences in the soil organic carbon concentration (OC%) and available nitrogen (Av. N) were observed. The Av. N and available phosphorous (av. P) concentrations of soils were generally very low and are limiting factors for crop production in different land use in soils of Jhansi. Soils under Rice-Wheat cropping systems were considerably low OC percentage as compared the other systems. As compared to other cropping systems the natural forest soils showed high in soil OC (1.01%), and Av. N (0.12%), followed by Sesamum Chaickpea land use systems. Correlation analysis also showed a highly significant positive relationship between soil OC% and Av. N but negative with soil pH. The DTPA extractable Zn, Mn, and Cu contents of soils were generally low and are limiting for crop production in different land use systems in Jhansi district. The intensive exploitation of land resources and improper soil management under various land use systems in the area could be the major factors for variations in soil properties. Therefore, there is a need to develop integrated soil management practices that could help to restore soil nutrients and thereby minimize the continuing soil degradation as well as environmental ecosystems for sustainable agricultural productivity. Keywords: Land use systems, Management strategies, Soil properties, Sustainability

LITTER DYNAMICS IN TROPICAL PLANTATIONS

Saurabh Kumar¹ and Jatin kumar¹

¹Department of Silviculture and Agroforestry
Dr Y S Pamar University of Horticulture and Forestry, Nauni, Solan. H.P.

ABSTRACT

Litter dynamics is a principal renewal mechanism, acting as a temporary sink for nutrients and function as a slow release nutrient source, thereby guaranteeing a permanent contribution of nutrients to soils. Establishing forest plantations to meet the ever-increasing demand for tropical tree products has been a long-standing tradition. The promotion of short rotation plantations to resolve the chronic wood shortages faced by millions of people in the Tropical regions, however raised doubts about their sustainability. The small farmers will continue to remove litter from the plantations or forest floor to use in the fields or home gardens or otherwise aid in the growth of subsistence crops. Tropics are characterized by higher rates of litter fall and rapid organic matter turnover than the temperate regions. Basal area and age structure are often cited as important determinants of litterfall. In a developing stand, annual litterfall rates may increase as stand basal area accumulates (with age), and it may plateau out at about the same time as that of canopy closure. In most studies in natural or plantations forest ecosystems indicate a pronounced seasonality in litterfall. Litterfall generally follow a unimodal distribution pattern with a distinct peak during winter or dry season. Physical disturbances like fire, wind, hurricane, induce large pulses of litterfall. Deciduous species may have more conspicuous peaks in litterfall than the evergreen species. Nitrogen fixing trees are widely extolled for their soil improving potentials as a result of production of N-rich litter. Some N fixing species like *Casuarina equisetifolia* and *Acacia auriculiformis* are capable of accumulating large quantities of organic matter on the forest floor. Perhaps the greatest need for research in the near future is the role of litter dynamics in averting the potentially adverse effect of nutrient limitation on plantation crops. To manage short and long term N availability to crops with organic input, we need to understand N mineralization and immobilization pattern in relation to chemical composition of litter. Mixed species stands and agroforests usually have higher litterfall rates than monospecific stands owing to litter heterogeneity. Thus, more information is needed on how species selection can improve utilization of natural resource. Although much attention was focused on litterfall and decomposition, removal of litter from the forest floor, typical of the tropics, has seldom considered. Removal of litter and green leaves from the plantations could have a significant nutrient cost. Studies on litter dynamics i.e. litter production and its decomposition processes are highly important and have a significant role in the nutrient and biogeochemical cycles and healthy functioning of tropical forest ecosystem. Moreover, it is very important to understand the various factors that influence litter decomposition for broad understanding of ecosystem functioning.

**LONG TERM INFLUENCE OF PACLOBUTRAZOL ON MICROBIAL
ACTIVITY AND NUTRITIONAL STATUS OF SOIL IN MANGO
CV. DASHEHARI ORCHARD**

Pradeep K. Shukla*, Govind Kumar, A K Bhattacharjee and V. K. Singh

ICAR-Central Institute for Subtropical Horticulture
Rehmankhura, Lucknow

ABSTRACT

Paclobutrazol is a plant growth regulator largely used to increase the mango productivity through the control of biennial bearing habit. It is usually applied in to the soil, where it persists for long periods. Indiscriminate use and untimely application of paclobutrazol has become a major threat to soil health of mango orchard. Keeping in to this view the response of paclobutrazol on soil microbial population, Dehydrogenase, Fluorescein diacetate activities, nutritional status along with its persistency was assessed periodically in treated soil of mango cv Dashehari, the choicest cultivar of north India, and compared to control. The paclobutrazol in soils of mango orchard affected negatively to the soil microbial population particularly at higher concentration. The lower concentration of paclobutrazol was recorded to be stimulatory for soil bacterial community. The average value for total bacterial was enhanced after paclobutrazol application and maximum value (134.67 – 144.33 cfu/ml) was recorded at 320 days at lower concentration (2-8 g a.i.). But the higher concentration (10 g a.i./tree) show inhibitory effect. On the other hand marginal difference in fungal population was noticed in treated soil as compared to untreated. The lower dose (2-8 g a.i./tree) of paclobutrazol influenced positively (>0.5 TPF $\mu\text{g/g}$ FW) to dehydrogenase activity, however no set pattern of FDA under the paclobutrazol treatment was observed. Maximum level of paclobutrazol residue and maximum inhibition of microbes at higher dose may be associated to its negative effect on soil biota. Data on majors and minors nutrient level of soil in relation to PBZ application clearly exhibited non significant effects on nutritional level of soil. It is concluded that optimum dose of paclobutrazol does not cause any deleterious effect of soil health of mango orchard in terms of soil microflora and nutrition status.

**LONG-TERM (2001-2020) TREND ANALYSIS OF TEMPERATURE AND
RAINFALL AND DROUGHT CHARACTERISTICS BY *IN-SITU*
MEASUREMENTS AT A TROPICAL SEMI-ARID STATION
(ANANTAPUR) OVER A PENINSULAR INDIA**

**Lokeswara Reddy Thotli, Balakrishnaiah Gugamsetty, Raja Obul Reddy Kalluri
Rama Gopal Kotalo*, Bhavyasree Akkiraju, Siva Sankara Reddy Lingala**

Aerosol & Atmospheric Research Laboratory, Department of Physics
Sri Krishnadevaraya University, Anantapur, Andhra Pradesh, India

ABSTRACT

With the effects of climate change prevailing worldwide, it is essential to understand the long-term rainfall and temperature trends at regional scales to plan for adaptation strategies. Investigating the temporal dynamics of meteorological variables in the context of climate-induced changes, particularly for rain-fed agriculture countries such as India, is needful. The present study focused on the temporal variation of rainfall and temperature trends to analyze the drought characteristics over the past 20 years (2001-2020) using ground-based Automatic Weather Station (AWS) data over the semi-arid station Anantapur in southern peninsular India. The seasonal maximum mean temperature (T_{mean}) was observed in summer (32.20 ± 1.36 °C), followed by the monsoon (29.08 ± 1.02 °C), post-monsoon (26.45 ± 2.44 °C), and winter (25.45 ± 1.01 °C) during the study period. The Mann-Kendall trend test result showed the seasonal mean temperatures decreasing trend in drying period [winter (-0.069 °C/year) and summer (-0.081 °C/year)] and increasing trend in the wetting period [monsoon (0.012 °C/year) and post-monsoon (0.034 °C/year)]. On the other hand, the seasonal rainfall decreases in the post-monsoon (-2.276 mm/year) while increasing in winter (0.5 mm/year), summer (2.137 mm/year), and monsoon (6.901 mm/year) seasons. The annual trends of minimum, maximum, and mean monthly temperatures are decreasing at a rate of -0.121 , -0.123 and -0.022 °C/year, respectively, while the rainfall was increasing at a rate of 8.979 mm/year. Furthermore, the temporal evolution of meteorological drought characteristics was estimated with the help of the Standardized Precipitation Index (SPI) and Standardized Precipitation Evapotranspiration Index (SPEI) in multiple time scales ranging from 1-month to 24-month on a monthly basis during the study period. The 24-month SPI values showed that 1 'severely dry' and 29 'moderately dry' long-term drought events were observed. From 24-month SPEI, a total of 15 'severely dry' and 20 'moderately dry' long-term droughts were observed during the study period. The severely dry years were observed in 2002 and 2003, while the wettest periods were 2007 and 2010. Both indices are identified as more severe dry periods from 2002–2006 & 2013–2017 than rest periods. Also, a significant decreasing tendency of droughts was observed in both indices. The SPI values are compared with El Niño Southern Oscillation (ENSO) and Normalized Difference Vegetation Index (NDVI) and found that the SPI vs ENSO index negatively correlates with the coefficient of -0.58 significantly, while between the SPI vs NDVI correlation not significant. The results show the study region converted from the drying period to the wetting period.

**MAIZE LETHAL NECROSIS (MLN): EFFORT TOWARDS
CONTAINING THE SPREAD THE SPREAD AND IMPACT OF A
DEVASTATING TRANSBOUNDARY DISEASE IN SUB-SAHARAN AFRICA**

**Suresh LM, Yoseph Beyene, Manje Gowda, Michael Olsen, MacDonald Jumbo,
Dan Makumbi, Mosisa Worku, Francis Mwatuni, and BM Prasanna**

International Maize and Wheat Improvement Center (CIMMYT)
ICRAF Campus, UN Avenue, Gigiri, PO Box 1041-00621, Nairobi, Kenya

ABSTRACT

Maize (*Zea mays* L.) is the most important cereal crop in sub-Saharan Africa (SSA), covering over 35 million ha, largely in smallholder farming systems that produce over 70 million metric tons (MMT) of grain. Maize Lethal Necrosis (MLN) disease first appeared in Kenya in 2011 and became a major threat to maize production in eastern Africa in subsequent years. In eastern Africa, MLN is caused mainly by synergistic interaction between two viruses, Maize Chlorotic Mottle Virus (MCMV) and Sugarcane Mosaic Virus (SCMV). MLN can cause up to 100% yield loss in susceptible maize varieties. The disease poses a complex challenge as the MLN-causing viruses are transmitted by insect vectors, and also through contamination of the seed, especially by MCMV. CIMMYT implemented a multipronged strategy in partnership with several international and national partners to tackle the MLN challenge. These efforts included: a) b) establishing a state-of-the-art MLN Screening Facility in partnership with Kenya Agriculture and Livestock Research Organization (KALRO) in Naivasha for identifying sources of resistance to MLN, MCMV and SCMV under artificial inoculation; b) accelerated breeding and deployment of MLN-tolerant/resistant maize varieties with other relevant traits preferred by African smallholders; c) optimizing MLN diagnostic protocols; c) strengthening capacities of national plant protection organizations (NPPOs) across sub-Saharan Africa on MLN diagnostics, monitoring and surveillance system; d) creating awareness among the maize seed sector institutions on SOPs for producing and exchanging MLN-free commercial seed; e) disseminating information on farming practices for minimizing MLN incidence; e) establishing an MLN Phytosanitary Community of Practice involving various stakeholders, including national plant protection organizations (NPPOs), seed companies, regional/sub-regional organizations, etc.; and f) probing the epidemiology of the disease, especially the factors underlying seed contamination by MCMV. These comprehensive efforts have led not only in preventing the further spread of MLN into other major maize-growing countries in sub-Saharan Africa, especially southern and West Africa, but also minimized the incidence of the disease in the MLN-endemic countries in eastern Africa.

MARINE BASED NUTRACEUTICALS FOR HEALTHY LIVING

G. Rajitha

Institute of Pharmaceutical Technology
Sri Padmavati Mahila Visvavidyalayam, Tirupati, India

ABSTRACT

The term nutraceutical was coined from Nutrition and Pharmaceutical. Nutraceuticals are the substances which are not traditionally recognized nutrients but provide nutritional benefits as well as medicinal effects. Nutraceuticals do not easily fall into the legal category of food and drug and often inhabit a grey area between the two. Nutraceuticals contains biologically active molecule such as omega-3-fatty acids, collagens, chitins, fucanoids etc. Nutraceuticals may be used to improve health, delay the aging process, prevent chronic diseases, increase life expectancy, or support the structure or function of the body. Marine nutraceuticals are the innovative health benefit products which provide healthy living by prevention of diseases instead of treatment. In food and supplement industry, marine nutraceuticals has gained a lot of attention as marine resources constitute 75% of the world biota. The safe nature of the marine based nutraceuticals makes them suitable alternative of allopathic drugs. Marine nutraceuticals possess many bioactive compounds and secondary metabolites derived from marine invertebrates such as tunicates, sponges, molluscs, sea slugs, sea weeds, Brown algae etc. These secondary metabolites possess antibiotic, anticancer, antiviral, antiinflammatory properties. Consumption of these biologically active ingredients present in marine life help to combat diseases such as cancer, cardio vascular disease, gastrointestinal tract diseases etc. Keywords: Marine nutraceuticals, collagen, chitin, anticancer, antiviral.

Organized jointly by

National Environmental Science Academy (NESA), New Delhi
Rani Lakshmi Bai Central Agricultural University, Jhansi, U.P.
ICAR-Indian Grassland and Fodder Research Institute, Jhansi, U.P.
ICAR-Central Agroforestry Research Institute, Jhansi, U.P.
Bundelkhand University, Jhansi, U.P.
Central Ayurveda Research Institute, Jhansi, U.P.

**MELATONIN REDUCES FLUORIDE UPTAKE AND
TOXICITY IN RICE SEEDLINGS BY ALTERING
PHYTOHORMONAL AND ANTIOXIDANT HOMEOSTASIS**

Aditya Banerjee

Post Graduate Department of Biotechnology
St. Xavier's College (Autonomous)
30, Mother Teresa Sarani, Kolkata, West Bengal, India

ABSTRACT

The investigation presents an elaborate report on the ameliorative effects of exogenous melatonin in soil-grown seedlings of the rice variety, IR-64 subjected to prolonged fluoride stress. Exogenous melatonin stimulated the physiological growth of the stressed seedlings by triggering high accumulation of gibberellic acid (GA) and melatonin via up regulation of the biosynthetic genes like *GA3ox*, *TDC*, *SNAT* and *ASMT*. The endogenous abscisic acid (ABA) content increased via induction of *NCED3* and suppression of *ABA8ox1*. However, the ABA-dependent genes like *TRAB1*, *WRKY71* and *OSBZ8* were down regulated in presence of high endogenous GA and melatonin. High melatonin level led to low indole-3-acetic acid accumulation in the treated seedlings during fluoride stress. Melatonin significantly decreased fluoride bioaccumulation by suppressing its uptake via *CLC1* and *CLC2*, and also restored *P-H⁺/ATPase* expression. The damage indices like chlorosis (accompanied by low *RuBisCo*), malondialdehyde, electrolyte leakage, methylglyoxal (detoxified by glyoxalase II) and protein carbonylation were greatly reduced. Increased proline synthesis, activation of the ascorbate-glutathione cycle and enhanced activity of glutathione peroxidase, catalase and guaiacol peroxidase led to low ROS accumulation and localization in the melatonin-treated plants exposed to stress. Overall, melatonin treatment alleviated fluoride-mediated injuries by restricting fluoride uptake, refining the defence machinery and altering the phytohormone homeostasis.

MEGA GAON - MEGA GAURAV (MGMG): IMPACTING AGROFORESTRY INTERVENTIONS FOR INCREASING TREES OUTSIDE FORESTS IN THE VILLAGES OF BUNDELKHAND REGION OF CENTRAL INDIA

R.P. Dwivedi*, A. Arunachalam, Rajendra Prasad, A.K. Handa, Inder Dev, Badre Alam, Naresh Kumar, K. Rajarajan, Sushil Kumar, Asha Ram, Hridayesh Anuragi, Ashok Yadav, Priyanka Singh, Suresh Ramanan S., Sovan Debnath, C.K. Bajpai, Rajendra Singh, R.K. Singh, SPS Yadav, Ajay Pandey and Rajesh Kumar Srivastava

Central Agroforestry Research Institute, Jhansi (U.P.) India

ABSTRACT

Krishivaniki: Ek Jeevan Dayani (Agroforestry: A Life Giver), Dwivedi, 2008. Agroforestry is found to be the desirable strategy for maintaining social, economic and ecological sustainability in India. The 5 Fs (Food, Fodder, Fuelwood, Fruit and Fertility) of agroforestry is indeed a stake for socio-economic sustainability. ICAR-CAFRI, Jhansi is implementing 'MGMG'- The flagship scheme of ICAR in 16 villages (12 villages in Jhansi district, UP & 4 villages in Niwari district, MP) of Bundelkhand region of central India. The main objective is to provide farmers with required information, knowledge and advisories on regular basis by adopting villages. Interface of scientists with the farmers to hasten the lab to land process. Farmers need to be given timely information on investment in agriculture, loans, availability of other basic amenities, market rates, extension activities and facilities provided by different agencies, new research findings and technologies, etc. The major interventions like: distribution and planting of seedlings of agroforestry tree species, Kisan Gosthi, capacity building, Har Med Par Ped, Scientists-Farmers interface meetings and exposure visits of farmers to research organizations are included. The MGMG has impacted in the increased awareness of farmers towards agroforestry, changes in attitude towards ICAR's scheme and increased participation of farmers in Institute's programme. Total 227 activities conducted which has impacted the 1912 farmers benefitted from agroforestry interventions. *Lakdi Chara Phal aur Ann-Krishivaniki Hai Jeevan* (Wood Fodder Fruit and Grain –Agroforestry is Life Again) is the slogan being chanted by villagers in the adopted villages. There is a need to increase the number of villages under MGMG by ICAR Institutes, CAUs, SAUs, SHFUs, KVKs and State line departments for betterment of farmers in other parts of the country to benefit the large strata of the farming community in rain-fed agriculture. Capacity buildings of Agroforestry stakeholders need to be strengthened. The efforts of MGMG will certainly improve the biodiversity and conservation of natural resources.

**METABOLITE PROFILING OF LABDANE DITERPENOIDS IN
DIFFERENT ACCESSIONS OF *ANDROGRAPHIS PANICULATA*
LEAVES AT DIFFERENT LEAF AGES AND COLLECTION TIME**

Paurabi Das and Puja Khare

Crop Production and Protection Division
CSIR-Central Institute of Medicinal and Aromatic Plants, Lucknow, India

ABSTRACT

This study delineates the dynamic changes of labdane diterpenoids coupled with chemometric differentiation of leaves of eight accessions of *Andrographis paniculata*. A two factorial RBD-designed field experiment was conducted. Firstly, leaves of *A. paniculata* accessions were obtained from distinct nodal positions classified as new (N), middle (M) and old (O) corresponding to different leaf ages respectively. Secondly, leaves were collected at different time intervals i.e., T1– 65 days after sowing (DAS); T2 – 95 DAS and T3 – 125 DAS. High-performance liquid chromatography (HPLC) allowed quantification of major labdane diterpenoids namely andrographolide, neoandrographolide, 14-deoxy-11,12-didehydroandrographolide, and andrograpanin. The chemometric tools such as cluster analysis, principal component analysis (PCA), and supervised orthogonal projection to latent structures (OPLS) were used for discrimination among the accessions. The results revealed marked differences in labdane diterpenoids content among different accessions based on leaf ages and different time intervals. New leaves were enriched with andrographolide, 14-deoxy-11, 12-didehydroandrographolide, while older ones with neoandrographolide and andrograpanin. Likewise, collection time-based segregation among different accessions was also observed in this study. The PCA and OPLS revealed that at 95 DAS andrographolide concentration was highest whereas neoandrographolide obtained more at 125 DAS. The interrelationship of plant mineral nutrient, carbohydrate, and protein content with secondary metabolite was also deciphered. The study indicates that these chemometric tools could be used for the discrimination of metabolic profiling among different accessions concerning different time intervals and leaf ages.

**METAGENOMIC ASSESSMENT OF SOIL MICROBIAL
DIVERSITY OF CROPS AND CROPPING PATTERN
OF MIDDLE GANGATIC PLAIN OF INDIA**

H. V. Singh, Sobit, Thapa, Udai. B. Singh and Deepti, Malviya

ICAR-National Bureau of Agriculturally Important Microorganisms, Kushmaur, Mau, U.P. India

ABSTRACT

Soil microbial diversity and community are very much influenced by anthropogenic activities, crop management practices and environmental conditions, which greatly affect the ecosystem services. Increasing and maintaining crop production to meet the feed requirement of ever burgeoning population which will be expected to reach to 9 billion in the 2050. To care the future food and energy demands while preserving soil quality and function is the major challenge in modern agriculture. Maintaining soil fertility is the key for sustaining crop production. In modern agriculture, soil fertility is maintained predominantly by external fertilizer inputs in term of inorganic source. Application of these inorganic sources in form of fertilizers and pesticides drastically reduces the microbial diversity and community structure. In conventional agriculture, agroecosystem management is mainly based on the use of monoculture as a means of increase in production through the application of chemical products such as fertilizers and agrochemicals, and the use of heavy machinery, which are meant to improve productivity. Agricultural soils under monoculture cropping systems are not as healthy as soils with diverse plantings. Land-use practices impact soil microbial functionality and biodiversity. The activities of the soil microbiota are essential to the long-term sustainability of agricultural systems, through their influences on biological, chemical and physical processes, which drive essential ecosystem services. Moreover, changes in microbial communities are considered as precursors to changes in the health and viability of the soil environment, due to their responses to changes in agricultural management practices. Understanding the dynamics of soil microbial communities and the factors that affect those dynamics is crucial for comprehending the processes affecting soil fertility in agricultural ecosystems. Traditional methods may underestimate the microbial diversity. Metagenome analysis using whole genome sequencing allows quantification of the diversity more accurately. Therefore the present work was conducted to collect the soil samples from middle Gangatic plain mostly comprising districts of Bihar to see the soil microbial dynamics influence with crops and cropping systems. Metagenomic approach was used to capture the culturable and non-culturable species of microorganisms associated with different crops and cropping pattern. It was observed that among four cropping patterns namely Litchi, Tobacco, Maize and wheat cropping system the abundance of microbial population in term of phylum, family and species of fungi, Bacteria and archaea were recorded. It was found that fungal abundance was not much affected and predominant phylum was Ascomycetes followed by Basidiomycetes and their population varied from 98.86 to 97.15 per cent and 2.15-0.6 per cent respectively. Maximum population of Ascomycetes 98.86 per cent was recorded with tobacco field soil. Similarly, Predominant fungal family was recorded as Chaetomiaceae which population was varied from 74.14 to 48.02 per cent. Variation fungal species was observed among cropping patterns. As for as concern about bacterial abundance phylum protobacteria was dominant among all cropping pattern while abundance of bacterial at family and species level very much influenced with cropping. Similarly, in case of Archaea abundance dominant phylum was thaumarchaeota in all cropping recorded, whereas predominant family of archaea was nitrososphaeraceae. Significant variation in predominant species of archaea was recorded among cropping pattern.

METAGENOMIC CHARACTERIZATION OF MICROBIAL COMMUNITIES ON SOIL UNDER THE AMENDMENT OF FLY ASH, VERMICOMPOST AND FERTILIZER IN CHICKPEA CROP

¹Devendra Mani Tripathi, ¹Deepa Singh and ²Smriti Tripathi

¹Department of Microbiology, Bundelkhand University, Jhansi

²Department of Environment and Developmental Studies, Bundelkhand University, Jhansi

ABSTRACT

A Combination of fly ash (FA), vermicompost and RDF were used to impart soil and plant health as compared to chemical fertilizer and vermicompost alone involving chickpea as the host crop. Microbial biomass carbon is a critical component of soils that control many processes linked with nutrient cycling. The Microbial Biomass Carbon (MBC) and soil respiration were found maximum in treatment that received FA at 20 t ha⁻¹ with 2 t ha⁻¹ vermicompost and RDF (recommended dose of fertilizer). The soil microbial structure of this treatment was investigated by using a metagenomic study. However, this study aimed to characterize the composition of microbial communities under the FA amendment in chickpea crops. Nevertheless, the impact of these activities has been poorly studied and detailed analyses are needed to understand the soil ecosystem at the structural and metabolic level. Our results suggest that the presence of some most important microorganisms in the agricultural soil help to increasing nitrogen fixation in the leguminous crop, the sample was analyzed by 16s rRNA gene V3-V4 region, a number of reads 0.2M (in million) with GC content was 54.5%. A dominant phylum in soil includes *Cyanobacteria*, *Euryarchaeota*, *Proteobacteria*, *Actinobacteria* and *Acidobacteria* while minor group includes *Verrucomicrobia*, *Planctomycetes*, *Nitrospirae*, *Gemmatimonadetes*, *Chloroflexi*. The most enriched genera were *Azospirillum*, *Gordonia*, *Chlorenema*, *Burkholderia*, *Calothrix*, *Chlorenema*, *Devosia*, and *Dorea* were observed. Among all *Gordonia*, and *Azospirillum* most abundant. MANOVA revealed significant difference ($P < 0.001$) for soil respiration ($F = 4828$; $P = 0.00$) and MBC ($F = 32.7$; $P = 0.00$) in the following amendments.

MITIGATION WEATHER RISKS THROUGH AGRO-MET ADVISORY SERVICES-FARMERS FEEDBACK

Amrendra Yadav¹, V.K. Kanaujia², A.K. Singh³, Raghvendra Singh⁴ and K.K. Singh⁵

^{1,2}Krishi Vigyan Kendra, Kannauj, Uttar Pradesh

³Directorate of Extension, CS Azad University of Agriculture & Tech Kanpur, Uttar Pradesh

⁴GKMS DAMU, ICAR- ATARI Kanpur, Uttar Pradesh

⁵AASD IMD New Delhi

ABSTRACT

In the present scenario of climate change i.e., increasing number of floods, droughts, raising temperatures and land inundation every year, maintaining the steady agricultural productivity and income is ascertaining. The average annual losses were estimated to be around US\$ 9-10 billion to Indian agriculture due to extreme events. A complete control over abnormal weather is not possible to reduce the losses but it can be minimized by adjusting farm operations with timely and accurate forecast of weather. Most of the farmers in the country neither aware of weather importance nor receiving regular weather advisories to cope up with changing scenario. Keeping in view, the Ministry of Earth Science, Government of India (GoI) taken an initiative to establish a scheme namely Gramin Krishi Mausam Sewa (GKMS) with the primary objective of issuing Medium Range Weather Forecast (valid up to next 5 days from date of issue) inclusive of all-weather parameters and increased Agromet Advisory Services (AAS) at the level of Agro-climatic zone to the local farmers. Agromet Advisories decreased the input and increased the net profit. As part of the study, District and block specific medium range weather forecast (valid up to 5 days from date of issue) of all-weather elements are being issued regularly along with weather forecast, Agromet Advisories prepared by Subject Matter Specialist of KVK, Kannauj and are being disseminated regularly (Twice in a week i.e., Tuesday and Friday) to the farmers. To assess the effectiveness and improvement in quality and reliability, feedback was collected from farmers at end of the season through prepared google forms. Out of 50 farmers feedback on receiving of agromet advisories, 36 farmers responded positively and remaining 14 farmers replied negatively. In case of regularity in receiving advisories farmers were reported as very regular, frequent regular and irregular respectively in helping them in managing day-to-day farm operations in accordance with weather conditions. Overall, the cost saved ranged from Rs. 1000 to 10,000/- per acre and up to Rs. 18,000/- per acre in some cases. The variation in cost savings depended on the type of farm operation that got altered upon receiving weather forecast and advisories. This resulted in difference in cost of cultivation and net returns between the farmers following agromet advisories and those who are not following agromet advisories.

MOLECULAR ANALYSIS AMONG *FAGONIA* SPECIES

Piyush Panwar

Department of Botany
GD Girls college, Alwar (University of Rajasthan, Jaipur)

ABSTRACT

Zygophyllaceae is a family of flowering plants known to grow in arid and semi-arid areas worldwide. Study till now reports 285 numbers of species and 22 genera worldwide. Among them, the genus *Fagonia* contributes 35 species. Inclusively, *Fagonia* plants species locally known by the name of dhamasa. Ayurvedic literature mentioned its name by Dhanvayāsaḥ. It plays an important role in ayurvedic medicine by treating Dermatitis, pyrexia and infections. Congenially modern days research proven its importance by reporting its potential to fight against cancer, antioxidant activities and antimicrobial activities. However, it is arduous to distinguish between all *Fagonia* species. In this study, we establish the relationship between morphological features and genetic variation. DNA barcoding is a molecular method used for an identification of the species. A short section of DNA from a specific gene with less intraspecific (among species) variation can be used to uniquely identify a species. To evaluate genetic variation, Internal transcribed spacer (ITS) was sequenced. Resulting close relationship between *Fagonia indica* and *Fagonia bruguieri* DC.

**MOLECULAR DIFFERENTIATION AND CHARACTERIZATION OF
SYZYGIUM CUMINI (MYRTACEAE) MEDICINAL TREE COLLECTED
FROM DIFFERENT ECOLOGICALLY REGIONS OF INDIA**

**RS Tomar^{1*}, Ranjit Pal¹, Prabha Singh²,
Ravi Prakash Saini², Ashutosh Singh¹, Ajai K. Pandey¹ and Sushma Tiwari³**

¹Rani Lakshmi Bai Central Agricultural University, Jhansi

²ICAR-Indian Grassland and Fodder Research Institute, Jhansi

³Department of Genetics and Plant Breeding, College of Agriculture
Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior

ABSTRACT

Syzygium cumini (Myrtaceae) popularly known as Jamun is native to India. It is widely used for medicinal properties especially in treatment of diabetes. Although, available in diverse range despite less genetic differentiation and molecular characterization work has been done so far in this important medicinal tree. There are large number of germplasm and populations of *S. cumini* located in different habitats in India. These germplasm lines differ from one another based on ecological factors. The molecular characterization of *Syzygium cumini* Linn collected from various agro-ecological regions was performed. Inter simple sequence repeat (ISSR) markers were used to detect inter and intra levels of genetic variations of twelve *S. cumini* genotypes collected from four major agro-ecological zones of India. It resulted in three clusters CI (JL-1, J-37, J-42, NJ-6 and GP), CII (BL-1, BL-2, DL-1, DL-2, JL-2) and CIII (PW-1 & PW-2) based on similarity coefficient. Highly Polymorphic markers were identified UBC817, UBC827, UBC830 and UBC831. High PIC value helped in identification of most informative marker i.e. UBC827. Unique bands helped in identification of diverse germplasm lines i.e. cultivar barcoding. Identification of suitable genotypes for commercial cultivation in the region based on discrimination and resolving power is possible using these molecular markers.

**MOLECULAR IDENTIFICATION AND BIOGEOGRAPHICAL
DISTRIBUTION OF *SPODOPTERA FRUGIPEDRA*
(LEPIDOPTERA: NOCTUIDAE) ACROSS KARNATAKA.**

Karthik V Rao and Doddamane Manjulakumari

Department of Microbiology and Biotechnology
Bangalore University, Bengaluru, Karnataka, India

ABSTRACT

The armyworm *Spodoptera frugiperda* (Lepidoptera: Noctuidae) is one of the major agriculture pest of *Zea Mays* (maize) and are widely distributed in the Indian subcontinent, East and southern Asia, as well as in the Australian regions. Generally the army worm infests maize crops of less than 10-20 days old. They are gregarious, defoliators of maize and move from one field to other in large number like an army. The taxonomical classification of *Spodoptera* species is mainly based on the structure of genitalia, antenna and the colour pattern of the wing. In this study, we have used various mitochondrial genes like COI, Cyt b and 12s gene as markers for the molecular identification and phylogenetic analysis of the pest. This study aims to track the geographical distribution and genetic diversity of army worm infestation in maize crops.

MONITORING AND FORECASTING OF DISEASES IN ECONOMICALLY VALUABLE CROPS BY LEAF WETNESS DURATION (LWD) SOFTWARE

Rajesh Kumar Pandey

Department of Botany,
Bundelkhand University, Jhansi, Uttar Pradesh, India

ABSTRACT

Diseases in vegetables, fruits, medicinal and aromatic crops have the potential to cause devastating epidemics that threaten the world's food supply and vary widely in their dispersal pattern, prevalence, and severity. Disease dynamics involves a complex interaction between a host, a pathogen, and their environment, representing one of the largest risks facing the long-term sustainability of agriculture. New air borne inoculum, weather, and satellite-based technology provide new opportunities for combining disease monitoring data and predictive models—but this requires a robust analytical framework. Integrated model-based forecasting frameworks have the potential to improve the timeliness, effectiveness, and foresight for controlling crop diseases, while minimizing economic costs and environmental impacts, and yield losses. Relationships between leaf wetness and plant diseases have been studied for centuries. Relationships among leaf wetness duration (LWD) and air temperatures required for infection of several hosts by three different phytopathogenic fungi. Using these types of relationships, disease-warning systems were developed and are now being used by grower communities for a variety of crops. As a component of Integrated Pest Management (IPM), disease-warning systems provide growers on his mobile as alert with information regarding the optimum timing for chemical or biological management practices based on weather variables (rainfall, humidity, LWD, air temperature) most suitable for pathogen dispersal or host infection. This approach contrasts with traditional calendar-based systems, which recommend sprays based on fixed calendar dates or phenological stages, rather than on dates determined by measures of environmental variables on infection and the levels of disease risk. Disease-warning systems can reduce the number of recommended sprays during periods when disease risk is low in several economical valuable vegetables, fruits, medicinal and aromatic crops, but may also recommend more sprays than a calendar-based system when conditions are exceptionally disease-conducive.

Leaf wetness is the presence of free water on the surface of a crop canopy. It results primarily from three sources: water that has been intercepted by the canopy during a rainfall or fog event; overhead irrigation; or dew, which can form on any surface of the crop canopy, mainly on leaves, on both their top and bottom sides. Dew forms where water vapor condenses on a surface; it is triggered when the temperature of a canopy surface drops below the dew point temperature of the surrounding air as results several wet loived pathogenic microbes actively engaged in multiplication and penetration. Among white Grape variety, Marsanne is one of the very high yielding variety but it is very prone to downy mildew caused by *Plasmopara viticola* when weather is congenial this disease. In such cases, weather forecast particularly leaf wetness, precipitation and cloud would be very effective tools for Integrated disease management. It is concluded that there is no single "best" method to acquire for disease management but combined strategy of weather forecasting tools with different integrated disease management tools would be one the most successful approach.

MULTI-LOCATION EVALUATION OF SPECIALTY AND BIOFORTIFIED MAIZE HYBRIDS FOR FORAGE - AND SILAGE- QUALITY

Nikhil Kumar Chhipa^{1*}, Brijesh K. Mehta¹, P. Shashikumara¹, Anup Kumar¹,
Firoz Hossain², Vignesh Muthusamy², Rajkumar U. Zunjare², K. Sridhar³,
Rahul Ghajghate¹, H.S. Mahesha¹ and Shahid Ahmed¹

¹ICAR-Indian Grassland and Fodder Research Institute, Jhansi

²ICAR-Indian Agricultural Research Institute, New Delhi

ICAR-Indian Grassland and Fodder Research Institute, SRRS, Dharwad

ABSTRACT

Maize is an important crop for food, feed, fodder and environmental security. Here, we evaluated the fodder potentiality of ten newly developed maize hybrids with different use pattern such as biofortified hybrids (PVQ9I, PHQPM5I, APH1, PHM8I and PHM9I), sweet corn hybrids (PSSC-1 and PSSC-2), baby corn hybrid (ABSH4-1) and pop corn hybrids (APCH-2 and APCH-3) along with three checks (two forage maize composites: African Tall and J-1006, and one normal maize hybrid: COHM-8) in term of fodder yield, forage quality and silage quality. Experiments were conducted in randomized complete block design (RCBD) with three replications at three locations: IGFRI, Jhansi; IARI, New Delhi and IGFRI-SRRS, Dharwad. ANOVA revealed significant genotype and genotype \times environment interaction variation ($P \leq 0.05$) among the maize genotypes for fodder yield, forage quality and silage quality. Fodder yield of all the newly developed hybrids (< 1200 g) was lower than African Tall (1316.3 g), while APCH-3 (985.0 g), PHM8I (1198.5 g), PVQPM9I (700.0 g) and PHQM5I (790.6 g) were *at par* with J-1006 (974.4 g). PHM8I (9.23%) and PHM9I (8.15%) showed higher crude protein in forage over checks (7.18%). APH-1 (76.27%) recorded higher neutral detergent fibre (NDF) in forage than checks (69.16%), while ABSH4-1 (39.33%) and PHM8I (37.05%) possessed higher acid detergent fibre (ADF) in forage compared to checks (34.29%). APH-1 (2.63%) and PSSC-1 (2.75%) showed low acid detergent lignin in forage than checks (2.95%), while total ash was higher in ABSH4-1, APCH-3, PHM8I and PVQ9I ($> 9.22\%$) compared to checks (7.66%). Silage quality in term of NDF was superior for PHM9I (88.64%), while PHQPM5I was found superior for ADF (57.86%) and total ash (12.37%) over the checks. The study concluded that biofortified and specialty corn hybrids possess the required characteristics of a nutritious fodder and its preservation as silage could significantly minimize the green fodder deficit in India.

NON-DESTRUCTIVE QUANTIFICATION OF ANTINUTRITIONAL AND BIOACTIVE TRAITS IN PEARL MILLET USING NEAR-INFRARED SPECTROSCOPY (NIRS) BASED PREDICTION MODELS

Maharishi Tomar^{1,2}, Reetu Verma³, Archana Sachdev²,
Rakesh Bhardwaj⁴, and Vijay Kumar Yadav¹

¹Division of Seed Technology, ICAR-Indian Grassland and Fodder Research Institute, Jhansi, India

²Division of Biochemistry, ICAR - Indian Agricultural Research Institute, New Delhi

³Division of Crop Improvement, ICAR-Indian Grassland and Fodder Research Institute, Jhansi, India

⁴Germplasm Evaluation Division, National Bureau of Plant Genetic Resources, New Delhi, India

ABSTRACT

The inherent biodiversity, high productivity, need for minimal agricultural inputs and the hardy nature of Pearl millet make it a crop of choice for several farmers in. This crop can be used as a staple food and can successfully fulfil the crucial nutritional requirements for a large population in developing and underdeveloped nations, particularly in Asia and Africa. The available genetic and biochemical diversity preserved in the germplasm directly influences the success of crop improvement programs. Bioactive composition of pearl millet like polyphenols and antinutritional factors like RFOs and phytic acid determine the nutritional diversity and functionality of pearl millet germplasm. These parameters are conventionally determined through complex chemical methods which are time and labour-intensive and require expensive analytical instruments and technical expertise. This makes these methods intricate and strenuous to be used for screening a large number of samples with accuracy. Near-infrared spectroscopy (NIRS) ascertains high speed, accurate, non-destructive, quantitative and qualitative analysis and screening of biochemical parameters in a large germplasm collection for genetic analysis and breeding programs. MPLS (Modified Partial Least Squares) regression-based NIRS prediction models were developed to assess the bioactive composition of pearl millet as polyphenols and antinutritional factors as phytic acid and RFOs. Mathematical treatments executed by permutation and combinations for calibrating the model, where 2nd, 3rd, and 4th derivatives produced the best results. Mathematical treatment “3,4,4,1” was finalized for phenolics, “2,4,4,1” for phytic acid and “2,6,4,1” for RFOs. Treatments with the highest 1-Variance ratio, RSQ_{internal} (coefficient of determination) values, lowest SEC(V) (standard error of cross-validation), SEP(C) (standard error of performance) were identified for subsequent validation. External validation determined the prediction accuracy based on RSQ_{external}, RPD (residual prediction deviation), SD (standard deviation), p -value ≥ 0.05 and low SEP(C).

NUTRIENTS CONTENT, UPTAKE AND SOIL BIOLOGICAL PROPERTIES AS INFLUENCED BY VARIOUS NUTRIENT MANAGEMENT PRACTICES UNDER FODDER PEARL MILLET CULTIVATION

**Rakesh Kumar*, Hardev Ram, R.K. Meena,
Anurag Saxena, Sandeep Kumar, Praveen B R and Brijesh Kumar**

ICAR-National Dairy Research Institute, Karnal, Haryana, India.

ABSTRACT

Quality characteristics of fodder crops are largely influenced by various agronomic management practices at field conditions in different climatic strata. Nutrient's deficiency in soils leads to produce mineral deficient fodder. However, animals depending on such fodder shown nutrients deficiency symptoms. Keeping these facts in mind an experiment was conducted with aim to evaluate nutrient management practices for enhancing quality of fodder pearl millet (*Pennisetum glaucum* L.). The present study was undertaken during kharif season of 2019-20 at Agronomy research farm, ICAR-NDRI, Karnal (Haryana). The experiment was laid out in Randomized Complete Block Design with eight treatments viz. T₁: Absolute control; T₂: 100% RDF; T₃: 100% RDF + Cow urine foliar spray; T₄: 100% RDF + PGPR; T₅: 100% RDF + PGPR + Cow urine foliar spray; T₆: 75% RDF + Cow urine foliar spray; T₇: 75% RDF + PGPR and T₈: 75% RDF + PGPR + Cow urine foliar spray with three replications. Study indicated that the nutrients content and uptake by fodder pearl millet significantly affected with different nutrient management practices and recorded maximum nitrogen (1.57%), phosphorus (0.27%), potassium (1.66%), iron (347.67 ppm), manganese (44.67 ppm), copper (12.90 ppm) and zinc (38.33 ppm) contents as well as uptake of nitrogen (177.40 kg ha⁻¹), phosphorus (30.62 kg ha⁻¹), potassium (188.56 kg ha⁻¹), iron (3938.68g ha⁻¹), manganese (506.89g ha⁻¹), copper (146.17g ha⁻¹) and zinc (433.80g ha⁻¹) with application of 100% RDF + PGPR + Cow urine foliar spray, which, was found statistically at par with 100% RDF + PGPR. Maximum microbial biomass carbon (163.47 and 192.44 µg/g dry soil), dehydrogenase activities (13.25 and 23.83 µg TPF/g soil/day), alkaline phosphatase activities (84.55 and 106.96 µg PNP/g soil/hr.), bacterial counts (14.46×10⁶ and 22.09×10⁶ CFU/g soil), actinomycetes counts (26.40×10⁵ and 37.15×10⁵ CFU/g soil) and fungal counts (14.07×10⁴ and 18.85×10⁴ CFU/g soil) at 40 DAS and harvest respectively, with application of 100% RDF+PGPR+CU, which was found statistically at par with 100% RDF+PGPR followed by 75% RDF+PGPR+CU and 75% RDF+PGPR at 40 DAS, while, at harvest it was found at par with 100% RDF+PGPR and both were found significantly higher over rest of the treatments. Which, will further strengthen and sustain soil fertility, fodder quality and animals' health.

**NUTRITIONAL AND BIOCHEMICAL EVALUATION
OF PIGEON PEA (*CAJANUS CAJAN*)**

Mamta Rathore, Ashish Srivastava and H.G. Prakash

C.S. Azad University of Agriculture and Technology, Kanpur, U.P. (India)

ABSTRACT

As compared to the other legumes in the family the pigeon peas are a good source of protein. It is a healthy choice of food, considering its high fiber and mineral content with low fat content. It is an important legumes pigeon peas is good for health. It is a good source of protein content and control blood pressure, prevent anemia ,assist in growth helps in losing weight, boost energy, aids, immunity ,healthy heart, better digestive health. The pigeon pea is a perennial legume, reigns from the family fabaceae. The cultivation takes place as a single crop or with cereals like sorghum, pearl millet, maize or combined to legume like peanuts. The nutritional values of pigeon peas comprises of carbohydrates, sugar, dietary fibre, fat, protein. It contains vitamins like –Thiamine, riboflavin, niacin, pantothenic acid, Vitamin-B, Folate, Choline, Vitamin-C, Vitamin-E and Vitamin-K with Ca, Fe, Mg, Mn, P, K and Na, Zn. This legume contain right amount of fibre content and low fat value.

NUTRITIONAL AND PALATABILITY INDICES OF TEMPERATE GRASSES AND LEGUMES FOR LIVESTOCK FEEDING

Sultan Singh¹, Tejveer Singh,¹ Suheel Ahmad²,
Sheeraz Saleem Bhat² and Nazim Hamid Mir²

¹ICAR-Indian Grassland and Fodder Research Institute Jhansi, UP, India

²ICAR-Indian Grassland & Fodder Research Institute, RRS, Srinagar (UT of J & K)

ABSTRACT

Eight perennial grasses (*Dactylis glomerata*-DG, *Festuca arundinacea*-FA, *Phalaris tuberosa*-PT, *Phleum pretense*-PP, *Lolium perenne*-LP, *Bromus willdenowii*-BW, *Bromus inermis*-BI, *Festuca rubra*-FR) and five legumes (*Trifolium pretense*-TP, *Trifolium repens*-TR, *Onobrychus viciifolia*-OV, *Medicago sativa*-MS and *Coronilla varia*-CV) were evaluated for nutritional and palatability attributes. Grasses had lower ($P < 0.05$) protein (7.52-15.14) than legumes (17.84-21.76%DM). Grasses had higher ($P < 0.05$) NDF, ADF and cellulose than legumes. Grasses had higher ($P < 0.05$) total carbohydrates (tCHO) than legumes except TP (65.44% DM). Legumes non structural carbohydrates (NSC; 20.81-29.33) were higher ($P < 0.05$) and structural carbohydrates (SC; 34.72-45.20) were lower than grasses (NSC; 9.30-16.51 and SC; 58.13-68.67%DM). Lignin bound carbohydrate fraction (C_c) was higher in legumes than grasses except PP and FR (28.23 and 32.90%tCHO). Protein fraction P_a of grasses (3.40-33.89 and legumes (17.45-47.39%CP) differed ($P < 0.05$). Rapidly degradable protein fraction (P_{B1} ; 7.24%CP) was lowest in grasses and legumes. Unavailable protein fraction (P_c) varied from 7.96 to 38.27 in legumes and 8.10 to 26.22%CP in grasses. Digestible energy (DE) differ ($P < 0.05$) between 4.48-4.55 and 2.01-2.56 in grasses and 4.54-4.57 and 2.21-2.70 M cal/kg DM in legumes. Legumes had higher net energy (NE) efficiency for lactation (NE_L), growth (NE_G) and maintenance (NE_M) than grasses. Legumes had higher TDN (50.07-61.33) than grasses (45.59-55.62) except BW (57.96%). The total digestible non fibrous carbohydrates (tdNFC) of legumes (20.39-28.74) were higher ($P < 0.05$) than grasses (9.11-16.18%). Grasses and legumes tdCP ranged between 5.75- 13.74 and 11.27- 19.78%, respectively. Grasses had higher (32.51-38.07) rumen degradable protein (RDP) than legumes (22.98-34.00%), except TR (46.16%). Grasses and legumes digestible dry matter (DDM) varied between 53.37-60.58 and 56.05-62.79%, respectively. Legumes dry matter intake (DMI) and relative feed value (RFV) were higher ($P < 0.05$; 2.33-2.92 and 101.15-137.14) than grasses (1.59-1.85% and 68.42-85.08%). Results revealed that legumes had more protein, less fiber, higher NSC, higher intake, more tdCP, tdNFC, DDM, TDN and energy than grasses.

OILSEED PRODUCTION: BOON IN BUNDELKHAND REGION

**Yogendra Pratap Singh*, Asok Kumar,
Deependra Singh and Kuber Singh Patel**

Department of Seed Technology
Bundelkhand University, Jhansi

ABSTRACT

Bundelkhand region of Uttar Pradesh spans over seven districts covering 26,653 km² of area and is situated in north central India. Agriculture continues to be the main occupation of the people of the Bundelkhand region. The region has also lagged behind agriculturally due to its typical geographical terrain and climatic conditions. Cereals, pulses and oilseeds are the three groups of crops that are primarily grown in the region and sustained in this water-challenged zone as these were cheaper to grow (Anonymous, 2012). Keeping in view the importance of oilseeds crops in Bundelkhand region of UP state, attempt was made for decadal analysis of growth and stability in area production and productivity of major oilseeds crops over past two decades (2000-21) in the region. In contrast, linseed recorded highest decline rate with respect to area (-3.15%) and production (-1.65%), while groundnut registered highest decline rate with respect to productivity (-2.83%) in the region during last two decade. District wise analysis showed that among all the oilseed crops, sesame recorded highest growth rate in area and production in all the districts of Bundelkhand region of UP state except Lalitpur and Chitrakoot districts. In contrast, area coverage under linseed registered decline in all the districts of Bundelkhand region, while production also followed the suite except for Mahoba and Banda districts. Keywords- Oilseed, Climate, Production, Linseed, Bundelkhand region.

ONE DISTURBANCE: A THREAT TO MANY EXTINCTIONS

Ankita, Preeti and Umakant Dash

Kerala Agricultural University
Thrissur, Kerala, India

ABSTRACT

The global assessment report by Intergovernmental science-policy platform on Biodiversity and Ecosystem services (IPBES) deciphered the unprecedented and fast declining rate in biotic community with approximately 25 percent species on the verge of extinction while 23 percent already been declined. Comparative to earliest estimates natural ecosystem has declined by 47 percent. There are about 72 percent indicators reported from indigenous people that are directly related to the present deterioration. There are number of direct and indirect drivers that accelerates the pace of declining trend in biodiversity. Direct exploitation of organisms, climate change, invasive alien species, pollution and land/sea use change contributes to this decline directly. Several indirect agents include human population dynamics (demographic drivers), consumption patterns (socio-cultural drivers), trade and trafficking (economic drivers), institutions & governance and Conflicts & epidemics. Land use change primarily through agriculture, forestry and urbanization has elevated the levels of pollution associated with air, water, and soil. The direct drivers have huge impact on terrestrial, freshwater, and marine ecosystem combined ly about 50 percent. The unsustainable use of earth's resources augmented by these drivers furthermore interact in other complex form that widely disturbs the ecological balance at global level. This complexity needs to be addressed and looked afterwards. Keywords: Biodiversity, species, ecosystem, sustainability, extinction

OPPORTUNITIES AND CHALLENGES OF CARBON SEQUESTRATION THROUGH AGROFORESTRY IN WASTELANDS

Asha Ram, Ayyanadar Arunachalam, Inder Dev, Suresh Ramanan S. and Naresh Kumar

ICAR-Central Agroforestry Research Institute
Jhansi, Uttar Pradesh, India

ABSTRACT

Rise in frequency and intensity of extreme climatic events due to increased emission of Greenhouse Gases (GHGs) has caused the 'Global Climate Emergency'. Due to greenhouse effect of GHGs, the average global temperatures are expected to increase in the range of 0.5°F to 8.6°F by 2100. Agroforestry emerged as a well-established tactic to sustainable land management, not only for conserving natural resources, but also for ecological and environmental considerations. It has been identified as a key strategy for meeting NDC targets of many developing countries. Conversion of the wasteland and grasslands into the agroforestry has the best potential of sequestering atmospheric CO₂ apart from increased biomass productivity and soil and water conservation benefits. India with 97.85million ha degraded land which largely is carbon depleted, but can brought back to high carbon carrying capacity with reclamation and adaptive agroforestry. Large number of tree species available for agroforestry in the wasteland areas to suit the different agroclimatic and edaphic conditions in the country. Recently, the potential of agroforestry systems to accumulate C has been estimated between 0.29 to 15.21 Mg/ha/yr. However, carbon sequestration potential of the agroforestry systems depends upon various factors such the management practices, physiognomies of tree species, land, environmental factors and socio-economic aspects. There are many challenges in utilization of the wasteland under tree farming which needs to be addressed and these challenges must be transformed into the opportunities to meeting the India's NDC targets.

**OXBOW LAKES OF EAST CHAMPARAN DISTRICT,
BIHAR (INDIA) HISTORY, CLASSIFICATION, ORIGIN,
DISTRIBUTION AND DETERIORATION**

Kumari Priyanka

Department of Zoology
B.R.A. Bihar University, Muzaffarpur, Bihar

ABSTRACT

Oxbow lakes are U – shaped or curved bends in a river that are cut off from the main river flow. These lakes occur in river valleys. When the river enters the plain, it twist and turn to form meanders. These meanders in due course of time form cut off lakes resembling an oxbow, hence called oxbow lakes. An oxbow is a lake that forms when a section of a river is cut off, leaving a separate body of water (Martin, 2020).

East champaran district of North Bihar having more water than land lies east of the Gandak River in the North Ganga Plain. The district lies between north latitude $26^{\circ} 15' 10''$: $27^{\circ} 10' 30''$ and east longitude $84^{\circ} 30'$ - $85^{\circ} 17' 50''$ covering an area of around 3968 Sq.Km. and mainly drained by Gandak and Sikrahana rivers.

The district has a large potential for fishery development. The lake district in Gandak basin comprises 28 U – shaped natural inpoundments originated due to the fluvial activity of Burhi Gandak and its tributaries. It covers an area of around 350 Sq. Km. The lakes formed in the vicinity of the river channels of the district are threatened ecosystem.

The condition of these lakes are deteriorating under the impact of anthropogenic pressures, fast pace of development and subsequent modifications of the river basins.

The present paper deals in detail the history, classification, origin, distribution and factors for deterioration of the oxbow lakes of East Champaran district of North Bihar, India, in order to conserve this threatened rich biodiversity and to check further deterioration of this precious biodiversity.

**PATH ANALYSIS STUDIES ON YIELD AND ITS COMPONENTS IN
MUNGBEAN [*VIGNA RADIATA* (L.) WILCZEK]**

Gopi Krishan Gaur¹ and A.K. Sharma²

¹Department of Genetics and Plant Breeding, SKN COA Jobner, Rajasthan, INDIA

²Genetics and Plant Breeding SKRAU, Bikaner, Rajasthan, INDIA

ABSTRACT

Pulse crops are in forefront among plant kingdom, to address malnutrition. Mungbean has an added advantage compared to other legumes that both protein and carbohydrates are easily digestible and create less flatulence. Path analysis is standardized partial regression coefficient analysis, which splits the correlation coefficients into the measures of direct and indirect effects of a set of independent variables on the dependent variable (yield). At phenotypic level, highest positive direct effect on seed yield was observed for harvest index after that biological yield per plant, days to maturity, plant height, germination percentage, 100-seed weight, number of pods per plant, seed volume and water absorption capacity. Thus, a significant improvement in seed yield can be expected through selection in the component traits with high positive direct effects.

**PATHOGENICITY OF DIFFERENT INOCULUM LEVELS OF
MELOIDOGYNE INCOGNITA INFECTING *VIGNA RADIATA* AND
MANAGEMENT BY FLY ASH APPLICATION**

*¹Abbasi and ²Hisamuddin

¹Department of Botany, Shia P.G. College, Lucknow, India

²Department of Botany, Aligarh Muslim University, Aligarh, India

ABSTRACT

The experiment was conducted in pot, to evaluate the damage potential of *Meloidogyne incognita* against *Vigna radiata* at different inoculum levels, by inoculating with 200, 400, 800 and 1,600 J2. The results showed that the threshold level of inoculum was (800 J2) at which the rate of reproduction of nematode was increased and prominent symptoms were developed. Plant growth parameters including plant length, fresh weight, dry weight, leaf area, nodule number were significantly decreased at 800 inoculum level in addition to decrease in number of pods, seeds and seed weight. Fly ash was added @ 15%, 30%, 45% and 60% into the soil. Fly ash amendment at 15% was found to be most effective which probably acted as stimulant for the growth and yield of *Vigna radiata* and accorded negative impact on the nematode at fly ash concentrations.

PHENOTYPING OF LENTIL (*LENS CULINARIS* MEDIK.) GERMPLASM AGAINST HIGH TEMPERATURE STRESS

**Neeraj Kumar¹, R.V. Charitha Reddy¹, Somsole Bharath¹, Amita Singh¹,
Anshuman Singh^{1*}, Meenakshi Arya², Rakesh Choudhary¹,
Rumana Khan¹, and S.K. Chaturvedi**

¹Dept. of Genetics and Plant Breeding

²Dept. of Plant Pathology, Rani Lakshmi Bai Central
Agricultural University, Jhansi, Uttar Pradesh, India

ABSTRACT

Lentil is an important food legume crop of northern India grown during Rabi season on residual soil moisture. Rising temperatures are proving detrimental for various agricultural crops. Lentil is very sensitive to even small increase in temperature during the reproductive stage, hence there is need to explore the available germplasm for source of heat tolerance in breeding programs. The objective of present study is to identify lentil germplasm with improved tolerance to extreme heat events during the reproductive phase. In the present study two hundred twenty eight genotypes of lentil along with six checks were sown in augmented design in late sown conditions (third week of January; max/min temperature >32/20°C during the reproductive stage) than the recommended date of sowing (first week of November; max/min temperature <32/20°C during the reproductive stage) in the field conditions. Various observations on agro-morphological traits such as growth habit, plant biomass, days to 50 % flowering etc. and cytological and physiological traits such as pollen viability, pollen germination and chlorophyll content have been recorded. Some promising genotypes have shown the pollen viability up to 82.46 % and pollen germination up to 85.75 % as these are known as the most heat-sensitive stages among various developmental stages. The inclusion of this germplasm into current breeding programmes will improve yield stability and also allowing greater flexibility in sowing dates. This will not only enable further increase in area of lentil under rice based cropping system but will also help in improving the production and productivity of lentil grown after long duration rice varieties, which matures by the month of November in north and central India.

PHENOTYPING OF SESAME GENOTYPES FOR WATERLOGGING TOLERANCE UNDER CONTROLLED CONDITIONS

Ashutosh Kumar, Artika Singh, Rakesh Choudhary and S. K. Chaturvedi

Rani Lakshmi Bai Central Agricultural University
Jhansi

ABSTRACT

Sesame (*Sesamum indicum* L.) is an ancient oil crop that is extensively grown around the world including India. India is the world's leading producer, with 19.47 lakh ha area and 8.66 lakh tonnes produced. In comparison to other nations (535 kg/ha), India's average sesame yield (413 kg/ha) is low. Sesame is very sensitive to excess soil moisture as well as depleted soil moisture and a crop loss due to waterlogging is considerably high. Hence, present study was undertaken as part of Department of Biotechnology supported research project to investigate the response of sesame genotypes under different durations of waterlogging conditions at different plant growth stages. A total ten promising lines selected from previous year's field screening including 2 checks (IC 204414, EC 334965, EC 334449, EC 334970, EC 334981, EC 346727, IC 96095, EC 334977, GT 10, RT 346) were evaluated for waterlogging tolerance. Seeds were sown in plastic pots containing loam soil mixed with vermicompost. Eight seeds were sown in each pot, and five plants were maintained in each pot. The waterlogging stress was imposed at 5 different crop growth stages, viz. at 20, 30, 40, 55 and 70 days after sowing for 24, 36, 48 and 72 hours duration. Control plants remained well-watered throughout the experiment. After the treatment period, water was drained out from the pots and plants were allowed to grow to recover and survival percentage was recorded. Moderate wilting was shown in every pot during 48- and 72-hours waterlogging at 20 DAS except GT 10, EC 346727, EC 334449 but plants were recovered after 7 days from drooping of leaves. At 30 DAS, all the plants showed wilting during 48- and 72- hours waterlogging stress except genotype GT 10 but after recovery period, all the plants of each pot recovered after 7 days from wilting. Plant height and chlorophyll content decreased when compared to control. In genotypes EC346727, GT 10, and RT 346, there was a lower decline in chlorophyll content (%) at 30 & 40 DAS waterlogging treatment. These accessions (EC346727, GT 10, and RT 346) can be utilized further in breeding programme for the development of waterlogging tolerant varieties of sesame.

PHYTOBIOME ENGINEERING AND ITS IMPLICATIONS IN SUSTAINABLE AGRICULTURE

Nisha Prajapati and Subha Narayan Das

Department of Botany
Indira Gandhi National Tribal University, Amarkantak, Madhya Pradesh

ABSTRACT

To feed the increasing human population, agrochemicals are extensively being used by farmers which lead to loss of soil microbial diversity and reduction in soil fertility. The harmful effects of agrochemicals are going to be worsened in future as the global food demand is expected to increase 70% by 2050. Loss of soil microbial diversity along with the loss of microorganisms associated with crop plants i.e. phytobiome has negative impacts on crop productivity. Recent research progress suggests that soil microbial diversity and phytobiome have potential to provide fitness advantages to the crop, including growth promotion by nutrient acquisition, resilience to stresses and resistance to pathogens.

Microbes are essential to the maintenance of life on Earth, yet we understand little about the majority of microbes in soil and even those living inside the plants. Knowledge on phytobiome holds great promise to the integral challenges of achieving food security while supporting a healthy environment in line with the United Nation's Sustainable Development Goals (SDGs), 2050. Additionally, studies on soil microbial diversity and phytobiome are expected to substantially contribute to increased farm productivity with less chemical inputs. In this presentation, we will be discussing the recent progress towards phytobiome research along with the possible phytobiome engineering for sustainable agriculture.

Organized jointly by

National Environmental Science Academy (NESA), New Delhi
Rani Lakshmi Bai Central Agricultural University, Jhansi, U.P.
ICAR-Indian Grassland and Fodder Research Institute, Jhansi, U.P.
ICAR-Central Agroforestry Research Institute, Jhansi, U.P.
Bundelkhand University, Jhansi, U.P.
Central Ayurveda Research Institute, Jhansi, U.P.

PHYTOCHEMICAL SCREENING AND ANTIMICROBIAL ACTIVITIES OF GUIZOTIA ABYSSINICA L. LEAF AND FLOWER EXTRACTS

Priyanka Prasad, Aadil Mansoori, Anirudh Kumar and Subha Narayan Das*

Department of Botany
Indira Gandhi National Tribal University, Amarkantak, Madhya Pradesh

ABSTRACT

Sustainable agricultural systems demand less or no use of synthetic chemicals, which has various adverse effects on the environment and human health. In this context, studies on phytochemicals with antimicrobial and antioxidant properties holds great promise to suppress plant diseases and, thereby, in reducing the application of synthetic chemical pesticides. Such alternative approach requires screening and identification of bioactive compounds from various plant species towards realizing their agricultural application. In the present study, *Guizotia abyssinica* L., an oilseed crop plant that requires less water with no pesticide inputs to grow, was screened for its potential antioxidant and antimicrobial phytochemicals. The methanolic and aqueous extracts of leaves and flowers from *G. abyssinica* were tested for their polyphenol content (total phenols and flavonoids) and antioxidant potential. The antioxidant and free radical scavenging activities of both methanolic and aqueous extracts were higher in comparison to many previously reported plant extracts. Furthermore, leaf extracts *G. abyssinica* have shown slightly higher antioxidant activity over flower extracts. The chemical nature and composition of these crude extracts were analyzed by FTIR and GC-MS. Approximately, 50 compounds detected in GC-MS were predicted to have antimicrobial activity. Additionally, *in vitro* antibacterial and antifungal studies confirmed the inhibitory effect of methanolic extracts of leaves and flowers against phytopathogens like *Xanthomonas oryzae* RR24, *Fusarium* sp. and *Alternaria* sp. Based on our results, we conclude that *G. abyssinica* extracts could be effective in suppressing the growth of phytopathogens and may contribute to sustainable agriculture in the future.

**PHYTONUTRIENT MEDIATED SYNTHESIS AND STABILIZATION OF
SILVER NANOPARTICLES FROM THE LEAF EXTRACT OF *JASMINUM
TORTUOSUM* AND STUDIES OF THEIR ANTIBACTERIAL EFFECTS**

M. P. Somashekarappa*

Department of PG Studies in Chemistry
IDSG College, Chikkamagaluru, Karnataka State, India

ABSTRACT

Aqueous extract of the leaves of a medicinal plant, *Jasminum tortuosum* was used to synthesize and stabilize the silver nanoparticles (AgNPs). The particles were characterized using Uv-visible extinction spectroscopy, scanning electron microscopy (SEM), transmission electron microscopy (TEM) and powder X-ray diffraction (PXRD) studies. The average particle size of the AgNPs worked out using PXRD data was 26-30 nm. Phytonutrients in the extract of the plant mediates the reduction of silver salt in to metallic silver and the metal crystallizes in to face centred cubic structure to form spherical to quasispherical particles. Inhibition effect of the nanoparticles against the spread of *Escherichia coli* (*E. coli*) and *Staphylococcus aureus* (*S. aureus*) were determined and compared with reference antibacterial substance ciprofloxacin. The AgNPs inhibit the growth of both *E. coli* and *S. aureus* bacteria.

POLICIES AND STRATEGIES FOR ORGANIC FARMING IN BUNDELKHAND REGION

Abhilasha^{1*}, Santosh Panday², Pawan Kumar Gupta³

^{1&2} Department of Agricultural Agronomy, Bundelkhand University, Jhansi

³ Department of Agricultural Extension, CoA, BUAT, Banda

ABSTRACT

Organic farming is a production system where all kinds of agricultural products are produced organically, including grains, meat, dairy, eggs, and fibers such as cotton, flowers and processed food products. Organic farming avoids or largely excludes the use of synthetic fertilizers, pesticides, growth regulators and livestock feed additives. Today very essential to interact in a constructive and life-enhancing way with natural systems and cycles, consider the wider social and ecological impact of the organic production and processing systems, encourage and enhance biological cycles within the farming system, involving microorganisms, soil flora and fauna, plants and animals, maintain and increase the long-term fertility of soils, and allow everyone involved in organic production and processing a quality of life which meets their basic needs and allows an adequate return and satisfaction from their work, including a safe working environment and make different types strategies as well as increase in awareness and health consciousness. Global consumers are increasingly looking for organic food which is considered safe, and hazard free and global prices of organic food are more lucrative and remunerative. The potential of organic farming is signified by the fact that the farm sector has abundant organic nutrient resources like livestock, water, crop residue, aquatic weeds, forest litter, urban, rural solid wastes and agro industries, bio-products. Natural or Organic farming a holistic system that focuses on improvement of soil health, use of local inputs, and relatively high- intensity use of local labor, is an admirable fit for dry lands in many ways, and the dry lands offer many benefits that would make it relatively easy to implement.

PRELIMINARY PHYTOCHEMICAL SCREENING OF SOLVENT EXTRACTS OF BACOPA MONNIERI

Chhaya Singh

Department of Microbiology and Biochemistry
Bundelkhand University, Jhansi, Uttar Pradesh, India.

ABSTRACT

Bacopa monnieri (L.) of the Scrophulariaceae family is a Medhya (nootropic) drug mentioned in Indian systems of medicine. Brahmi has a long history of medicinal properties such as brain stimulation, memory enhancement, anti-anxiety, anti-depressant, and anti-epileptic agents. The pharmacological properties of natural prescriptions are due to the presence of specific photochemicals in them, which offer a viable option in contrast to anti-toxins. The aim of the present study was to investigate the phytochemical screening of five organic solvent extracts of leaves and stems of *Bacopa monnieri* by using standard tests. Various solvents such as methanol, ethanol, petroleum ether, chloroform, and distilled water were used to extract the leaves and stems. The presence of the most phytochemical elements was found in ethanol, methanol, and aqueous extracts of both plant samples, followed by chloroform and petroleum ether extracts, which could be attributed to the polarity of solvents. The researcher discovered the presence of phytochemicals such as terpenoids, cardiac glycosides, tannins, steroids, phenols, flavonoids, carbohydrates, alkaloids, and amino acids, and the absence of saponins was detected. Thus, this study confirmed that the leaves and stems of *Bacopa monnieri* can be used as a giant supply for the improvement of the actions of drugs.

PRODUCTIVITY, QUALITY AND PROFITABILITY OF SCENTED RICE AS INFLUENCED BY PLANTING GEOMETRY AND NITROGEN LEVEL

Praveen B. R.^{1*}, O. P. Lathwal², Sandeep Kumar¹, Rakesh Kumar¹

¹ICAR-National Dairy Research Institute, Karnal, Haryana (India)

²Rice Research Station, Kaul, Kaithal, Haryana (India)

ABSTRACT

A field experiment was conducted during kharif 2018 at Research Farm of College of Agriculture, Kaul (CCS HAU, Hisar) to study the effect of planting geometry and nitrogen levels on productivity, quality and profitability of scented rice (Pusa 1121). The experiment was allotted with three planting geometry viz., 20 cm x 15 cm, 30 cm x 15 cm and 30 cm x 20 cm in the main plots and five nitrogen levels viz., 0 (control), 30, 60, 90 and 120 kg ha⁻¹ in sub plots by split plot design with four replications. The soil was sandy clay loam in texture with medium in organic carbon (0.54 %), low in available nitrogen (163 kg N ha⁻¹), medium in phosphorous (27 kg P₂O₅ ha⁻¹) and high in potassium (379 kg K₂O ha⁻¹). Number of tillers m⁻² and number of effective tillers m⁻² were significantly higher with 20 cm x 15 cm and 120 kg N ha⁻¹. Whereas, number of grains panicle⁻¹ was significantly higher with 30 cm x 20 cm and 120 kg N ha⁻¹. Test weight was found non significant with planting geometry but significantly higher at 120 kg N ha⁻¹. Grain yield and biological yield were significantly higher with 20 cm x 15 cm (4394 and 10333 kg ha⁻¹, respectively) and at 120 kg N ha⁻¹ (4458 and 10287 kg ha⁻¹, respectively). Harvest index, kernel length, breadth, kernel length: breadth (L: B) ratio were found non significant with both planting geometry and nitrogen level. However, highest protein content was recorded at 120 kg N ha⁻¹. Hulling %, milling % and head rice recovery % were significantly higher at 30 cm x 20 cm and 120 kg N ha⁻¹. Highest net return and benefit: cost (B: C) ratio were obtained with 20 cm x 15 cm and at 120 kg N ha⁻¹. Hence, the cultivation of scented rice (Pusa 1121) was found economical when it was transplanted at planting geometry of 20 cm x 15 cm and supplied with 120 kg N ha⁻¹.

PROSPECTS OF ARTIFICIAL INTELLIGENCE IN AGRICULTURE

Deepak Kumar Pathak¹, Rajeev Ranjan Patel², Navneet Maurya³ and Manoj Kumar⁴

^{1,2&3}Department of Agricultural Extension BUAT, Banda (UP)

⁴Department of Agricultural Extension, SVPUAT, Meerut (UP)

ABSTRACT

AI is the intelligence exhibited by machines, rather than human or other animals. The intelligent agents which perceive its environment and takes action to maximize the success (Russel et al., 2003). Invented by Herbert Simon (1965). Word coined by John McCarthy. Is not 'Man Vs Machine' but is 'Man and Machine' synergy. AI will benefit most to Medicine sector. Capability of a machine to imitate intelligent human behavior. Perform tasks that normally require human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages. AI used in agriculture like automated farming activities, identification of pest and disease outbreak before occurrence, managing crop quality, monitoring biotic. abiotic factors and stress, machine vision systems and phenotype lead to adjustments. Recent development in India like AI-Powered data driven supply chain optimization platform by Matrix Partners India in New Delhi, PEAT, Earth Food and V Drone Agro use AI to assess soil conditions over the cloud, SatSure in India, assess imageries of farms and predict monetary prospects of their future yield, Monsanto had trained the AI algorithms for 15 years which could predict the corn variety's highest performance in the first-year trial. Applications of Artificial Intelligence in agriculture like Automated Irrigation System, Drones for spraying, Remote sensing-based crop health monitoring, Face recognition system for domestic cattle, blue river technology, Decision Support System for Green House, Green House Climate Controller with AI-Based Techniques etc. Limitations of AI in agriculture like it is expensive, joblessness, hackers can exploit AI solutions to collect private and sensitive information. The AI can be programmed to do something devastating. If programmed to do something beneficial, but it develops a destructive method for achieving its goal, it can be dangerous. Adopt a deliberate policy to drive AI innovation, adaptation and proliferation in all sectors. Policymakers should make AI a critical component flagship programmes such as Make in India, Skill India and Digital India. The farmers should seek cognitive technologies (e.g. AI) to maximize return on crops Farmers should be directed to precision agriculture, AI can be the best tool to assist it. AI can be appropriate and efficacious in agriculture sector as it optimizes the resource use and efficiency. It solves the scarcity of resources and labour to a large extent. Adoption of AI is quite useful in agriculture. Artificial intelligence can be technological revolution and boom in agriculture to feed the increasing human population of world. Artificial intelligence will complement and challenge to make right decision by farmers. Keywords- Intelligent agents, Innovation, DSS, Digital India, Precision Agriculture

QUADRATIC MODEL FOR PREDICTING PEAK YIELD OF *CURCUMA LONGA* IN RESPONSE TO OPTIMUM DOSE OF NITROGEN FERTILIZER

Umakanta Dash¹, Shilpa², Sourav Ranjan Mohapatra³ and Ankita Bhardwaj⁴

^{1&4}Department of Silviculture and Agroforestry

³Department of Forest Biology and Tree Improvement
Kerala Agricultural University, Thrissur

²Department of Silviculture and Agroforestry
Dr YS Parmar University of Horticulture and Forestry, Himachal Pradesh

ABSTRACT

Nitrogen is the main promoter of crop growth and yield, therefore it is important to improve management practices that minimize N losses and increase the recovery of applied N by the crop. It is economically and environmentally imperative to determine the optimum amount of nitrogen needed by plants. In this context, an on-farm experiment was carried out near Solan, Himachal Pradesh, India during kharif 2019-2020 where *Curcuma longa* was grown under *Populus deltoides* supplied with eight nutrient sources viz. T₁; Control, T₂; 100 % RDNF (recommended dose of nitrogen fertilizer), T₃; 75 % RDNF + 25 % RDN (recommended dose of nitrogen) through FYM (farm yard manure), T₄; 50 % RDNF + 50 % RDN through FYM, T₅; 25 % RDNF + 75 % RDN through FYM, T₆; 100 % RDN through FYM, T₇; 100 % RDN through VC (vermicompost), T₈; Jeevamrut (10 %). Furthermore, the relationship between the optimum nitrogen dose and *C. longa* yield was defined by using a quadratic equation i.e.

**QUALITATIVE ASSESSMENT OF TREATED WASTEWATER BY
CONSTRUCTED WETLAND FOR IRRIGATION PURPOSE.**

Shubham Kumar

Central University of South Bihar, Gaya, Bihar

ABSTRACT

The use of raw waste water for irrigation is becoming increasingly common. However, raw waste water is often contaminated and can cause environmental harm and pose health risks too. Nevertheless, it is used without any significant treatment and is considered safe. This study aims to develop a green, sustainable, cost-efficient, energy-efficient, and easily handled system, that would allow safe and sustainable use of raw waste water for irrigation purposes at a smaller level. The system is based on a nature-based treatment method called constructed wetland (CW). The property of CW, removal efficiency, and the environmental effects of the treated wastewater were studied. The treatment efficiency in the form of removal % of different water quality parameters like TSS, BOD, COD, NO₃-N, and PO₄ had seen in the range of 58-92%. The treated wastewater has no significant negative impact on plants or soil during the study period. We concluded that the nature-based CW system is a sustainable and promising treatment system for campus wastewater and its use for irrigation purposes.

Organized jointly by

National Environmental Science Academy (NESA), New Delhi
Rani Lakshmi Bai Central Agricultural University, Jhansi, U.P.
ICAR-Indian Grassland and Fodder Research Institute, Jhansi, U.P.
ICAR-Central Agroforestry Research Institute, Jhansi, U.P.
Bundelkhand University, Jhansi, U.P.
Central Ayurveda Research Institute, Jhansi, U.P.

QUANTIFICATION OF POLLINATION ECOSYSTEM SERVICES OF INDIAN MUSTARD FROM THE IMPACTS OF TROPOSPHERIC OZONE AND ELEVATED CARBON DIOXIDE INTERACTION

**Gayathri J¹, D.K. Sharma¹, Arti Bhatia¹, Manjunath Prasad C.T.²,
Sudhir Kumar³, Sachin Suresh Suroshe⁴ and Naresh Kumar S¹**

¹Division of Environmental Science, Indian Agricultural Research Institute, New Delhi

²Division of Seed Science and Technology, Indian Agricultural Research Institute, New Delhi

³Division of Crop Physiology, Indian Agricultural Research Institute, New Delhi

⁴Division of Entomology, Indian Agricultural Research Institute, New Delhi

ABSTRACT

In the past few decades, tropospheric ozone (O₃) a short-lived secondary air pollutant and greenhouse gases (GHG) concentration escalating due to human activities (rapid industrialization, urbanization, and increased vehicle traffic) are causing substantial climate change (Griffiths et al., 2021). As per the 5th assessment report of Intergovernmental Panel on Climate Change (IPCC), tropospheric ozone concentration projects an increase of about 20-25% by 2050 across the globe. Atmospheric CO₂ concentrations (385 ppm) have increased by at least 35%, since the start of the industrial revolution and are forecasted to reach 540–970 ppm by the year 2100. Understanding of plant responses to rising atmospheric CO₂ and O₃ is fundamental to forecast future atmospheric composition and global climate, global net primary productivity and ecosystem service provisioning, and remains one of the largest uncertainties in global terrestrial models. Ecosystem Services are the components of nature that benefits human by goods and services directly or indirectly which are usually taken for granted. The concept of Ecosystem Services are focused in a broader way after the publication by UN in Millennium Ecosystem Assessment (2005). Pollination is one among the critical component of biodiversity is becoming a critical service and being threatened at an alarming rate (Bako et al., 2021). The pollination ecosystem services of undeniable economic values are linked with human well-being by agricultural production and food security. Knowingly or unknowingly, about 35% of global crop production is contributed by biotic pollinators. Recently, from the pollinators of commercial agriculture, the worldwide economic benefit is estimated to be over €550 billion per annum (IPBES, 2016). Rapeseed-mustard (*Brassica spp.*) is grown as a major oilseed crop in 53 countries across six continents, and is used mainly for culinary purposes. In India, mustard is mainly grown in the northern and eastern parts of the country which ranks 3rd position in oilseed production and ranked 3rd globally after Canada and China sharing about 11% of the global rapeseed-mustard production and 24.7% and 29.4% in terms of area and production (2018-19) (ICAR-DRMR). There is increase in strong agreement among scientists which revealed that the climate change influence in threatening pollinators and agriculture thus scientific evidence to support this is slowly amassing. Thus, the study intended us to focus on quantification of pollination ecosystem services of Indian Mustard under Tropospheric ozone and Carbon dioxide interactions. In the preliminary study the pollinators foraging behavior, Pollen-pistil interaction (Stigma receptivity, pollen viability and pollen germination) and yield were assessed.

**RADIAL AND LONGITUDINAL SWELLING
BEHAVIOUR IN *MELIA DUBIA* CAV.**

**Toshika Karmakar, Amey Kale, Vinod Kumar,
Jahangeer A. Bhat and Manmohan J. Dobriyal**

College of Horticulture and Forestry
Rani Lakshmi Bai Central Agricultural University, Jhansi

ABSTRACT

Melia dubia is the emerging indigenous secondary timber species in India. Economically important tree species, taken up as Agroforestry tree; being grown in many parts of the country. Tree grows best in moist regions with annual rainfall beyond 1,000 mm. optimum temperature of 30-35 °C (can tolerate maximum temperature of 45 °C). Wood is suitable pulp and paper, pencil, plywood, matchstick and pole industries. Short rotation tree like *Melia dubia* is key species in bridging the gap between ever increasing demand and supply of timber. Being a plantation grown timber, swelling in wood is one of the concern in utilization. During the service life of the plywood because of the moisture uptake, delamination of veneers, glue failures are the major defects. Hence study of swelling behaviour of *Melia dubia* wood was carried out in 33 and 75% Relative Humidity (RH) and under total submerged conditions.

RECLAMATION OF PESTICIDES CONTAMINATED SOIL AND WATER USING BIOCHAR: A REVIEW ON ADSORPTION POTENTIAL OF BIOCHAR

Akriti Ashesh and Ningombam Linthoingambi Devi

Department of Environmental Sciences
Central University of South Bihar, SH-7 Gaya-Panchanpur Road, Gaya, Bihar, India

ABSTRACT

The application of agrochemicals into the environmental matrix has sluggishly degraded the quality of their original form. Pesticide consumption in agricultural sector has been used for the quantity production of crops however, now consider as a culprit for the quality crops. Lands that once provided ample crops of good quality are now facing a case of severe damage impacting their crop quality. The prime need is to reclaim these contaminated matrices. For the same, an eco-friendly approach should be adopted. One such approach is the application of biochar for pesticide sorption. Biochar is a carbon-rich, stabilized product acquired when biomass undergoes pyrolysis at 200-650°C. It is known for sequestration ability and mitigation of environmental contaminants. Its properties (surface area, pore size, ash contents, and functional groups) determine the potential for sorption. Biochar when modified is most effective for the sorption mechanism. For instance, rice straw biochar when treated with phosphoric acid (T-RSBC) showed stronger adsorption capacity for sorption in wastewater effluent. Corn straw when doped with phosphorus functional groups was highly effective for adsorption of triazine pesticide from water. Other biochar that could remove pesticides are corn cob and corn starch. Activated coconut shell biochar showed the highest adsorption capacity for diazinon removal from water than other modified coconut shell biochar. Plant biochar (pine needle, oak wood, corn stover) having a high content of lignin have better properties such as large surface areas ($112-642 \text{ m}^2\text{g}^{-1}$) and macropores ($0.06-1.90 \text{ cm}^3\text{g}^{-1}$) that increase the sorption capacity of pesticides in soils than animal and cellulose-based biochar. This review paper aims to evaluate the role of biochar in the sorption of pesticides from soil and water.

REMOTE SENSING AND GIS ANALYSIS FOR LAND COVER CHANGE ASSESSMENT

¹Kiran Doodhawal, ¹R.H. Meena, ²Hansa Baradwal and ¹Jitendra Singh Bamboriya

¹Rajasthan college of Agriculture, MPUAT, Udaipur

²Bundelkhand University, Jhansi

ABSTRACT

Land use land cover (LULC) change detection based on remote sensing data is an important source of information for various decision support systems. Information derived from land use and land cover change detection is important to land conservation, sustainable development, and management of water resources. This purpose of this study is therefore concerned with identifying the change in land use and land cover detection. To identify land cover changes detection; remote sensing data, satellite imagery and image processing techniques had done within three dates of 1986, 2002 and 2018 using Land sat TM 30 m resolution images. The aim of change detection process is to recognize LULC on digital images that change features of interest between two or more dates. There are many techniques developed in literature using post classification comparison, conventional image differentiation, using image ratio, image regression, and manual on-screen digitization of change principal components analysis and multi date image classification.

RESIDUES OF PESTICIDE IN HINDON RIVER FLOWING THROUGH URBAN RICE CROPPING AREA

T. Jindal and S. Thakur

Amity Institute for Environmental Toxicology, Safety and Management
Amity University, Noida, Uttar Pradesh, India

ABSTRACT

Rice is the staple food of Asia and part of the Pacific. Over 90 % of the world's rice is produced and consumed in the Asia-Pacific Region. The irrigated rice area currently occupies about 56% of the total area and contributes 76% of the total production. The high water requirements and the heavy pesticide load used in rice in India have resulted in contamination of associated surface water, such as streams, ditches, rivers and lakes. There are several reports on the indiscriminate use of pesticide cocktail in heavy doses by farmers in the fields. Farmers use higher doses ignoring the prescribed dosages assuming that the pesticide formulations are either adulterated or do not have the prescribed active ingredient of optimum quantity. This leads to severe contamination of the soil besides the agricultural produce may carry high pesticide residues. The status of drinking water supplied to the common people in this context is a matter of great concern. Therefore a study was undertaken to analyse the contamination by pesticide residue in surface water samples of rice growing areas along with survey for pesticide use and rice varieties grown by farmers.

In this study, an effort has been made to evaluate the residues of selected pesticide in surface water collected from Hindon River flowing near the rice farms growing area of Greater Noida, Uttar Pradesh. Gas Chromatography with ECD and NPD detector and HPLC was used to determine the concentration of pesticide and herbicide residues. Table 1, 2 and graph 1 shows the results obtained so far for organochlorine, organo phosphorous and herbicides. Concentration of organochlorine pesticide residues analysed ranged from 0.007- 2.211 $\mu\text{g/L}$ in surface samples. Organo phosphate pesticide residues ranged from 0.011 to 1.919 $\mu\text{g/L}$ in surface samples, respectively. However all the synthetic pyrethroids were found below detectable limit, while the herbicide ranged from 0.030 to 0.924 $\mu\text{g/L}$ in surface samples, respectively.

RESPONSES IN PHOTOSYSTEM PROTECTION AND CELLULAR ANTIOXIDANT DEFENSE SYSTEM IN *PONGAMIA PINNATA* (L.) PIERRE

Badre Alam, Sukumar Taria, Sushil Kumar and A.K. Handa

ICAR-Central Agroforestry Research Institute
Gwalior Road, Jhansi, Uttar Pradesh, India

ABSTRACT

The adverse impact of climate change has been the major focus in all segments of life including the agriculture. Perennials, especially multipurpose trees can play remarkable role to cope with the changing climate. However, emphasis on the trees in this context is gaining momentum lately as most of the attention has been on the crops. Increasing atmospheric dryness, high temperature and drought are among the many to be of grave concern. Due to changing climate scenarios, for future preparedness for the promising trees, it is important to understand how the trees are managing the constraints. Thus, the study aimed to understand how the multipurpose biofuel tree species *Pongamia pinnata* (L.) Pierre manage the climatic constraints namely hot summer atmospheric harshness through protecting photosystem from cellular oxidative stresses and to get the insights on it. The experiments were conducted with mature trees of clonal and seedlings *P. pinnata* during dry hot summer at the central research farm of CAFRI, Jhansi where the peak summer day temperature reached about 47°C. Most important and vital functions of photosystem activities were highly downregulated. The inhibited photosystem functions have been evidenced in the decrease in CO₂ assimilation rate (Pn), maximum potential quantum yield of photosystem-2 (Fv/Fm), light dependent PS2 quantum yield (Φ_{PS2}) and other associated photosystem functioning. The estimated values in Pn, Fv/Fm and Φ_{PS2} in clonal plants during summer were about 70%, 25% and 34% higher than the seedling plants respectively. In defending oxidative stress, peroxidase activity was about 58% higher in clonal plants in hot summer than the seedling plants. The photosystem activities during the hot summer in clonal plants were noted comparatively better than the seedling plants indicating the better tolerance potential in the clonal plants. It was evident that the clonal plants maintained better physiological functioning in the harsh dry climate by protecting the photosystems from stress-induced cellular oxidative stress. Better photosystem protection in clonal plants have been supported in the higher antioxidant activities resulting in less lipid peroxidative damage to cope with harsh hot climate.

**REVIEW ON PLANT TISSUE CULTURE :
A SOURCE OF PHYTO-PHARMACEUTICALS**

Harjeet Singh¹, Gagandeep Singh, Charul Anand and G. Babu

¹Central Ayurveda Research Institute, CCRAS, Ministry of AYUSH, Jhansi

ABSTRACT

Since ancient times, plants have been used in the form of medicines in various traditional systems like Ayurveda, Unani, Homeopathy, Chinese and Siddha. Plants have been a potential source of natural products from various plant parts like root, stem, leaf and bark. Plants usually produce primary and secondary metabolites and use of plant tissue culture for production of secondary metabolites is quite common. The plant cells offer a novel route for the synthesis of a wide array of secondary metabolites, many of which are used as valuable drugs. Some of these are difficult to synthesize by conventional methods. The morphology and chemical totipotency of plant cells enables any cell of plant for the synthesis of compounds produced by the intact plant. The secondary metabolites on plant cell cultures can be significantly enhanced by elicitation, precursor feeding, media modification, hairy root culture, immobilization of plant cells, biotransformation or by manipulating culture conditions.

ROLE OF ADVANCED TOOLS AND TECHNIQUES LIKE INFORMATION TECHNOLOGY, BIG DATA ANALYSIS AND ARTIFICIAL INTELLIGENCE IN AGRICULTURE

Kandi Laxmi Prasanna

Acharya Narendra Deva University of Agriculture and Technology
Ayodya, Uttar Pradesh

ABSTRACT

Many techniques have been invented in recent years and will bring a huge revolutionary change in the future. The applications like artificial intelligence, big data analysis and information technology have partially started taking interventions in agriculture. Firstly, Artificial Intelligence has proved its flexibility through a 10% increase in production from unused lands, besides its programs like Management-oriented modeling (MOM), PROLOG proved that they utilize weather data, machinery capacities, labor availability, implements, etc., for evaluating the operational behavior of agriculture. Secondly, Information and Communication Technology (ICT) plays a substantial role in developing agricultural growth through various types of equipments to attain economic sustainability and self-reliance. The most trending usage of ICT is Agriculture Information System (AIS). Agriculture Information System (AIS) is a system that contains all the information related to agriculture which is helping farmers in managing information and policy decision making. Thirdly, Big Data analytics can be defined as the processes of collecting, organizing, curing, and analyzing the patterns and trends that can take place in agriculture. In the market, there are many industry-standard Big Data analytical tools like Hadoop, MapReduce, HDFS, HIVE, HBase where Hadoop is open-source multi-task software for data storage and running analytics in computers, MapReduce is a model for BD processing with parallel and distributed algorithm, and HDFS is a Java-based file system which is scalable and reliable that gives a smooth functioning on precisions of data of agriculture. Finally, the adoption of ICT, AI, and BD Analytics, in particular, is growing at a remarkable rate in developing countries

ROLE OF ENDOPHYTIC MICROBES IN BIOTIC AND ABIOTIC STRESS TOLERANCE

**Rohitash Sharma¹, Deepak Gupta¹, Basant Kumar Dadarwal², Preeti Basser³
Harshit Chaturvedi¹, Gopi Krishan Gour¹ and Mahendra Kumar Ghasoliya¹**

¹Department of Genetics and Plant Breeding, SKN Agriculture University, Jobner, Rajasthan

²Department of Plant physiology, Banaras Hindu University, UP

³Department of Genetics and Plant Breeding, MPUAT UDAIPUR

ABSTRACT

Abiotic stresses such as drought, salinity, heat, and soil pH are major limiting factors that affect crop productivity worldwide as a result of their debilitating effects on all plant functions. Plants host a number of fungi and bacteria within their tissues much like the gut in humans. In plants, microorganisms that are present, but do not cause disease symptoms, are called endophyte. Endophytic associations can either be commensal (there is no effect on the host by the organism), parasitic (the fungi or bacteria benefit, but there is no benefit to the host), or mutualistic (the host receives some benefit by having the organism present). They have several beneficial effects on host plants such as plant growth promotion and increased resistance against plant pathogens and parasites. Furthermore, endophytic bacteria have recently been discovered to mitigate the adverse effects of abiotic stress on the host plant. This article focuses on the potential of endophytic microbes that induce abiotic stress tolerance in plants.

ROLE OF ICT (INFORMATION COMMUNICATION & TECHNOLOGY) IN SUSTAINABLE DEVELOPMENT OF AGRICULTURE

Abhinav Singh¹ and Virendra Pratap²

Acharya Narendra Deva University of Agriculture and Technology
Kumarganj Ayodhya, Uttar Pradesh

ABSTRACT

ICTs is a broader term for Information and Communication Technology (ICT). Which refer to all communication technologies, including the internet, wireless network, cell phones, computer, software, middleware, video-conferencing, social networking, and other media application and services. Information and Communication Technology (ICT) plays a substantial role in developing agricultural growth through the use of various devices to attain economic sustainability and self-reliance. It was found that improvement of market activities, exchange of relevant information, profit gain, networking agricultural sector globally, conducting research and strategizing economic growth for self-reliance are among the possible benefits of ICT in agricultural sector. Likewise, the review identified inadequate ICT facilities, lack of personnel, insufficient infrastructure, harmonization of knowledge and language, power supply and farmers' perception are some of the challenges and issues that obstruct successful implementation of ICT in agricultural growth. It was concluded that more research need be conducted in order to draw relevant ideas and suggestions that will enhance fruitful implementation of ICT to develop sustainable agriculture.

ROLE OF LEGUMES IN SUSTAINABLE CROP PRODUCTION AND MAINTAIN SOIL FERTILITY

Anil Jakhar¹, Sarita Choudhary² and Preeti Chahar²

¹Department of Agronomy, RLBCAU, Jhansi (U.P)

²Department of Soil Science and Agricultural Chemistry
Rajasthan College of Agriculture, MPUAT, Udaipur (Rajasthan)

ABSTRACT

Legumes, a group of the plant of Fabaceae family are the most cultivated in the tropics and subtropics of both southern Asia and Central America. These are the vital source of protein for human and animals. Apart from their uses as food and fodder they have a very important role in maintaining soil fertility by fixing atmospheric nitrogen (BNF) and improving soil structures and adding organic matter. Statistics on food demand and fertilizer requirements highlight the dependence on foreign imports of fertilizer for food crop production. However, legume crops have a potentially important role to play in increasing indigenous nitrogen production, besides meeting human demands for protein and energy. Some legumes have the ability to solubilize otherwise unavailable phosphate by excreting organic acids from their roots, in addition to improving soil fertility. Legumes also help to restore soil organic matter and reduce pest and disease problems when used in rotation with non-leguminous crops. In the north-eastern Indian Himalaya, indigenous legumes such as rice bean, jack bean and tree bean are more nutritious than other legumes and offer major scope to restore soil fertility. The intercropping systems are useful in terms of increasing productivity and profitability, water and radiation use efficiency, control of weeds, pests and diseases. The critical role of biological nitrogen fixation and the amounts of N transferred to associated non-leguminous crops determines the extent of benefits. In intercropping, land equivalent ratio (LER), benefit cost ratio (BCR) and monetary advantage index (MAI) are used to assess the productivity and its economic benefits. It also improves environmental quality by sequestering carbon and mitigating other pollutants. Legumes are also a potential plant group in which some of the species having a capacity of remediating toxic metals and organic pollutants. Based, on the available literature legumes are found to be a jack of all trades in providing food security maintaining agricultural sustainability.

CHARACTERIZATION OF ELITE COTTON (*GOSSYPIUM HIRSUTUM* L. AND *GOSSYPIUM ARBOREUM* L.) GENOTYPES UNDER ORGANIC CONDITION

Pardeep Beniwal

Department of Plant Breeding & Genetics
College of Agriculture, Gwalior

ABSTRACT

Cotton (*Gossypium* spp.) is one of the most widely cultivated crops, with more than 80 countries growing it in a wide range of climatic conditions. Cotton is the world's most important source of fibre for industry, as well as of oil for human consumption. Cotton hybrids are used by farmers to increase production, reduce the diversity of cotton genotypes. Indeed, identification and characterization is very important for sustainable use and proper conservation of Plant Genetic Resources (PGR). The characterization of genotypes with the use of a proper set of primers is the best method for identifying various genotypes. *G. hirsutum* is thought to have more genetic diversity than the other three cultivated cotton species (Wendel et al., 1993). According to many studies, the modern *G. hirsutum* gene pool is relatively small, including the result from DNA fingerprinting studies using restriction fragment length polymorphism (RFLP) (Iqbal et al., 2001), single nucleotide polymorphisms (SNP) markers (Hinze et al., 2017) and simple sequence repeat (SSR) markers (Tyagi et al., 2014; Bertini et al., 2006). Modern hybrid cotton varieties are genetically susceptible to diseases, pests, and environmental stresses due to its narrow genetic base which threatens the growth of cotton cultivars and sustained genetic gain. As a result, characterization and identification of cotton genotypes with a suitable method like use of molecular markers are very important.

ROLE OF REMOTE SENSING IN AGRICULTURE

Kaptan Baboo¹, Vishuddha Nand² and Shivanand Maurya¹

¹Department of Agronomy,
Acharya Narendra Deva University of Agriculture & Technology, Kumarganj Ayodhya, U.P.

²Department of Agronomy
Acharya Narendra Deva University of Agriculture & Technology, Kumarganj Ayodhya, U.P.

ABSTRACT

Agriculture provides humanity with food, fibers, fuel, and raw materials that are paramount for human livelihood. Today, this role must be satisfied within a context of environmental sustainability and climate change, combined with an unprecedented and still-expanding human population size, while maintaining the viability of agricultural activities to ensure both subsistence and livelihoods. Remote sensing has the capacity to assist the adaptive evolution of agricultural practices in order to face this major challenge, by providing repetitive information on crop status throughout the season at different scales and for different actors. Remote sensing technology uses the visible, infrared and microwave regions of radiation to collect information about the various objects on the earth surface. The typical responses are used to distinguish object such as vegetation, water, bare soil, concert and other similar features. We present the agronomical variables and plant traits that can be estimated by remote sensing, and we describe the empirical and deterministic approaches to retrieve them. A second part of this review illustrates recent research developments that permit to strengthen applicative capabilities in remote sensing according to specific requirements for different types of stakeholders. Such agricultural applications include crop breeding, agricultural land use monitoring, crop yield forecasting, as well as ecosystem services in relation to soil and water resources or biodiversity loss. Finally, we provide a synthesis of the emerging opportunities that should strengthen the role of remote sensing in providing operational, efficient and long-term services for agricultural applications.

**ROLE OF TREES IN ECOSYSTEM SERVICES:
A STUDY OF A GREEN CAMPUS, NEW DELHI**

Mayank Tiwari and Shakeel Ahmad Khan

Division of Environment Science
NRL Building, IARI, New Delhi

ABSTRACT

Trees indeed are remarkable species owing to their extraordinary services in ecosystem dynamics. As a step towards green campus initiative, a study to estimate the arboreal carbon storage (regulating ecosystem service) and APTI (Air pollution Tolerance Index) of various tree species at Indian Agricultural Research Institute (IARI), New Delhi campus has been done through field survey, laboratory analysis and by implication of allometric equations. Two parameters namely tree height and diameter at breast height (DBH) of total 5,368 individual native trees belonging to 64 diverse species and 27 different families were employed to determine their above ground biomass (AGB), below ground biomass (BGB), carbon storage, CO₂ equivalent and APTI. The prominent carbon storing trees were identified as *Terminalia arjuna* (14.18 tons) > *Ficus religiosa* (11.62 tons) > *Eucalyptus tereticornis* (9.18 tons) > *Syzygium cumini* (7.14 tons) > *Azadirachta indica* (6.80 tons) > *Ficus virens* (5.72 tons) > *Dalbergia sissoo* (4.04 tons). The girth of the tree was found to be positively correlated with carbon storage value of tree ($R^2 = 0.72$). Total 119.31 tons carbon is stored by 64 individual tree species of IARI campus which is 436.83 tons in terms of CO₂ equivalent. Therefore, these species should be preferred during afforestation and plantation programs of any area. Thus, protection and preservation of native trees of the IARI campus is crucial to maintain the carbon stock. Further, trees like *Terminalia arjuna*, *Ficus religiosa* and *Azadirachta indica* possess great ability to mitigate air pollution as it is evident by their APTI values. Hence in addition to providing excellent carbon storage abilities in their biomass, these trees can further be recommended for planting in the regions which are rigorously air polluted.

**ROLE OF VALUE-CHAIN ANALYSIS OF HORTICULTURAL CROPS:
A BOON FOR LIVELIHOOD SECURITY OF FARMERS IN
BUNDELKHAND REGION OF UTTAR PRADESH**

Pawan Kumar Gupta, Dheeraj Mishra, Rajeev Ranjan Patel, Deepak Kumar Pathak

Department of Agricultural Extension, CoA, BUAT, Banda

ABSTRACT

Value chain encompasses full range of activities from the production, distribution, processing, transporting and value addition, finally to the end consumer. In Horticultural sector in Bundelkhand Region, value chain analysis provides us an opportunity to map the chain, locate the actors involved as well as understand the different challenges in the movement of the product from the producers to the consumers. The agri-climatic diversity of Bundelkhand Region presents varied opportunities in terms of production as well as distribution of the horticultural crops. We tried to analyze the mainly district Banda, Chitrakoot, Mahoba, and Hamirpur of the Bundelkhand regions. Based on the current production, area and productivity we analyzed the area and the value chain in each of the region. While the production was significant for the total horticultural sector, there were issues in the value chain efficiency and high perishability and lower marketing infrastructural capacity affected the overall progress of the sector in the Bundelkhand region. This lowers down the total remuneration accrued to the farmers. Proper infrastructural development like road connectivity, communication networking and adequate agricultural information dissemination at regular intervals is critical for better productivity and production of the horticultural crops in the Bundelkhand region. Overall, value chain analysis helps us understand the problems at each level of the production, value addition and transportation.

ROLE OF WRKY GENE IN THE DEVELOPMENT OF DROUGHT TOLERANT TOMATO VARIETIES

Pratibha Pandey, S.P. Mishra, ¹Major Singh and ²A.K. Pandey

Department of Crop Sciences, Faculty of Agriculture, M.G.C.G.V.V. Chitrakoot, M.P.

¹ICAR-Directorate of Onion and Garlic Research, Rajgurunagar, Pune

²College of Horticulture & Forestry, Central Bundelkhand University, Jhansi, U.P.

ABSTRACT

Tomato (*Solanum lycopersicum*, syn. *Lycopersicon esculentum* L.) is an important member of the Solanaceae family with over 152 million tons annual production. In India, tomato growth and productivity is being challenged due to various abiotic stresses especially drought. Most of the commercial tomato cultivars are considered to be moderate to highly sensitive to drought stress. The WRKY transcription factor are important and best characterized transcription factors in plants known to confer tolerance towards drought, cold and light. WRKY proteins belong to the WRKY-GCM1 super family of zinc finger transcription factors that evolved from Mutator or Mutator like (Mule) transposases. For exploring the role of WRKY TF's in stress tolerance, Seeds of the drought-tolerant and drought-sensitive lines were collected from the germplasm section of the Indian Institute of Vegetable Research, Varanasi and were sown in pots (30.0 cm diameter and 30.0 cm height) filled with a mixture of soil and compost. Germinated seedlings were maintained at 25°C under optimal conditions in a glass house with regular watering to induce expression of the target genes, drought stress treatments were given to 3-month-old plants by withholding water for 21, 14 and 7 days. After treatment, leaves were taken frozen in liquid nitrogen, and stored at -80°C for further analysis. For physiological, biochemical and molecular analysis, samples were taken in three biological replications from root, stem, leaf and flower of tolerant and susceptible line. The physiological and biochemical analysis revealed that drought susceptible tomato lines have increased relative water content (RWC), low electrolyte leakage (EL), improved chlorophyll color index (CCI), decreased H₂O₂ formation and lowered malondialdehyde (MDA) content. The significant and consistent changes in the activities of antioxidant enzymes superoxide dismutase, catalase, ascorbate peroxidase and glutathione reductase and in enzyme peroxidase paralleled with an increased proline accumulation were observed. The results strongly suggesting EC-520061 to have significantly increased levels of drought tolerance and real potential for molecular breeding programs aimed at augmenting yield of tomato in regions affected with drought stress.

Expression profiling revealed that 62 WRKY genes were grouped in six sub groups i.e. group I, group IIa + IIb, group IIc, group IId, + IIe, group III. The analysis of qRT-PCR results indicated the characteristic expression patterns revealed by each group independently. All the WRKY genes of Group I were up-regulated under drought stress except *SIWRKY33* (13.26) followed by *SIWRKY18* (10.26). The group IIc genes exhibited mixed pattern of expression where down-regulation was less significant (<2 fold). Three genes of this group viz. *SIWRKY30*, *SIWRKY83* and *SIWRKY75*, revealed significant up-regulation. Similarly, most of the WRKY genes of Group IId + IIe were also up-regulated with only three genes showing down-regulation. Here, highest expression was observed for *SIWRKY77* followed by *SIWRKY79*. In case of Group IIa + IIb, only one gene, *SIWRKY72*, was highly up-regulated (36 fold) while other genes depicted mixed pattern of expression. The most peculiar results were observed in Group III where a single gene, *SIWRKY58* was exceedingly up-regulated (125 fold) while almost all other members were found to be down-regulated. The present results of *SIWRKY58* establish its role in drought stress as well supporting the results in cotton. Based on the results of the present study it is concluded that the potentially superior genetically engineered WRKY transformed tomato genotypes can be developed, that have inherent capacity to withstand drought. Results also indicate that EC-520061 genotype have overall abiotic stress resistance in tomato and leads to decreased production of free radicals reducing thereby the oxidative stress in the tissues. The present expression study will also be useful to annotate drought related WRKY proteins. Nine WRKY genes, particularly WRKY58, which were significantly induced by drought, can be further used as targets for drought tolerant transgenics, either individually or in combination with other gene(s).

SCREENING OF NUTRITIONAL RICH WHEAT (*TRITICUM AESTIVUM* L.) VARIETY FOR CENTRAL PLAIN ZONE OF U.P.

A.K. Srivastava, Deepu, Mamta Rathore and H.G. Prakash

C.S. Azad University of Agriculture & Technology
Kanpur, U.P India

ABSTRACT

A field experiment was conducted during Rabi season of 2020-21 at S.I.F. of C.S. Azad University of Agriculture and Technology, Kanpur U.P. India, on Screening of Nutritional rich wheat (*Triticum aestivum* L.) variety for Central Plain Zone of U.P. with an objective to find out the nutritive status and yield potentiality of varieties sown under late sown condition. The 8 varieties (V1- K307, V2- K9107, V3- KD9851, V4- K7903, V5-K1006, V6-K1317, V7-K8434 and V8-K424) were tested in Randomized Block Design with three replications. Result showed that among the eight wheat variety V5(K1006) recorded the highest grain yield (52.50 q/ha) and net income (Rs. 96988/ha) in comparison to all other varieties. The minimum grain yield (27.80 q/ha) and net income (Rs. 34005/ha) was recorded under the varieties V6(K1317). For the nutritive point of view the cultivar V3 i.e KD9851 contain highest proteien (16.36%), and carbohydrate i.e (15.56%). The lowest carbohydrate contain Varieties is V7(K8434) i.e 6.89% and V1 (K307) 7.23%.

SCREENING STRATEGY FOR HIGH TEMPERATURE TOLERANCE IN GARDEN PEA

Janani R. and Shri Dhar

Division of Vegetable Science
ICAR-Indian Agricultural Research Institute, New Delhi

ABSTRACT

Garden pea is a cool season crop, grown during winter in North Indian plains and summer in hills. The optimum temperature range is 15-23°C and growth stops above 30°C (Lambert and Linck, 1958). In the rising global temperature, there is a dire need to bred garden pea varieties tolerant to high temperature. Lack of fast and efficient screening strategy is the major constraint in heat stress tolerant breeding. Seedling stage screening proved to be an effective method to screen tolerant germplasm at an early stage. A set of 86 garden pea seedlings was subjected to varied temperature treatment at National Phytotron Facility, IARI, New Delhi. Based on seedling survivability and number of leaves wilted after every treatment, seedlings were grouped into tolerant, moderately tolerant, moderately susceptible and susceptible. Sixteen lines have been identified as tolerant and eight lines have been identified as moderately tolerant to high temperature. This strategy will be helpful in identifying existing genetic variations for thermo-tolerance at an early stage for several crops.

SEASONAL FLUCTUATION IN SPINY EEL CATCH VARIETY IN THE RIVER GANGA NEAR PATNA

Syed Shabih Hassan

Department of Fisheries Resource Management, College of Fisheries
Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana (Punjab) India

ABSTRACT

The Ganga, the lifeline of the Indian subcontinent, rises from an ice cave in Gangotri in the Himalayas at an altitude of 4100 meters above mean sea level and empties into the Bay of Bengal. India's freshwater fish fauna is fascinating, and it provides a unique opportunity to study its diversity and distribution. The fishery resources of the River Ganges are extremely valuable both economically and nutritionally. In India, the Ganga has long been an important source of variety of fishes. The river is home to a different range of vegetation and animals, including 382 types of fish species. Field surveys were undertaken at landing sites in and around Patna during the summer, monsoon, and winter seasons, covering a total distance of more than 20 km. Spiny eel is a member of the order-Synbranchiformes and family-Mastacembelidae. *Mastacembelus armatus* (Lacepede), *Macrognathusa ral* (Bloch & Schneider), *M. pancalus*(Ham.), and *M. aculeatus* (Bloch.) are among the species. *M. armatus* is considered as commercially valuable species of the River Ganga. These species also found in the Ganges River, where they have a long nose appendage with two tubulated nostrils, a series of well-separated dorsal spines on their back, and live in muddy and sandy soils with dense flora, and a low height. During the day, they hide in plants or bury themselves in bottom muds. These spiny eels eat prawn, molluscs, insects, earthworm, debris, plant materials etc and reproduce during wet season. The total catch of Mastacembelids during the survey period was estimated to be 1.2%, 2.3%, and 3.6% in monsoon, winter, and summer, respectively. During different seasons, the catch varied by landing sites. The report discusses seasonal fluctuation in catch diversity of spiny eels in the River Ganges.

SEASONAL FLUCTUATIONS IN THE POPULATION OF PHYTONEMATODES ASSOCIATED WITH KINNOW IN HARYANA

Sujata R.S. Kanwar and Anil Kumar

Department of Nematology
CCS Haryana Agricultural University, Hisar, India

ABSTRACT

The study on the seasonal fluctuation of Phytonematodes is essential for developing effective management strategies. In the present study, seasonal fluctuations of plant-parasitic nematodes (PPNs) were recorded in Kinnow orchards during the year 2020-21. Populations were in November (2020), March (2021) and July (2021), at four different locations selected in Hisar district viz., Arya nagar, Nangthala, Malapur and at CCSHAU Hisar, research farm. Soil samples were drawn at 15-30 cm depth around the tree with help the of auger and processed with Cobb's sieving and decanting technique. At Arya Nagar and Malapur two genera *Tylenchulus semipenetrans* and *Hoplolaimus indicus* were present. Highest population of *T. semipenetrans* (2676 J₂/200 cc soil) and *H. indicus* (265 J₂/200 cc soil) at Arya Nagar was in November while lowest was in July, 1485 J₂/200 cc soil and 112 J₂/200 cc soil, respectively. At CCSHAU, Hisar was selected; at this location orchard was infested *T. semipenetrans* and *Helicotylenchus* spp. The population density of *T. semipenetrans* was more as compared to *Helicotylenchus* spp. and population of both genera was highest in November (2877 J₂/200 cc soil and 603 J₂/200 cc soil, respectively) and lowest in July. At Nangthala, two genera, *T. semipenetrans* and *Pratylenchus* spp. were found associated with this orchard. Maximum population of *T. semipenetrans* (492 J₂/200 cc soil) and *Pratylenchus* spp. (2028 J₂/200 cc soil) was recorded in November followed by March and July. At Arya nagar and Hisar, *H. indicus* and at Malapur and Nangthala *Pratylenchus* spp. were the other major PPN along with citrus nematode.

SIGNIFICANCE ON PHYTO-DIVERSITY AND DEVELOPMENT OF REHABILITATION TECHNIQUES FOR MANAGEMENT OF STONE MINE SPOIL AREAS IN SOUTH-EASTERN RAJASTHAN, INDIA

S. Kala, B.L. Mina, Ashok Kumar, H.R. Meena, Shakir Ali,
I. Rashmi, Gulshan Kumar Sharma and Anita Kumawat

*ICAR-Indian Institute of Soil & Water Conservation Research Centre,
Kota, Rajasthan, India

ABSTRACT

Mine spoils left to nature may take decades to centuries to develop any vegetation cover. However, carefully planned artificial interventions that mimic natural processes can reduce this time span. An extensive vegetation survey was conducted to study the phyto-diversity of selected mine spoil areas in south-eastern Rajasthan for effective rehabilitation and restoration of disturbed land in mining areas. Species for restoration were selected through a systematic procedure based values for naturalised plant species in the mine area. Totally 29 plant families are distributed in mine spoil areas. In tree cover dominant species belongs to family Fabaceae and in ground cover dominant species belongs to family Poaceae. Considering the subfamilies of Family- Fabaceae ranks first in dominance followed by Asteraceae, Euphorbiaceae and Mimosaceae in order of dominance among dicotyledonous plants. Fabaceae is regarded as one of the most successful families of the flowering plants due to its extreme flexibility in the adaptive response to different environments. Tree plantations can be used as a tool for mine spoil restoration as they have ability to restore soil fertility and ameliorate microclimatic conditions. Nursery evaluation trial were established with 11 multi-purpose hardy tree species viz., *Acacia Senegal*, *Acacia nilotica*, *Aegle marmelos*, *Butea monosperma*, *Ficus glomerata*, *Inga dulce*, *Syzygium cuminii*, *Azadirachta indica*, *Cassia siamea*, *Pongamia pinnata* and *Acacia tortilis* at ICAR- IISWC, Research Centre – nursery in Kota- Rajasthan. The tree species were raised with different rooting media composition viz., T1: Soil, T2: Soil + FYM, T3: Soil + VAM and T4 : Soil +VAM+FYM, under nursery for initial stress screening and hardening in order to identify highly suitable species for mine spoil rehabilitation purposes. Four best performing tree species (*Acacia nilotica*, *Inga dulce*, *Syzygium cuminii* and *Pongamia pinnata*) under nursery were planted for field evaluation at laxmipura stone mine spoil sites at Ramganjmandi in Kota district of Rajasthan in July 2016. Among the four tree species highest survival rate of plant was recorded with *A.nilotica* (99.2%) and lowest in *S.cuminii* (94.2%). At initial stages of the experiment, planting techniques which involves pit size and rooting media were clearly indicating significant difference interms survival and growth performance among four tree species. Among the different tree species highest plant height and collar diameter was recorded with *A.nilotica* followed *Inga dulce*, *P.pinnata* and lowest in *S.cumini* with pit size-1 compare to pit size-2 at mine spoil site. The selected tree species are highly suitable and enduring benefit for rehabilitation of stone mine spoil areas spreaded over south-eastern part of Rajasthan.

SOIL BIOLOGICAL HEALTH IN RELATION TO TREE DENSITY OF *HARDWICKIA BINATA* ROXB IN AGROFORESTRY SYSTEMS OF SEMI-ARID REGION

Rajendra Prasad, A. Arunachalam, S. Debnath, Ashok Shukla and Prashant Singh

ICAR-Central Agroforestry Research Institute
Jhansi, Uttar Pradesh, India

ABSTRACT

Hardwickia binata, a leguminous plant species, provides fodder, fuel, timber, fibre, etc. and likely to improve soil fertility through biological N-fixation. It is an important tree species for planting in agroforestry systems in Bundelkhand, a typical semi-arid region of Central India. However, it is imperative to know how the tree density planted in field affects soil biological health, as soils of the Bundelkhand are less fertile and may not support high density plantation beyond its carrying capacity. Hence, a study was carried out at ICAR- Central Agroforestry Research Institute, Jhansi to assess the effect of planting spacing of *H. binata* viz., 10×5 m (200 trees ha⁻¹), 5×5 m (400 trees ha⁻¹) and 5×2.5 m spacing (800 trees ha⁻¹) on soil organic carbon (SOC), microbial biomass carbon (MBC), dehydrogenase activity (DHA) and potentially mineralizable nitrogen (PMN) in a 20-year-old *H. binata* based agroforestry system. For the purpose, samples were collected from two sampling locations [rhizosphere (> 1.5 m from tree-base) and the non-rhizosphere zone (outside tree-canopy i.e. <5 m from tree-base)] and at each location, from two soil depths (0-15 and 16-30 cm). The results revealed that close spacing or plantation (5×2.5 m) had maximum SOC, MBC, DHA and PMN while wide spacing (10×5 m), the minimum. Further, soil biological activities were higher in rhizosphere soil than that in non-rhizosphere. The depth of soil sampling also caused variations in soil biological activities which were comparatively higher in top soil layer (0-15 cm) than that in sub-soil layer (16-30cm). Findings concluded that close spacing i.e. high density plantation (800 trees ha⁻¹) of *H. binata* holds the key of improving soil biological health in Bundelkhand region of semi-arid Central India.

SOIL HEALTH CARD

Mamta Choudhary and Suman Kantwa

Sri Karan Narendra Agriculture University
Jobner, Jaipur, Rajasthan, India

ABSTRACT

Soil Health Card is a Government of India's scheme promoted by the Department of Agriculture & Co-operation under the Ministry of Agriculture and Farmers' Welfare. It is being implemented through the department of agriculture of all the State and Union Territory Governments. A Soil Health Card is used to assess the current status of soil health and, when used over time, to determine changes in soil health that are affected by land management. A soil Health Card displays soil health indicators and associated descriptive terms. The indicators are typically based on farmers' practical experience and knowledge of local natural resources. Soil Health Card is a printed report that a farmer will be handed over for each of his holdings. It will contain the status of his soil with respect of 12 parameters, namely N, P, K (macro nutrients); S (secondary nutrient); Zn, Fe, Cu, Mn, B (micro nutrients); and pH, EC, OC (physical parameters). Based on this, the Soil Health Card will also indicate fertilizer recommendations and soil amendment required for the farm.

Organized jointly by

National Environmental Science Academy (NESA), New Delhi
Rani Lakshmi Bai Central Agricultural University, Jhansi, U.P.
ICAR-Indian Grassland and Fodder Research Institute, Jhansi, U.P.
ICAR-Central Agroforestry Research Institute, Jhansi, U.P.
Bundelkhand University, Jhansi, U.P.
Central Ayurveda Research Institute, Jhansi, U.P.

SOIL HEALTH MANAGEMENT THROUGH INTEGRATED NUTRIENT MANAGEMENT

Rajveer Singh Yadav and Manish Kumar Sharma

Department of Agronomy
Mahatma Gandhi Chitrakoot Gramodaya Vishwavidyalaya
Janki Kund, Chitrakoot, Madhya Pradesh

ABSTRACT

Now a days, due to intensive cropping, imbalanced use of fertilizer and lesser use of organic manure, is leading to degrade soil health. Intensive cropping leads to over mining of inherent minerals of soil causing deficiency of nutrients. Beside these, practicing of imbalance use of fertilizer is leading to imbalance status of available soil nutrients. The mechanization in agriculture is replacing the use of animals which are providing organic manure directly and easily in the form of dung, urine and litter. These are affecting soil chemical, physical and biological properties of soil health. The integration of organic and inorganic source can solve this problem up to certain level. The required amount of nutrients should be given in integrated form. Beside this, use of green manuring crop should be promoted because mechanization is the need of current agriculture. The chemical fertilizer is able to meet quick requirement of nutrients while organic manure is able to meet the need of nutrients in long lasting manner. The organic manures are also known for improving soil chemical, physical and biological properties of soil. By adopting integrated nutrient management, optimum potential of crop can be harvested.

SPATIAL-TEMPORAL ANALYSIS OF AGROFORESTRY AREA IN BUNDELKHAND REGION USING GOOGLE EARTH ENGINE

**Maneesh Yadav¹, Abbas Mehdi¹, A.K. Handa¹,
S. Ramanan¹, Latika Pandey¹ and A. Arunachalam¹**

ICAR-Central Agroforestry Research Institute, Jhansi

ABSTRACT

Tree mapping information is in high demand for forestry/agroforestry/tree outside forest (TOF) management, carbon-cycle estimation, further biodiversity assessment and environmental monitoring investigations. Over regional or large areas, distinguishing tree information at high resolutions faces the challenge of lack of representative features and computational power. The Bundelkhand region is the rich storehouse of tree-based traditional knowledge. The aim of the present study was the assessment of the area under the agroforestry system in the Bundelkhand region of India for the years 2015 and 2022. The dataset of Sentinel-2A and 2B for the years 2015 & 2022 (with 7 years difference), was accessed from Google Earth Engine (GEE) platform which is a huge data cloud platform with high-performance computing. Using Sentinel 2 Spectral Index, we calculated eight commonly used indices incorporating visible, near-infrared, and red-edge bands these indices were processed via Google Earth Engine for the years 2015 and 2022. Object-Based Image Analysis (OBIA) was applied to the agricultural area because agroforestry systems exist on agricultural land only. It was observed that for the year 2015, the total area under agroforestry in Bundelkhand region was 6.86% (4849.10 sqkm) of the total geographical area (70686.60 sqkm) of the region. Likewise, the total area under agroforestry for the year 2022 is 7.23% (5110.64 sqkm) of the total geographical area of the region, which indicates that the area under agroforestry in Bundelkhand region of India has increased over the period. The overall accuracy achieved in the assessment of the Agroforestry area is 81.65% respectively. Keywords – Google Earth Engine, Spectral Indices, Spectral Signatures, OBIA, Random Forest, Sentinel 2

STATUS OF MEDICINAL PLANTS SECTOR IN INDIA– POTENTIAL, OPPORTUNITIES AND CHALLENGES

Saroj Arora

Department of Botanical and Environmental Sciences
Guru Nanak Dev University, Amritsar, Punjab

ABSTRACT

India is one of the 12-mega biodiversity centers having about 10% of the world's biodiversity wealth. Of the 17,000 species of higher plants in India, about 6,500 are known for having diverse medicinal properties. Currently, approximately 25% of drugs are derived from plants and many others are synthetic analogues built on prototype compounds isolated from plant species in modern pharmacopoeia. The medicinal plants are distributed across the diverse habitat types and landscapes. Around 70% of India's medicinal plants are found in the tropical areas mostly in the various forest types spread across the Eastern and Western Ghats, the Vindhyas, Chotanagpur plateau, Aravalis, the Tarai regions in the foothills of the Himalaya and north east India. About 30% of the medicinal plants are found in the alpine and temperate regions and a small number of medicinal plants are also found in aquatic habitats and mangroves. A large number of medicinal plants are found in the dry and moist deciduous vegetation as compared to evergreen or temperate habitats. Medicinal species are found in the groups of algae, fungi, lichens, bryophytes, pteridophytes, gymnosperms and angiosperms.

The annual raw demand for botanical raw drugs in the country has been estimated as 3,19,500 MT annually, of which 1,77,000 MT is for herbal industry, 86,000 MT for rural household usage and 56,000MT is for exports. The annual trade value of botanical raw drugs in the country is estimated at Rs. 1,069 crores. Of the total 960 traded medicinal plant species, 176 species are consumed in volumes exceeding 100 MT per year. Of these 176 species, 21 species are obtained from temperate forests, 70 species from tropical forests, 46 from roadsides and 36 species are obtained from cultivation. The remaining species are imported from other countries. The annual turnover of the herbal industry in the country for the year 2005-06 was Rs. 8,800 crores. The continuous increase in human population is one of the causes for concern in meeting the daily requirements of medicine as the economy and livelihoods of human societies living in developing countries primarily depend on forest products. This phenomenon is leading to continuous erosion of medicinal plant populations in the wild, thus making challenge to meet the requirements as well as to conserve them. For past couple of decades, medicinal plants have been increasingly recognized for their role as not only for health care but also for improving the economic status. This ongoing trend towards increasing commercialization has resulted in overharvesting of some economically important medicinal plant species, many of which has become rare, endangered and threatened. Since the medicinal plants form an important health commodity, sustainable utilization and conservation of this valuable bio-resource is an urgent need of hour. During last 30 years, a lot of efforts have been directed at the national level to conserve, cultivate and value addition including product development. These issues shall be highlighted and emerging opportunities shall be discussed.

STRUCTURAL OPTIMIZATION OF NOVEL INHIBITORS OF MALARIAL ASPARTIC PROTEASES PLASMEPS IN - I & II

Amit Kumar Gautam¹ and B. Rupini²

¹Dept of Chemistry, D.A.V College Kanpur, Uttar Pradesh

²SOITS, School of Inter-Disciplinary and Trans-Disciplinary Studies (SOITS)
Indira Gandhi National Open University, New Delhi

ABSTRACT

Malaria has been haunting human civilization for over centuries and claiming millions of lives worldwide. African countries are the worst affected owing to their geographical locations coupled with other factors which are optimal for the blossoming of malarial parasites. In the last couple of decades, incidence of malaria drops fairly complementing effective medication approved by Food and Drug Administration (FDA) and stringent rules and regulations put forward by World Health Organization (WHO) to contain the deadly disease. Despite all these measures and medication, eradication of malaria is far fetched yet we witness sporadic success in the containment of the deadly disease. Effective therapeutics are urgently required to provide shielding from malaria since the impact is staggering on humankind and rising drug resistance has rendered the current therapeutics less effective.

Digestive vacuole of the human malaria parasite *Plasmodium falciparum* (*P. falciparum*, *Pf*), is equipped with four plasmepsins (*PfPlms*) and has been identified as *PfPlm* I, II, and IV and histo-aspartic proteinase (*PfHAP*). The functions of these digestive vacuole plasmepsins are mainly involved in hemoglobin degradation, which was originally detected from the initiation of hydrolysis of hemoglobin by a purified naturally-occurring enzyme. Aspartic protease enzymes of *Plasmodium falciparum* such as plasmepsin I (*PfPlm* I) have been recognized as an attractive drug target for antimalarial drug discovery. Hydroxyethylamine and piperazine are validated pharmacophores against malaria parasite infection so we synthesized and optimized derivatives as novel inhibitors based on these known pharmacophores and structural dynamics, stability, and reactivity were compared with reference to pepstatin-A, a known pepsin inhibitor. Biophysical properties were promising and encouraged us to develop novel inhibitors against malaria parasite aspartic proteases plasmepsin I & II.

**STUDIES ON COMBINING ABILITY FOR YIELD AND ITS
COMPONENTS IN FIELD PEA (*PISUM SATIVUM* VAR. ARVENSE)**

Syed Kulsoom Fatima Jafri, Geeta Rai, Devesh Yadav

Department of Genetics and Plant Breeding
C.S Azad University of Agriculture and Technology, Kanpur, Uttar Pradesh

ABSTRACT

Pulses are the second most important component of the Indian diet after cereals. They are an important source of protein for the poor as well as for the vegetarians which constitute major population of the country. The field pea (*Pisum sativum* L. var. arvense), also known as dry pea is a leguminous plant in the Papilionoideae subfamily that belongs to the general class of dicotyledons. It is mostly a cold-weather crop that can tolerate mild frost. An investigation was conducted during Rabi season of 2020-21 at oilseed research farm, Kalyanpur of Chandra Shekhar Azad University of Agriculture and Technology Kanpur. The experiment was conducted in Randomized Block Design with 8 parents and three replications to study combining ability in different cross combinations and the data was recorded for different characters. The general combining ability with negative value for characters were observed in the parents viz., KPMR 400, KPMR 522, KPMR 940 for days to flowering, RACHNA, KPMR 522 for days to maturity and KPMR 400, SAPNA, KPMR 913 for short height of plant. GCA with positive value was observed in the parents viz., SHIKHA, KPMR 522 for branches per plant, RACHNA, KPMR 940 for pods per plant, KPMR 940 for grains per pod, KPMR 400, KPMR 522, KPMR 940 for 100 seed weight, KPMR 940, KPMR 522 for grain yield per plant, KPMR 940 for biological yield per plant, KPMR 522 for harvest index. The significant and desirable SCA effect for grain yield per plant were observed in crosses SWATI x KPMR 400, SHIKHA x KPMR 913, SWATI x KPMR 940 and RACHNA x KPMR 940.

**STUDIES ON COMPARATIVE EFFICACY OF DIFFERENT
ORGANIC MANURES AND FERTILIZERS ON GROWTH AND
YIELD OF *SPILANTHES ACMELLA* MURR.**

Manisha Lakhanpal¹, and Meenu Sood²

Department of Forest Products
Dr. Y S Parmar University of Horticulture and Forestry
Nauni, Solan, Himachal Pradesh

ABSTRACT

Spilanthus acmella Murr. commonly known as anti-toothache plant is a medicinally important plant belonging to the family, *Asteraceae*. Recently the species attracts a great deal of market attention for its medicinal and other uses that have been developed over time. But the information on its cultivation is very rudimentary. So, there is need to develop the cultivation technique for its commercialization. With this information the research was carried out to find out the comparative efficacy of different organic manures and fertilizers on growth and yield of *Spilanthus acmella* Murr. at experimental field as well as in laboratory of the Department of Forest Products, COF, Dr Y S Parmar University of Horticulture and Forestry, Nauni, Solan (HP) during 2019-20. The plants were subjected to eight different treatments viz., T₁; Control (without fertilizer), T₂; FYM (N content equivalent to RDF), T₃; Vermicompost (N content equivalent to RDF), T₄; RDF (60: 45: 30 kg/ha), T₅; FYM+RDF (N content equivalent to RDF + 60: 45: 30 kg/ha), T₆; Vermicompost + RDF (N content equivalent to RDF + 60: 45: 30 kg/ha), T₇; Jeevamruta (N content equivalent to RDF), T₈; Panchagavya (N content equivalent to RDF). The experiment was conducted in Randomized block design with four replications. The data on growth and yield parameters was recorded at full flowering stage. The results showed that integrated nutrient management of vermicompost (N content equivalent to RDF) + RDF (60:45:30 kg per ha) displayed significant results as compared to control. The maximum values for plant height (44.97 cm), plant spread (30.21 cm²), number of branches per plant (12.06), number of leaves per plant (81.89), number of flowers per plant (61.69), root length per plant (21.20 cm), fresh root weight per plant (18.87 g), dry root weight per plant (5.67 g), fresh stem weight per plant (64.80 g), dry stem weight per plant (14.52 g), fresh leaves weight per plant (49.16 g), dry leaves weight per plant (13.45 g), fresh flowers weight per plant (38.84 g), dry flowers weight per plant (10.91 g), seed weight per plant (1.87 g), fresh total biomass yield per plant (171.68 g) and dry total biomass yield per plant (44.56 g) were recorded when treatment combination of vermicompost (N content equivalent to RDF) + RDF (60:45:30 kg/ha) was applied.

STUDIES ON FUELWOOD CHARACTERIZATION OF SOME IMPORTANT TREES AND SHRUBS OF SEMI-ARID REGION OF CENTRAL INDIA

**Vivek Dube, Naresh Kumar, Pankaj Lavania, Asha Ram,
Shayma Parveen and A. Arunachalam**

ICAR-Central Agroforestry Research Institute, Jhansi, U.P.

ABSTRACT

The rural communities in India depends mainly on traditional biomass based fuels such as crop residue, fuel wood, animal dung etc. for meeting their energy needs. Forests have been the dominant source of fuel wood earlier, but since the implementation of social forestry/agroforestry and large scale afforestation programmes, the collection of fuel wood has substantially shifted from forest to non-forest areas. Keeping in view the importance of biomass based fuelwood tree species in rural area, the study was carried out to analyze the fuel wood properties of important trees and shrubs commonly found in semi-arid region of central India. The fuelwood properties of 25 important trees/shrubs were studied to explore the potential trees/shrubs for fuelwood production. Different parameter related to fuel wood characterization namely calorific value, wood density, moisture content, wood ash content, Fuel value index, Volatile matter, fixed carbon, heating values and lignin content have been studied. The calorific value of these species varied from 4725.67 to 1952.67 Kcal kg⁻¹ and 10 species were having more than 4000 Kcal kg⁻¹. The wood density varied from 0.69 g cm⁻³ to 0.32 g cm⁻³. The highest moisture content (74.29 %) was recorded in *Bombaxceiba* and, whereas the lowest (36.66 %) was found in *Lawsoniainermis*. Wood ash content in different species ranged from 5.03% to 1.10%. The Fuel Value Index(FVI) is an insightful parameter for screening fuel wood species and it ranged from 288.36 in *Pithecellobiumdulceto* 1681.35 in *Ipomeacarnea*. The study concluded that tree species viz., *Pithecellobiumdulce*, *Holopteleaintegrifolia*, *Tectonagrandis*, *Pongamiapinnata*, *Melia azedarach* and *Terminalia arjuna*; and shrubs viz., *Carissa carandas* and *Lawsoniainermis* were found suitable for fuelwood purpose in semi-arid region of Central India.

**STUDIES ON GENETIC VARIABILITY, HERITABILITY AND GENETIC
ADVANCE FOR YIELD AND YIELD ATTRIBUTES IN BITTER GOURD
(*MOMORDICA CHARANTIA* L.) GENOTYPES**

Manjulapur Sampath Reddy¹, P. Prashanth², D. Laxminarayana³, P. Saidaiiah⁴

College of Horticulture, Mojerla
Sri Konda Laxman Telangana State Horticultural University, Hyderabad (Telangana)

ABSTRACT

The present investigation was undertaken during *Kharif* 2017-18, College of Horticulture, Mojerla, Sri Konda Laxman Telangana State Horticultural University, Telangana. The trial was laid out in Randomized Block Design with twenty seven bitter gourd genotypes. Analysis of variance revealed significant differences among all the genotypes for all the characters. The genetic parameters were studied to elucidate the genetic variability, heritability and genetic advance in bitter gourd (*Momordica charantia* L.). The genotypes exhibited a large range of variability for all the characters. Phenotypic coefficient of variation (PCV) was more than genotypic coefficient of variation (GCV) for all the characters studied. PCV was higher than the appropriate GCV in all aspects that describe the environmental factors that influence their expression to some degree or another. Heritability (> 60) have been observed for vine length, number of primary branches per vine, number of nodes per vine, Internodal length, Days to first male flower appearance, Days to first female flower appearance, Nodes at which first male flower appearance, Nodes at which first female flower appearance, Number of fruits per vine, average fruit weight, fruit length, fruit diameter, number of seeds per fruit, 100 seed weight, total fruit yield per vine and fruit fly infestation per cent. Genetic advance, i.e., genetic gain, ranged from 0.91 to 108.80. High genetic gain (> 20%) was observed for vine length and days to last fruit harvest. High heritability combined with high genetic advance was observed for the characters vine length. High heritability combined with high genetic advance indicates that additive gene action plays a serious role in governing these traits and these traits will be improved by simple selection.

**STUDIES ON NATURAL REGENERATION STATUS OF DEODAR
(*CEDRUS DEODARA* ROXB.) FOREST IN KULLU DISTRICT
OF HIMACHAL PRADESH**

Ghanshyam Singh¹ and Vimal Chauhan²

Department of Silviculture and Agroforestry,
Dr Y S Pamar University of Horticulture and Forestry, Nauni, Solan-173230. HP.

ABSTRACT

The present investigation entitled “Studies on natural regeneration status of Deodar (*Cedrus deodara* Roxb.) forest in Kullu district of Himachal Pradesh.” was conducted during the year 2020-21. Field studies were conducted in *Cedrus deodara* bearing forests of Kullu districts of Himachal Pradesh situated between 76°59'30" - 77°52'20" E longitudes and 31°20'25" 32°26'00" N latitudes with the objective To study the phytosociology and natural regeneration status of *Cedrus deodara* in different Forests of Kullu district. The study area was divided into three forest divisions namely Seraj Forest Division, Parvati Forest Division, Kullu Forest Division and further divided into three altitudinal ranges i.e. 1500-1800m, 1800-2100m and 2100-2400m above mean sea level (MSL) systematically with random start to assess the phytosociology, and natural regeneration status of *Cedrus deodara*. Data collection, analysis and interpretation were conducted based on standard field and Statistical procedures. Species composition and status of natural regeneration varies significantly along altitudinal gradient. The results of the present study revealed that the overall tree density ranged from 150 to 220 individuals/ha, basal area 33.63 to 73.96 m²/ha. The overall shrub density ranged from 96.88 to 118.66 individuals/ha and basal area from 0.025 to 0.034 m²/ha. Lower elevation ranges were found denser as compared to the upper elevations. The natural regeneration of *Cedrus deodara* were recorded maximum at middle altitudinal range (1800-2100m) and minimum at higher altitudinal range (2100-2400m). An overall average regeneration (43.21 %) in Deodar forest (all the altitudes) of which maximum regeneration success share was of A₂ (1800-2100m) i.e. 53.70 percent followed by A₁ (1500-1800m) i.e. 46.30 percent and A₃ (2100-2400) showed minimum regeneration success i.e. 29.63 percent.

STUDIES ON SELECTION PARAMETERS IN INDIAN MUSTARD {*BRASSICA JUNCEA* (L.) CZERN AND COSS}

Devesh Yadav, Lokendra Singh, Syed Kulsoom Fatima Jafri

Department of Genetics and Plant Breeding
C. S. Azad University of Agriculture and Technology, Kanpur, Uttar Pradesh

ABSTRACT

Indian mustard is one of the most important oilseed crops of India which occupies considerably large area among the Brassica group of oilseed crops. It is the second in production among oilseed crops after soybean. Main thrust in any crop improvement area is to improve yield and as an established fact, yield is a complex trait and is dependent on many other ancillary characters which are mostly inherited quantitatively. The large spectrum of diversity in any population depends on the amount of the genetic variability among genotypes. The magnitude of heritable variation in the traits studied has immense value in estimating the potential of the genotype for further breeding programme. Variability for economic traits must exist in the working gene pool for useful exploitation following recombination breeding and selection. Heritability coupled with genetic advance would be more useful tool in predicting the resultant effect in selection of the best genotypes for seed yield and its attributing traits. An experiment involving 18 genotypes of Indian Mustard (*Brassica juncea* L.) was conducted in randomised block design with three replications, during Rabi 2020 to study selection parameters like heritability and genetic advance. Data were recorded and analysed for fourteen different characters. The characters like plant height, number of primary branches, number of siliquae/plant, number of grains/silique, biological yield/plant, 1000-seed weight, days to 50% flowering, protein content and economic yield/plant exhibited high value of heritability. In this study the high heritability coupled with high genetic advance in percent of mean was recorded for number of secondary branches followed by methionine content, 1000 seed weight. The lower values of genetic advance were shown by protein content and oil content.

**STUDIES ON THE EFFICACY OF BIO-PESTICIDES IN THE
MANAGEMENT OF TEAK DEFOLIATOR *HYBLEA PUERA*
(LEPIDOPTERA: HYBLAEDAE) IN SEMI-ARID REGION OF CENTRAL INDIA**

Sitaram Seervi, B. Gangwar, Pradeep Kumar and Mukesh Kumar

Department of Entomology, Bundelkhand University
Jhansi, Uttar Pradesh, India

ABSTRACT

Field studies were conducted on the management of teak defoliator *H. puera* was carried out during kharif season of 2020. In the field of Institute of Agriculture Sciences, Bundelkhand University, Jhansi (India). Different bio-pesticides viz: *Bacillus thuringiensis* var. *Kurstaki* (5% WP), *Metarrhizium anisoplae* (2×10^8 cfu), *Verticillium lecanii* (2×10^8 cfu), Neem oil (5% EC), Neem Seed Kernal Extract (Crude extract), *Baveria bassiana* (2×10^8 cfu). Experimental results revealed that the trees treated with bio-pesticides registered significantly difference of teak defoliator over the treatment of untreated control. Among them the treatment of *Baveria bassiana* (14.94 damage leaves/ plant) were found in significantly more effective against the pest as compared to other bio-pesticides NSKE, Neem oil, *Verticillium lecanii* and *Bacillus thuringiensis* var. *Kurstaki* were found moderately effective and proved significantly superior over NSKE, Neem oil, *Bacillus thuringiensis* var. *Kurstaki* and *Metarrhizium anisoplae* after, NSKE, Neem oil, *Bacillus thuringiensis* var. *Kurstaki* and *Metarrhizium anisoplae* proved significantly less effective among the bio-pesticides evaluated against *H. puera*.

STUDY OF THE MORTALITY RATE OF BRINJAL SHOOT AND FRUIT BORER LARVAE (*LEUCINODES ORBONALIS*) IN LAB CONDITION.

Raj Veer Yadav¹ and Anoorag R Tayde²

^{1&2}Department of Entomology
Sam Higginbottom University of Agriculture, Technology and Sciences
Allahabad, Uttar Pradesh

ABSTRACT

Laboratory experiments were carried out during Kharif season 2017 in the Department of Entomology SHUATS, Allahabad, U.P. India. To find out the mortality rate of brinjal shoot and fruit borer larvae. The results revealed that population mortality per cent of brinjal shoot and fruit borer of 3rd instar larvae 24, 48 and 72 hours after treatment showed that mortality per cent in all the treatments were significantly superior over control. Maximum mortality was observed with T₇, Cypermethrin (75.55 %), T₆- Pungam oil + Cypermethrin (72.21 %), T₁, Neem oil + Cypermethrin (66.66 %) and T₄, Neem leaf extract + Cypermethrin (64.66 %). Followed by T₂, NSKE + Cypermethrin (61.10); T₃, Garlic bulb Extract + Cypermethrin (58.88); T₅, Custard apple leaf extract + Cypermethrin (53.33) were recorded as least effective treatments of all the treatments excluding control.

**STUDY ON EFFECT OF MASS MEDIA FOR CHANGING
FARMER'S SOCIO-ECONOMIC STATUS IN VARANASI
DISTRICT OF UTTAR PRADESH**

Amritanshu Singh¹, R.K. Doharey², N.R. Meena³ and Abhinav Singh⁴

Acharya Narendra Deva University of Agriculture and Technology
Kumarganj Ayodhya, Uttar Pradesh

ABSTRACT

The planners in developing countries realized that the development of agriculture could be hastened with the effective use of mass media. In a country like India, where literacy level is low, the choice of communication media is of vital importance.

The study was conducted in Arajilne Block of Varanasi district (U.P.) selected purposively. A total number of 120 respondents were selected through random sampling. The structured schedule was developed keeping in view the objectives and variables under study. The respondents were contacted personally for data collection. The percentage, mean, standard deviation and correlation were used for calculation and drawing the inferences.

Results reveals that majority of respondents were found in young age category (43.33%), have higher secondary education (27.5%), Married (85.53%), Hindu (100%), OBC caste (74.16%), nuclear (95.00%) and small sized family (95.00%), were marginal farmers (49.16%), had took no participation in any organization (46.66%), engaged in farming only (75.83%), had income between Rs.1,00,000 to 2,50,00 (55.00%), having medium level of economic motivation (73.33%), having medium level of scientific orientation (64.16%). Majority of respondents were aware of TV, radio, mobile and internet in which material possession were found significant. Most of the respondents had medium level of effect of mass media (60.83%) in which age and extension contacts were found significant.

**STUDY ON GENETIC VARIABILITY ESTIMATES OF JACKFRUIT
[*Artocarpus heterophyllus* Lam.] GENOTYPES LOCALLY
AVAILABLE AT NORTHERN REGIONS OF TRIPURA STATE**

Abhijit Debnath, Prahlad Deb, Goutam Mandal and Snehasish Chakravorty

Department of Horticulture and Post-Harvest Technology (HPHT)
Palli Siksha Bhavana, Institute of Agriculture, Viswa-Bharati, West Bengal

ABSTRACT

The present experiment was undertaken, during 2019-21, for the purpose of estimation of the genetic variability existing within different quantitative traits among various locally available jackfruit (*Artocarpus heterophyllus* Lam.) germplasm at northern region of Tripura state. High magnitudes for G.C.V., heritability, genetic advance and genetic advance as percentage of mean were observed for yield, fruit productivity, fruit stalk length and fruit core weight, which might have more role in improvement of these traits through proficient selection process. Comparatively low genetic advance with high heritability estimates for some of the traits like - seed width, seed length and total sugar content of ripe fruit, could be indicating towards the fact that direct selection based on these characters would be less effective. Characters such as, number of fruit per cluster, shelf life of fruit and reducing sugar content exhibited wide range of differences between G.C.V. and P.C.V. Hence improvement of these traits by means of selection may not be effective at all.

SUITABILITY OF MULTIPURPOSE TREES AS AN AGROFORESTRY SPECIES IN JHARKHAND

Kushmita Dhan and Anil Kumar

Department of Silviculture and Agroforestry
Faculty of Forestry, Birsa Agricultural University, Kanke, Ranchi

ABSTRACT

Screening test of multipurpose tree species was performed for Suitability as an Agroforestry Species under rainfed conditions of Ranchi, Jharkhand. Nine multipurpose tree species were taken i.e *Melia azedarach*, *Azadirachta indica*, *Millettia pinnata*, *Artocarpus heterophyllus*, *Pterocarpus marsupium*, *Gmelina arborea*, *Dalbergia sissoo*, *Mahagoni mycrophylla* and *Acacia auriculiformis*. Maximum increment in growth was seen in *Acacia auriculiformis* and *Gmelina arborea* in terms of height (1.641 & 1.259m), collar diameter (1.92 & 1.367cm), Above ground biomass (15.532 & 7.421t/ha), Below ground biomass (4.194 & 2.004t/ha) and total biomass (19.726 & 9.425t/ha) respectively. Increase in the parameters related to physicochemical properties of soil such as Organic carbon %, available Nitrogen, available Phosphorus, Potassium and pH of the soil under *Millettia pinnata*, *Pterocarpus marsupium* and *Acacia auriculiformis*. Maximum BCR among nine MPTs were seen in *Gmelina arborea* and *Acacia auriculiformis* (3.33) & (2.75) respectively. Among these nine multipurpose tree species *Acacia auriculiformis*, *Gmelina arborea*, *Millettia pinnata* are the most suitable agroforestry species for Eastern plateau and hill region of India.

**SURVEY, COLLECTION, CHARACTERIZATION AND NUTRACEUTICAL
PROFILING OF MANILLA TAMARIND ACCESSIONS UNDER SEMI-ARID
CONDITIONS OF JHANSI DISTRICT OF UTTAR PRADESH.**

**Ashok Yadav¹, A. Arunachalam¹, Sandeep Garg^{1,2}, Satyam Bansal^{1,2},
Sushil Kumar², AK. Handa, Inder Dev^a and Badre Alam**

¹ICAR-Central Agroforestry Research Institute, Jhansi, Uttar Pradesh

²Bundelkhand University, Jhansi, U.P.

ABSTRACT

The climate induced stress has led to serious loss to the plant biodiversity, due to which several threats have emerged to feed the increasing population under this climate change era. There is a big challenge for researchers to find out the crops which not only provide the nutrition but also have multiple purposes i.e. food, fodder, fuel, fiber and fertilizers. Keeping these things in mind we found that Manilla tamarind is a potential crop which serves as a multipurpose crop. Manilla Tamarind is a fast growing, hardy and evergreen tree species which can resist drought and high temperature. It has several peculiar characteristics which makes it suitable to grow under an agroforestry system. Several surveys were conducted in the Jhansi district and different Manilla tamarind accessions were collected and characterized for nutraceutical value. The results indicated that Manilla tamarind can be a potential multipurpose crop for ecosystem restoration under the semi-arid condition.

SUSTAINABLE ENERGY PRODUCTION FROM ALGAE-A GREEN SOLUTION

Anwesha Khanra¹, Monika Prakash Rai² and Shakeel Ahmed Khan³

¹IMS School of Biosciences, IMS University Courses Campus, Ghaziabad,

²Centre for Biotechnology and Biochemical Engineering,
Amity Institute of Biotechnology, Amity University Uttar Pradesh, AUUP, Noida

³Division of Environment Science, NRL Building, IARI, New Delhi

ABSTRACT

The adverse effect of global warming and energy crisis due to fossil fuel depletion has paved the substitutive way for the development of green energy production. Presently, conventional energy sources such as coal, petroleum, and natural gas fulfill 80% of primary energy demand across the world but are consequently depleting rapidly and causing increase in greenhouse gas (GHG) emission. The major pollutants are carbon dioxide (CO₂), nitrous oxide (NO₂), and methane (CH₄), which cause changes in climatic conditions. Consequently, there is an urgent need for the evolution of renewable and sustainable energy resources like biofuels. Biofuels derived from plants, food, and non-food crops have been highly criticized by the scientific community and technocrats due to their extensive land usage, leading to food versus fuel dilemma. Therefore, researchers have turned their attention towards biofuel production from eukaryotic photosynthetic microbes-microalgae. Microalgae are considered as a source of third-generation biofuel and are among the fastest proliferating photosynthetic biomass on earth, with a high intracellular lipid content categorizing them as a green and sustainable source of fuel. Most of the algal strains are photoautotrophic in nature where light energy is harvested and CO₂ is used as a carbon source. However, photoautotrophic cultivation mode is quite insufficient for high biomass and lipid production from algae as less light penetration and mutual shading of the algal cells cause light inadequacy and hence, growth rate decreases earlier. In case of few algal species, like *Chlorella pyrenoidosa*, *Chlorella sorokiniana*, *Scenedesmus* sp., etc., mixotrophic culture condition exists where CO₂ and organic carbon both are utilized simultaneously in the metabolic pathways of photosynthesis and respiration. Techno-economic evaluation of microalgae derived lipid production is a key factor for cost analysis, which may lead to commercially viable biodiesel development. The use of microalgae biomass for the production of pigments, antioxidants, proteins, natural colorants in food, wastewater treatment has been successfully reported. In the field of sustainable energy sources, biofuels-liquids fuels from numerous biological resources have achieved great momentum due to lower emission levels than petrol. The extensive research is underway on biofuel synthesis from microalgae to address the current energy crises. During the oil crises in 1970s, numerous renewable energy programs were implemented involving microalgae biofuels by NREL formerly known as US Aquatic Species Program. In the recent years, the expansion in the field of microalgae biodiesel production is mainly due to the increasing pressure to find fossil fuel alternatives. Environment and cost consideration are also important topics for further study. The cost of cultivation can be reduced by growing microalgae in rural areas, where land prices are comparatively lower than urban areas. Furthermore, microalgae cultivation with fish or shrimps uplifts the productivity of animals and improves the quality of water. Microalgae can be grown in wastewater effluents in order to replace synthetic media, as a cost-effective approach.

Hence, we could envisage that the sustainable and renewable energy production from microalgae could play an essential role towards a successful biodiesel synthesis, served as an eco-friendly green solution.

**SUSTAINABLE FORAGE PRODUCTION IN
MELIA AZEDARACH BASED SILVOPASTORAL SYSTEM**

Firoz Ahmad and M.S. Malik

Department of Silviculture and Agroforestry, Faculty of Forestry,
Birsa Agricultural University, Ranchi, Jharkhand (India)

ABSTRACT

Silvopasture experiment was conducted to find out the performance of *Melia azedarach* (Bakain) with fodder crops in silvopastoral model of agroforestry under rainfed condition of Ranchi, Jharkhand. Four kind of fodder grasses viz., *Stylosanthes hamata* (Stylo), *Arachis glabrata* (Charabadam), *Brachiaria mutica* (Para grass) and *Pennisetum purpureum* x *Pennisetum glaucum* (NB Hybrid). Maximum growth was gained in Bakain in terms of tree height (185 cm) and collar diameter (24.97 mm) when intercropped with Stylo. Maximum green & dry fodder yield was observed in sole NB Hybrid grass, whereas Charabadam recorded maximum crude protein content in silvopastoral condition. The soil nutrient status of silvopasture was also raised as compared to sole tree/crops.

TAXONOMIC APPROACHES FOR THE IDENTIFICATION OF PHYTONEMATODES

Chandramani Waghmare and Archana U Singh

Division of Nematology
ICAR-IARI, New Delhi, India

ABSTRACT

Nematodes are the most common, abundant, and diversified multicellular animals present in soils and aquatic sediments and many of them are parasitizing plants or animals. To date the phylum Nematoda comprises approximately 27,000 described nematode species. Around 4,100 plant parasitic nematode species from 197 genera have been described worldwide representing about 10% of the total number of known nematodes to date. Plant parasitic nematodes are often thought of as limiting factor in Crop production. Identification of plant parasitic nematode species is relatively difficult due to its small size and limited number of distinctive traits that require trained expert. Taxonomic approaches have shifted from the classic/conventional description of species primarily based on morphological characters to biochemical and molecular parameters. Over the past few decades, efforts have been made to incorporate molecular methods and digital 3D image capturing technology (DNA barcoding, 4D microscopy, video vouchering) into nematode taxonomy. The aim is improving the accuracy of the identification of such difficult group in taxonomic terms and the second is aimed at communicating morphological data. Both methods are increasingly being used in recent taxonomy, biodiversity and biogeographic studies. Most of the important plant parasitic nematodes such as *Meloidogyne* sp., *Heterodera* sp., *Globodera* sp., *Pratylenchus* sp., *Radopholus* sp., *Ditylenchus* sp., etc have been characterized/identified with molecular based techniques such as RAPD, AFLP, RFLP (Biochemical) PCR, multiplex PCR, real time PCR (DNA based) by using different molecular markers such as ITS, 28S rDNA (LSU), 18S rDNA (SSU), COI and also with species specific molecular markers i.e. SCAR marker (Biochemical) etc. Like classical taxonomy, the DNA barcoding is a tool with lot of potential in the area of taxonomy. It serves as a rapid identifying feature of organisms. It is facilitating the recognition and discrimination of cryptic species of nematodes. Identification of nematodes is helping in the management of phytonematodes at their race, species & biotype level and also in the detection of harmful quarantine nematodes. This is particularly useful for differentiating between invasive and closely resembling but harmless species. Unlike Conventional taxonomy, DNA barcoding allows the identification of species to be determined from any available life stage and this becomes especially useful during the analysis of commercially intercepted samples where diagnosticians are often confronted with the problem of having very little equipment to work with. Therefore, improving knowledge about taxonomic approaches is very useful in the identification of Phytonematodes.

THE COMPARATIVE STUDY OF DIFFERENT VARIETIES AND SOIL FERTILITY LEVEL ON GROWTH AND YIELD OF TURMERIC CROP (*CURCUMA LONGA* L.)

Satyavir Singh and Guru Dayal

Department of Soil Science & Agricultural Chemistry
Institute of Agricultural Sciences, Bundelkhand University, Jhansi

ABSTRACT

A field experiment was conducted on Bundelkhand University Agricultural Research farm and Farmer's field to evaluate the varietal influence of turmeric crop on growth parameters and yield under different locations/soil fertility levels (F1 – BU Agricultural Research Farm and F-2 Farmers field). The maximum plant height (149.94 cm in F2 and 141.93 in F1), no. of leaves/plant (13.95 in F2 and 13.82 in F1), leaf length (91.7 cm in F2 and 88.23 cm in F1), leaf width (20.13 cm in F2 and 15.6 cm in F1), no. of tillers/plant (5.75 in F2 and 3.99 in F1), length of primary rhizome (11.06 cm in F2 and 9.13 cm in F1), length of secondary rhizome (10.15 cm in F2 and 7.02 cm in F1), length of mother rhizome (11.31 cm in F2 and 8.86 cm in F1), grith of primary rhizome (11.56 cm in F2 and 10.19 cm in F1), grith of secondary rhizome (11.89 cm in F2 and 9.05 in F1), grith of mother rhizome (14.91 cm in F2 and 13.82 cm in F1), no. of primary rhizome (9.26 in F2 and 4.59 in F1), no. of secondary rhizome (16.60 in F2 and 15.22 in F1) and no. of mother rhizome (3.74 in F2 and 2.81 in F1) in Moti Haldi under farmer's field. While maximum plant height (148.67 cm in F2 and 140.31 in F1), no. of leaves/plant (12.63 in F2 and 12.09 in F1), leaf length (90.2 cm in F2 and 87.32 cm in F1), leaf width (20.61 cm in F2 and 14.2 cm in F1), no. of tillers/plant (4.92 in F2 and 4.42 in F1), length of primary rhizome (10.67 cm in F2 and 9.89 cm in F1), length of secondary rhizome (10.09 cm in F2 and 7.9 cm in F1), length of mother rhizome (10.67 cm in F2 and 7.98 cm in F1), grith of primary rhizome (10.82 cm in F2 and 9.69 cm in F1), grith of secondary rhizome (10.26 cm in F2 and 8.87 in F1), grith of mother rhizome (13.36 cm in F2 and 12.11 cm in F1), no. of primary rhizome (8.45 in F2 and 4.11 in F1), no. of secondary rhizome (15.21 in F2 and 14.34 in F1) and no. of mother rhizome (4.03 in F2 and 2.81 in F1) in Rajendra Soniya under farmers field. In case of Moti Haldi and Rajendra Sonia are statistically Non-significant. The highest yield was recorded in the farmer's field (F2) Moti Haldi cultivar (332.11 q/ha) of turmeric crop in F1 (310.04 q/ha) Rajendra Sonia and motihaldi are statistically at par (334.07 q/ha in F2 and 309.03 q/ha in F1) and followed by IISR – Pragathi (326.6 q/ha in F2 and 238 q/ha in F1), while minimum yield was obtained in IISR – Pratibha (276.95 q/ha in F2 and 247.53 q/ha in F1). Nutrients status of BU research Farm was low in organic carbon, available nitrogen, available phosphorous, and medium in available potassium while in case of F2 (Farmers field) medium to high organic carbon, medium available nitrogen, medium available phosphorous and high in available potassium. The experimental soil was slightly alkaline in nature.

THE EFFECT OF BA ON ESTABLISHMENT, SHOOT PROLIFERATION AND GENETIC STABILITY OF *GERBERA JAMESONII* IN THE *IN VITRO* CULTURES

Satish Kumar¹, S.K. Sehrawat² and Shikha Yashveer³

^{1&2}Department of Horticulture

Chaudhary Charan Singh Haryana Agricultural University, Hisar, Haryana

³Department of Molecular Biology, Biotechnology & Bioinformatics

Chaudhary Charan Singh Haryana Agricultural University, Hisar, Haryana

ABSTRACT

Establishment and shoot proliferation are very important phases in micropropagation, decisive for economic efficiency of this method for a given taxon. To obtain early establishment of explant and a high multiplication ratio with a good quality of micro shoots, a detailed propagation protocol must be developed for a particular species or even cultivars. Gerbera is popular among cut flowers for its various coloured beautiful flowers and a longer vase life. So, there is a need to develop an efficient method of its propagation to fulfil the growing demand for this plant. The aim of the experiment was to evaluate effects of 6-benzyladenine (BA) in combination of Indole-3-butyric acid (IBA) on establishment of explants and effects of BA, or the combination of BA+KIN on the proliferation of shoots in two cultivars *viz.* Kormoran and Dolores of gerbera. Different morphological changes occurred during these phases of micropropagation were determined and occurrence of genetic changes was followed using SSR markers. BA in combination of IBA resulted in 100% explant regeneration with minimum days to establishment. On the medium with BA+IBA at low concentration produced a lower number of shoots but the highest proliferation was attained on the medium containing 4 mg BA + 0.5 mg IBA per litre. No polymorphism was detected among the mother plant and micro propagated plantlets of both cultivars for genetic fidelity during SSR analysis.

TO STUDY THE PROBLEMS FACED BY THE FARMERS OF USING THE MOBILE PHONES IN BALRAMPUR DISTRICT UTTAR-PRADESH

Virendra Pratap, Abhinav Singh and Amritanshu Singh

Acharya Narendra Deva University of Agriculture and Technology
Kumarganj Ayodhya, Uttar Pradesh

ABSTRACT

The present study was conducted on the 110 respondents in Balrampur district of U.P. to identify the problems faced by the farmers of using the mobile Phones in Balrampur District Uttar-Pradesh. Out of 132 villages, 11 villages were selected randomly and 10 respondents from each village were also selected randomly for the study and thus making a total of 110 respondents. Data were collected through an interview schedule and were analyzed using simple statistical techniques like frequency, percentage. In this study finding majority of farmers are facing the problem of Poor connectivity, economic problem, lack of confidence in handling smartphone, high cost internet services and smartphone, lack of updated information, lack of understanding the language and operating the smartphone. were some of the problems reported by the farmers.

TRANSCRIPTOME ANALYSIS TO IDENTIFY CANDIDATE GENES INVOLVED IN NITROGEN USE EFFICIENCY IN MAIZE (*ZEA MAYS* L.)

**Prabha Singh^{1,2,3}, Krishan Kumar¹, Abhishek Kumar Jha¹,
Pranjal Yadava², Madan Pal², Sujay Rakshit¹, and Ishwar Singh¹**

¹Indian Council of Agricultural Research-Indian Institute of Maize Research
Pusa Campus, New Delhi, India

²Indian Council of Agricultural Research-Indian Agricultural Research Institute
Pusa Campus, New Delhi, India

³Indian Council of Agricultural Research-Indian Grassland and
Fodder Research Institute, Jhansi, India

ABSTRACT

Maize, being a cereal crop, is a heavy consumer of nitrogenous fertilizer which not only increases the cost of cultivation but also contributes to environmental pollution. As a result, there is a need to develop N-use efficient genotypes, which requires a better knowledge of N-deficiency stress adaptation. To identify differentially expressed genes (DEGs) under low N stress, comparative transcriptome analysis was performed utilizing leaf and root tissues from two inbred lines, DMI 56 (resistant to N stress) and DMI 81 (sensitive to N stress). The opposing lines were cultivated hydroponically in a modified Hoagland solution with either enough or too little nitrogen, then sequenced using high-throughput RNA-sequencing. A total of eight sequencing libraries were created, with 88-97 percent of the raw reads sequenced. A total of eight sequencing libraries were created, with 88-97 percent of the raw reads sequenced being mapped to the B73 maize genome. DEGs were defined as genes having a p-value of 0.05 and a fold change of 2.0 or 2 in various combinations between susceptible and tolerant genotypes. According to their putative roles, DEGs were further categorized into several functional categories and pathways. These DEGs were classified into three functional categories based on Gene Ontology annotation: biological processes, molecular function, and cellular components. The majority of the DEGs are found in metabolic pathways such as secondary metabolite biosynthesis, signal transduction, amino acid metabolism, N-assimilation and metabolism, and starch metabolism, according to the KEGG and Mapman analysis. Some key genes involved in N uptake (high-affinity nitrate transporters 2.2 and 2.5), N assimilation and metabolism (glutamine synthetase, asparagine synthetase), redox homeostasis (SOD, POX), and transcription factors (MYB36, AP2-EREBP) were found to be highly expressed in the tolerant genotype when compared to the susceptible genotype. The candidate genes revealed in this study may play a key role in maize adaptation to low-N stress, and hence may be valuable in advancing studies on N metabolism and the generation of N-deficiency tolerant maize cultivars.

TYPES AND STRUCTURE OF THE SPIDER WEBS IN DIFFERENT HABITATS OF THE TUMAKURU, KARNATAKA, INDIA

Parimala B.

Department of Zoology
University College of Science, Tumkur University, Tumkur, Karnataka

ABSTRACT

Spiders have unique characters compare to the other arthropods by the presence of three pairs of spinnerets at the posterior end of their abdomen. All spider species secretes silken threads and some species of spiders construct different types of web structures for the food and shelter. The present study was conducted in Tumakuru in Karnataka to understand the types and structures of webs during June 2019 to May 2020. The different habitat structure was selected for the study such as forest ecosystem, agriculture ecosystem and urban ecosystem. During this study five different types of webs were recorded such as orb web, funnel web, Irregular or space web, sheet or tangle web and triangular web. A total of 8031 webs were recorded in study period. Out of these webs, funnel webs are most dominant (27%) followed by sheet webs (24%), orb webs (23%), irregular webs (16%) and triangular webs (10%) were recorded. 51% of the webs were from forest ecosystem, 42% from agricultural ecosystem and 7% from urban ecosystem. The families like Agelenidae and Hippasa of Lycosidae constructs funnel type of web and these are recorded throughout the year. Aranneidae, Tetragnathidae and Uloboridae constructs an orb web and species of Aranidae are recorded in monsoon and winter seasons while Tetragnathidae and Uloboridae are recorded in all the seasons but very less in summer. Eresidae, Pholcidae and Theridiidae constructs a space web and these are recorded in all the seasons but they were less abundant and the triangular web was constructed by Uloboridae species and it is least recorded when compared to other web structures.

UTILITY OF AQUACULTURE TECHNOLOGY FOR CROCODILE CONSERVATION

R J Rao

Barkatullah University, Bhopal, Madhya Pradesh

ABSTRACT

Aquaculture is the controlled cultivation of aquatic organisms such as fish, crustaceans, mollusks, algae and other organisms of value such as aquatic plants. Aquaculture involves cultivating freshwater, brackish water and saltwater populations under controlled or semi-natural conditions, and can be contrasted with commercial fishing, which is the harvesting of wild fish. One of the least aquatic forms of aquaculture involves the farming of turtles and crocodiles are referred as semi aquatic, and their husbandry is in some ways more similar to livestock production than to fish or shellfish farming.

In response to widespread declines in wild populations of Crocodiles worldwide and for commercial exploitation for leather products and meat, farming and ranching efforts began for several crocodilian species in the 1950s. Once the Convention on International Trade in Endangered Species (CITES) was established in the mid-1970s, interest in farming and ranching crocodilians increased in many countries. The worldwide conservationists are deeply concerned about the declining numbers of turtles and crocodiles in different countries due to illegal fishing and excessive sand dredging in their habitats. Populations of these animals were reduced due to over exploitation and habitat degradation. Like in other countries Government of India also adopted techniques of captive rearing of crocodiles in aqua farms for raising the animals for population replication of the endangered species. The major crocodile project has been established in the country during 1975 by the Food and Agriculture Organisation/United Nations Development Programme (FAO/UNDP) on the model of growing the crocodiles in captive farms similar to fish farms to raise the crocodiles to a certain age/size to release them back in the natural areas under crocodile rehabilitation programme. Natural wild habitats have been identified through ground surveys and using Remote Sensing technology and captive reared crocodiles are being released in those habitats by declaring them as protected areas. As part of the conservation programme efforts have been made to save the animals from extinction with the help of local communities who helps to protect and preserve the local habitat, because they live there and the conservation work is more effective. Community Fisheries fishing areas have been established to manage sustainable conservation of fishery in order to conserve turtles and crocodile habitats. In India crocodile project is based on 'grow and release programme' in which wild laid eggs are collected for raising in captive facilities and release back into the wild after they attain a required size. While captive breeding is common for several crocodile species in various parts of the world, ranching of crocodile is a best practice adopted, which based on annual egg collection from nests in the wild and subsequent grow-out under controlled farming conditions. Feeding and maintenance go on routinely in crocodilian farming until animals reach marketable size, the market is gradually shifting to accommodate somewhat larger animals. Captive breeding programme of crocodiles in many crocodile farming facilities and zoos in India has a major role in contribution of raising large number of crocodiles for conservation purpose. The aquaculture technology adopted for raising large number of crocodiles in India is the most successful programme for conservation of aquatic biodiversity.

**VARIABILITY AND CHARACTER ASSOCIATION IN M₃
GENERATION IN URDBEAN [*VIGNA MUNGO* (L.) HEPPEL]**

Harshit Chaturvedi and S.S. Punia

¹Department of Plant Breeding and Genetics
SKNCOA Jobner, Jaipur, Rajasthan

ABSTRACT

Variability and correlation coefficient analysis were carried out in a set of 72 mutants of Urdbean grown in an augmented randomized block design in four blocks during *Kharif*-2019. The analysis of variance depicted significant difference among the entries for most of the characters namely plant height, branches per plant, cluster per plant, pod per cluster, pods per plant, pod length, seeds per pod, 100-seed weight, seed yield per plant and protein content. This indicated existence of variability among the genotype.

Mutations were more in positive direction in case of progenies of parent PU 1 for all the traits studied except branches per plant and protein content (%). On the other hand, in case of progenies of parent CO 6 had more mutants in negative direction for all the traits except seeds per pod.

The high estimates of heritability and genetic advance were found for the characters seed yield per plant and pods per plant. The highest percentage of GCV and PCV was observed for seed yield per plant.

The association analysis revealed that the seed yield per plant exhibited positive and significant correlation with plant height, branches per plant, seeds per pods, pods per plant, pod length, 100-seed weight, pod per cluster, cluster per plant and it was non-significant with protein.

Among the 72 mutants, five M₃ treatments were found to be best *i.e.* T₂-19, T₁-6, T₁-1, T₂-14 and T₆-67 on the basis of seed yield per plant. They can be further used for Blackgram breeding program.

VARIABILITY IN *PHYTHOPHTHORA DRECHSLERI* F.SP CAJANI ISOLATES CAUSING STEM BLIGHT IN PIGEONPEA FROM BUNDELKHAND REGION

Monika Mishra and Ranjana Bhati

Department of Microbiology
Bundelkhand University, Jhansi, UP

ABSTRACT

Phytophthora Stem blight of pigeonpea caused by *Phytophthora drechsleri* is a devastating disease of Pigeonpea in India. Under favorable environmental conditions disease causing the loss up to 80- 100%. Lot of variability is present among the isolates, so management of this disease is become so important, the aim of this study, to know the Cultural, morphological and pathological variability among the isolates collected from the different locations of Bundhlekhnad region. Isolates exhibited a significant variation on Potato Dextrose agar medium under *in vitro* conditions. On the basis of mycelial growth, all the isolates were grouped in three groups; fast growing (81-90 mm), moderate growing (50-80 mm) and slow growing (below 50 mm). On the basis of cultural characters different types of colony growth were recorded i.e cottony white with fluffy, cottony white mat type colony, creamy white with fluffy colony, creamy white mat type colony and light pink fluffy colony. Further, based on the sporangial behavior, all the isolates are categorized in to three groups i.e. papillate, semi- papillate and non- papillate and sporangia were observed in all the 25 isolates. These finding would be further utilized in Phytophthora blight variability research in pigeonpea.

VECTOR SNAILS AND THEIR CONTROL BY THE USE OF NATURAL PRODUCTS

Pradeep Kumar

Department of Zoology,
Government Degree College Sukrauli, Kushinagar, U.P. India

ABSTRACT

Fasciolosis is an important zoonosis disease of humans and ruminants, although over the past three decades human fascioliasis has gained significance as an important disease. It is a waterborne disease, caused by trematodes species of *Fasciola hepatica* and *F. gigantica*. It is also known as liver cirrhosis or liver rot. The carrier host is a snail, in which *Lymnaea acuminata* and *Indoplanorbis exustus* snails is an intermediate hosts of liver fluke. The control of the snail population below threshold levels is a major tool in reducing the incidences of fasciolosis. Several type of research was designed for studying the effect of plants-derived molluscicides and their impact on the vector snails. It is safer and more biodegradable natural product. Plant-derived molluscicides have gained more importance because they are considered ecologically sound and culturally more acceptable than synthetic molluscicides. The molluscicidal activity of several groups of compounds present in plants of different families of angiosperm has been extensively reviewed. More than 1,500 species of plants have been studied for molluscicidal activity. It contains several compounds such as saponins, alkaloids, alkanet, tannins, phenols, trapezoids, falconoid, steroids, lactones and glycosides, etc. which have molluscicidal properties.

WHOLE GENOME-BASED IDENTIFICATION OF CYTOKININ DEHYDROGENASE GENE FAMILY IN WHEAT (*TRITICUM AESTIVUM* L.)

**Priyanka Jain¹, Ankita Singh¹, Mir Asif Iquebal¹,
Sarika Jaiswal¹, Anil Rai¹, Sundeep Kumar¹, Dinesh Kumar^{1,3}**

¹Centre for Agricultural Bioinformatics
ICAR-Indian Agricultural Statistics Research Institute, New Delhi, India

²ICAR-NBPGR, New Delhi, India

³Department of Biotechnology, School of Interdisciplinary and Allied Sciences (SIAS)
Central University of Haryana, Haryana, India

ABSTRACT

Cytokinin dehydrogenase (CKX; EC.1.5.99.12) regulates the level of cytokinin (CK) in plants and is involved in CK regulatory activities. In different plants, a small gene family encodes CKX proteins with varied numbers of members. These genes are expanded in the genome mainly due to segmental duplication events. Despite their biological importance, CKX genes in *Triticum aestivum* have yet to be studied in depth. A total of 11 CKX sub-families were identified with similar gene structures, motifs, domains cis-acting elements and an average signal peptide of 25 amino acid length was found. Introns, ranging from one to four, were present in the coding regions at a similar interval in major CKX genes. Putative cis-elements like abscisic acid, auxin, salicylic acid, low-temperature, drought and light-responsive cis-regulatory elements were found in the promoter region of the majority of CKX genes. Variation in the expression pattern of CKX genes was found across different tissues in *Triticum*. Phylogenetic analysis shows that the same subfamily of CKX clustered into a similar clade that reflects their evolutionary relationship. We performed genome-wide identification of CKXs family members in *Triticum aestivum* genome to get their chromosomal location, gene structure, cis-element, phylogeny, synteny, tissue and stage-specific expression along with the gene ontology. This study provides a resource for further analysis of the function of CKX under biotic and abiotic stresses in *Triticum* and other cereals in the endeavour of higher wheat productivity. The detailed analysis of CKX gene distribution in the wheat genome, motif characteristics, evolutionary and syntenic relationships, presence of cis-elements in the promoter regions were performed followed by gene ontology analysis. This study aims to better understanding of the role of CKX in regulation of biotic and abiotic stress resistance, growth and development in *Triticum* in endeavour of higher production and proper management.

WHY IS THE GULF OF MANNAR A BIOLOGICAL PARADISE FOR MARINE LIFE?

Jyothibabu Retnamma

CSIR-National Institute of Oceanography
Regional Centre, Vishakhapatnam, India

ABSTRACT

The Gulf of Mannar (GoM) is India's first lawfully declared Marine Biosphere Reserve, with a total area of 1500 km² stretching from Tuticorin to Mandapam over a distance of 190 km. Because of the incredible faunal diversity and richness, it is regarded as 'Marine Biologist's Paradise.' There are 450 species of fish, 158 species of arthropods, 731 species of mollusks, 110 gastropod species, 77 species of bivalves, 163 species of Scleractinia corals, 110 species of hermatypic corals, 100 species of echinoderms, 54 species of benthic foraminiferans, 52 species of Ostracods, and 42 species of fouling organisms. The pearl oyster (*Pinctada fucata*) and the molluscan resource holy chank (*Xancuspyrum*) are world-famous in the GoM. *Ptychodera flava* (living fossil) and *Balanoglossus*, the 'connecting link' between invertebrates and vertebrates, are also found in GoM. The GoM is also home to a variety of sea cucumbers, including *Holothuriascabra*, *H. spinifera*, and *Actinopygaechinites*. The GoM is home to all five known species of marine turtles (Green, Hawksbill, Olive Ridley, Leatherback, and Loggerhead), as well as ten whale species including the toothed whale, baleen whale, blue whale, humpback whale, fin whale, and pilot whale. The GoM's extraordinarily rich and diversified fauna is a fascinating characteristic. We demonstrated a classic situation, where a particular stretch of a large maritime environment acts differently from the rest of the region due to its unique geographical placement, using data spanning decades. Coastal upwelling does not occur in the GoM, unlike the nearby Indian south-western shelf, causing physiological stress on fauna owing to oxygen scarcity. Second, although being physically shielded from the domain's massive basin scale circulation, the GoM's Indian shelf receives adequate plankton stock (primary food) from the Arabian Sea and the Bay of Bengal due to seasonally reversing coastal currents. Finally, due to the lack of significant rivers and the good trapping of suspended sediments in the adjacent Palk Bay, the GoM has a high level of transparency. All of these factors favour the GoM's enormous bio-resources, which are made possible by the region's unique geographical position. Because this richness is the product of a lengthy process of natural evolution, it is critical to safeguard the GoM from all forms of environmental degradation in order to preserve its incredible marine life.

Organized jointly by

National Environmental Science Academy (NESA), New Delhi
Rani Lakshmi Bai Central Agricultural University, Jhansi, U.P.
ICAR-Indian Grassland and Fodder Research Institute, Jhansi, U.P.
ICAR-Central Agroforestry Research Institute, Jhansi, U.P.
Bundelkhand University, Jhansi, U.P.
Central Ayurveda Research Institute, Jhansi, U.P.

WOOL BASED ENVIRONMENT FRIENDLY SAPLING BAGS FOR HORTICULTURE CROP

**Vinod Kadam¹, Nilimesh Mridha², D B Shakyawar²,
Ajay Kumar¹, Sekhar Das¹ and Arun Kumar Tomar¹**

¹Textile Manufacturing and Textile Chemistry Division
ICAR-Central Sheep and Wool Research Institute, Rajasthan, India

²ICAR-National Institute for Natural Fiber Engineering and Technology, Kolkata, India

ABSTRACT

Plastic bags used for tree plantation is a big nuisance to the environment right from the bag manufacturing to its disposal. They are not biodegradable and decomposable which eventually adds land-fill waste and consumes space. In addition, such plastic bags, except for holding the plant, do not assist in plant growth. Indigenous wool fibre obtained from sheep has immense potential in agriculture and horticulture applications owing to its excellent moisture content and retention. Sapling bags have been prepared using coarse wool woven and nonwoven fabrics. Coarse wool comprised of $> 40\mu\text{m}$ fibre diameter and $> 50\%$ medullation (hollow air space at the centre of the fibre). The bags were prepared using needle punching and handloom technology. Areal density, thickness, and tensile strength of the bag are determined. An experiment was conducted for 30 days with watermelon seeds. The seed germination and plant growth performance were studied and compared with the conventional plastic bags. The plastic sapling bags yielded only 12% germination while wool sapling bags showed germination of 41%. The plant growth performance after 30 days after sowing was analyzed. The plants in wool bags showed significant ($p < 0.05$) improvement in plant height. The leaf area and the number of leaves were also found better than in plastic bags. To summarize, wool sapling bags performed better compared the plastic bags. These environment friendly bags are certainly a viable alternative to non-degradable plastic bags. The wool bag can be used for nursery plants, agriculture, horticulture, and forestry applications besides the tissue culture laboratories.

β-MANNANASE PRODUCTION BY SOLID STATE FERMENTATION USING AGRICULTURAL WASTE (COPRA MEAL AS SUBSTRATE)

Hemant Soni and G. Babu

Department of Microbiology
Central Ayurveda Research Institute (CARI), Jhansi
Central Council for Research in Ayurvedic Sciences (CCRAS), New Delhi
(Under Ministry of AYUSH, Govt. of India)

ABSTRACT

Hemicelluloses are structural heterogeneous polymers present in plant cell wall. Xylan and mannan form a prominent portion (7-30%) of hemicelluloses of plant biomass. It is present either in linear or branched forms, consisting of different monosaccharides, like D-xylose, D-mannose, D-galactose or D-arabinose. Mannan is the second major hemicellulose after xylan that appears as hemicellulose fraction of soft and hard wood. For complete degradation of mannan, apart from main chain breaking enzymes, which are β-mannanase (EC 3.2.1.78), β-mannosidase (EC 3.2.1.25) and β-glucosidase (EC 3.2.1.21), other side chain breaking enzyme like α-galactosidase (EC 3.2.1.22) are also necessary. Mannanase are produced by a wide range of microorganisms, including moulds, bacteria and actinomycetes. Solid State Fermentation (SSF) is best suitable for enzyme production from fungi. Mannan degrading enzymes have various applications in the paper, food and feed, and detergent industries. In this study, SSF method was preferred for optimized fungal mannanase production using copra meal as agricultural waste. Partial purified mannanase was characterized for optimum pH and temperature. Maximum mannanase activity was achieved on optimized conditions four folds than unoptimized conditions. Optimum activity of mannanase was observed on pH 7.0 and temperature 70°C.

**OSMOTIC ADJUSTMENT AND OXIDATIVE STRESS RESPONSES
OF INDIAN MUSTARD (*BRASSICA JUNCEA* L.) VARIETIES
UNDER DELAYED SOWING ENVIRONMENT**

Jyoti Chauhan¹ and J.P. Srivastava²

¹Noida International University, Noida (U.P) India

²Banaras Hindu University, Varanasi (U.P) India

ABSTRACT

The consequences of elevated temperature at the flowering stage is one of the critical constraints that prompt crop growth and productivity worldwide. The present experiment was aimed to reveal correct sowing times to regulate biochemical and antioxidants behavior under the fluctuating field temperature during flowering stage in Indian mustard varieties. This research was carried out with five genotype of Indian mustard viz, Pusa Mustard (PM) -25(V1), PM-26(V2), BPR-541-4(V3), RH-406 (V4), and Urvashi (V5). Genotypes were grown under the field conditions on October 30 (normal sowing; S1), November 18 (late sowing; S2) and November 30 (very late sowing; S3) situations. The S1 and S3 plants, at mid-flowering stage, showed a tremendous reduction in measured biochemical parameters viz, soluble sugar (8.5 and 17.3%), free amino acid (235.4 and 224.6%), and proline content (118.1 and 133%), respectively, and played a crucial role in the osmotic adjustment under stress. Under late sown condition, genotypes shows a significant induction of the hydrogen peroxide (H₂O₂) (2 fold) and malondialdehyde (50%) concentrations respectively, which showed the induction in oxidative stress. The study suggests that the late sowing significantly impaired the osmotic adjustment and oxidative stress in Indian mustard. Further, the mustard variety V4 (RH-406) was produce less oxidative stress and better osmotic adjustment ability and effective for cultivation in such Indian condition. Therefore, this variety could be highly useful in breeding for developing heat-tolerant genotypes for ensuring the food security.

ASSESSMENT OF ROOT TRAIT VARIABILITY IN DIVERSE OAT GENOTYPES FOR NITROGEN USE EFFICIENCY

**Bhayyalal Aanjna, Neeraj Kumar, Richa Patel, Devesh Borban,
Rajesh Kumar Singhal, Maneet Rana, Indu, and Shahid Ahmed**

¹Crop Improvement Division
ICAR-Indian Grassland and Fodder Research Institute, Jhansi, UP, India

ABSTRACT

The present investigation “Assessment of root traits variability in diverse oat genotypes for nitrogen use efficiency” was carried out during *Rabi* season of 2021-22 in crop improvement division at Indian Grassland and Fodder Research Institute, Jhansi, (U.P) India. A total 101 oat germplasm from different countries were used for the study. The experiment was conducted from January to April-2022 in the glass house facility with two specific objectives viz., screening of oat genotypes under nitrogen sufficient and limiting treatments, and assessment of root trait variability for high nitrogen use efficiency in oats. For the study the following root traits were observed viz., total root length (TRL), total projected area (TPA), total surface area (TSA), average root diameter (AVD), root volume (RV), fragile root length (FRL), fragile root surface area (FRSA), fragile root volume (FRV), tips number (TN) and fork number (FN) for varying nitrogen treatments on five plants. From the study it was observed that all the genotypes showed high variability for initial plant biomass in hydroponic systems under varying level of nitrogen treatments (N25; N50 and N100). The genotypes showing minimum reduction under treatment condition were selected for all the measured root traits. Genotypes (OL-12, OL-10, RO-11-1) for root diameter, genotypes (JHO-99-2, JHO-03-93, JHO-2001) for root length, genotypes (NDO-2, EC- 537796, UPO- 94) for root area, genotype (JO-1, JHO-210-1, EC-537821) for root volume, genotypes (EC-537821, UPO-94, OL-11) for root tips, genotypes (HFO-103, 78, HFO-58) for root tips and genotypes (OS-6, HFO-305, UPO-94) for root segments. These selected genotypes could serve as potential lines for improved nitrogen use efficiency and could be used in future breeding programme. The present analysis is a stepping stone towards finding out the nitrogen use efficient lines in oat and demarcate in identification of oat varieties for nitrogen efficient and deficient conditions.

EXCISED ROOT CULTURES OF *COLEUS FORSKOHLII* AS AN ALTERNATIVE AND NON-INVASIVE SYSTEM FOR FORSKOLIN PRODUCTION

**Mohini Sharma¹, Kiran Devi², Nisha Dhiman²,
Prakash N. Tiwari³, Dinesh Kumar², Amita Bhattacharya²**

¹Chaudhary Sarwan Kumar Himachal Pradesh Krishi VishwaVidhyalaya
Palampur, Himachal Pradesh, India

²CSIR-Institute of Himalayan Bioresource Technology, Palampur, Himachal Pradesh, India

³CCS Haryana Agriculture University, Hisar, Haryana, India

ABSTRACT

Coleus forskohlii of family Lamiaceae is a well-known medicinal perennial herb recognized for its various medicinal properties. The tuberous roots of this plant are the potential source of forskolin- a labdane diterpenoid, used to cure respiratory and circulatory disorders as well as induces lean body mass. Increasing demand of forskolin in pharmaceutical industries has made it necessary to evolve an alternative and efficient system to produce forskolin without harming whole plant. However, there were no efforts made towards this direction using highly efficient non-invasive method of excised or adventitious root culture. Therefore, our study focused on development of excised root cultures of *Coleus forskohlii* for *in vitro* forskolin production followed by their chemical quantification. The effect of geographical locales was also studied by developing excised root cultures of five different accessions (Haryana, Tamil Nadu, Uttar Pradesh NBRC-13, J&K, Punjab) along with their chemical quantification. The leaf explants of different accessions showed varied response with respect to adventitious root induction to different PGRs. Similarly, forskolin content also showed varied amount in different accessions. The leaf explants cultured on MS medium supplemented with different concentrations (2.5, 5.0, 10.0, 12.5, 15.0 μ M) of auxins (IAA, IBA, 2,4-D, NAA) for adventitious/excised rooting, maximum adventitious roots formation (49.31 ± 0.85) and highest root length (2.34 ± 0.05) was obtained in the leaves of Haryana accession on 2.5 μ M NAA supplemented MS medium. Among different accessions, Tamil Nadu supported best response in terms of AR induction followed by Haryana, J & K, NBRC-13 and Punjab. Maximum/highest forskolin content ($274.23 \mu\text{g}/100\text{mg}$ Fresh weight basis) was also observed in the adventitious roots of Tamil Nadu accession, while lowest in the Haryana accession ($37.05 \mu\text{g}/100\text{mg}$ FW basis) in 10 μ M NAA. However, a tenfold higher increase ($328.53 \mu\text{g}/100\text{mg}$) was recorded on application of 12.5 μ M IBA. This is the first report on adventitious/excised root cultures of *Coleus forskohlii* using leaf explants and provides opportunities to produce forskolin using this non-invasive method and its commercialization.

ROLE OF MOLECULAR MARKERS FOR GENETIC DIVERSITY ANALYSIS OF COTTON IN MODERN ERA OF SCIENCE: A REVIEW

Pardeep Beniwal, D K Shrivastava, Tanay Joshi¹, Sushma Tiwari and M K Tripathi

Department of Genetics and Plant Breeding, Rajmata Vijayaraje Scindia Krishi
Vishwavidyalaya, College of Agriculture, Gwalior (MP)

¹FiBL Switzerland, Department of International Cooperation
Group Resilient Cropping Systems

ABSTRACT

Cotton (*Gossypium* spp.) is one of the most widely cultivated crops, with more than 80 countries growing it in a wide range of climatic conditions. Cotton is the world's most important source of fiber for industry, as well as of oil for human consumption. Cotton hybrids are used by farmers to increase production, reduce the diversity of cotton genotypes. Indeed, identification and characterization is very important for sustainable use and proper conservation of Plant Genetic Resources (PGR). The characterization of genotypes with the use of a proper set of primers is the best method for identifying various genotypes. *G. hirsutum* is thought to have more genetic diversity than the other three cultivated cotton species. According to many studies, the modern *G. hirsutum* gene pool is relatively small, including the result from DNA fingerprinting studies using restriction fragment length polymorphism (RFLP), single nucleotide polymorphisms (SNP) markers and simple sequence repeat (SSR) markers. Modern hybrid cotton varieties are genetically susceptible to diseases, pests, and environmental stresses due to its narrow genetic base which threatens the growth of cotton cultivars and sustained genetic gain. As a result, characterization and identification of cotton genotypes with a suitable method like use of molecular markers are very important.

**MOLECULAR CHARACTERIZATION OF PEARL MILLET
GERMPLASM LINES AGAINST BLAST DISEASE EMPLOYING
SSR MOLECULAR MARKERS**

Poonam Rajpoot, M K Tripathi, Sushma Tiwari and Ravindra Solanki

Department of Genetics and Plant Breeding, College of Agriculture
Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya, Gwalior (MP)

ABSTRACT

Pearl millet (*Pennisetum glaucum*) is an important nutri-cereal for human as well as a forage/fodder crop for livestock. It is only cereal crop that is capable for adopting harsh climate condition and marginal soil. In country, it is cultivated over an area of 6.93 million ha with an average production of 8.61 million tones and the productivity is 1243 kg ha⁻¹. Madhya Pradesh occupies 0.31 million ha with an annual production 0.74 million tones and productivity is 2435 kg ha⁻¹. Blast incited by *Pyricularia grisea* (Cooke) Sacc. has occupied a key position among the pearl millet diseases resulting in severe losses in yield and yield potential of hybrids/ varieties particularly cultivated for fodder. The use of resistant varieties is the most economical and relevant way of managing blast disease in pearl millet. Several gene-based markers are direct manifestations of genetic content and can therefore serve as reliable indices of genetic or pathotypic variations. They are not influenced by environmental factors and hence are highly reproducible. In the present investigation, the experiment was carried out at the Department of Plant Molecular Biology & Biotechnology, College of Agriculture, RVSKVV, Gwalior (M.P.) in the session Kharif 2021-22. Total 75 genotypes included for molecular study with 55 different gene-based SSR molecular markers. Among 55 markers, a total 39 markers were attached and 16 markers were found to be polymorphic while 23 markers showed monomorphism.

SCREENING OF WHEAT GENOTYPES FOR RUST RESISTANCE USING MOLECULAR BREEDING APPROACHES

Vinay Kumar Hardaha, Pradeep Kumar Yadav, Sushma Tiwari and M.K. Tripathi

Department of Genetics & Plant Breeding
Rajmata Vijayaraje Scindia Krishi Vidyalaya, Gwalior (M.P.)

ABSTRACT

In India, wheat is the second most important food crop after rice both in terms of area and production. It has been described as the 'King of cereals' because of the acreage it occupies, high productivity and the prominent position it holds in the international food grain trade. It is grown in temperate, irrigated to dry and high- rain-fall areas and in warm, humid to dry, cold environments. Wheat is consumed in a variety of ways such as bread, chapatti, porridge, flour, suji etc. Among several pathogens damaging wheat crop, rust pathogens are the most prevalent. They are reported from all wheat growing countries and causes a severe damage to the wheat production worldwide. In present investigation total 96 wheat genotypes were examined for rust resistant gene by using the molecular markers SSR and SCAR. On the basis of molecular study among the 96 genotypes, in 47 genotypes rust resistant gene was present for SSR marker and these genotypes found to be rust resistant. Similarly, in 49 genotypes rust resistant gene was present for SCAR marker and these genotypes found to be rust resistant. For morphological characters wheat genotypes were significantly differed for all 16 characters i.e. viz., days 50% heading, days 50% flowering, days to maturity, grain filling period, spikes per plant, spike length, peduncle length, plant height, flag leaves areas, spike weight, grains per spike, grain weight per spike, 1000 seed weight, biological yield per plant, harvest index and grain yield per plant.

MORPHO-PHYSIOLOGICAL CHARACTERIZATION OF MAIZE (ZEA MAYS L.) GENOTYPES UNDERWATER STRESS CONDITION

Pramod Kumar Yadav, A. K. Singh, M. K. Tripathi and Sushma Tiwari

Department of Genetics and Plant Breeding, College of Agriculture
Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya, Gwalior (MP)

ABSTRACT

Maize is moderately sensitive to drought. Drought affects virtually all aspects of maize growth in varying degrees at all stages, from germination to maturity. Drought stress, particularly at flowering stage, has been identified as the most important factor limiting maize production and productivity in India. Improving drought tolerance in maize has become one of the top priorities in maize breeding programs. In this study, all 80 genotypes of maize including 66 hybrid, 12 parents and 2 check (drought tolerant HKI1105 and drought susceptible HKI1128) was used, these genotypes grown in irrigated and partial irrigated condition and laid out in a randomized block design (RBD) with two replications. In Irrigated condition grain yield per plant ranged from 42.11 to 113.73 with mean value of (71.06) among these genotypes also including drought tolerant HKI1105 (62.93) and drought susceptible HKI1128 (71.43) check genotype and In partial Irrigated condition grain yield per plant ranged from 40.33 to 105.17 with mean value of (68.08) among these genotype also including drought tolerant HKI1105 (65.04) and drought susceptible HKI1128 (63.21) check genotype. Among all 80-maize genotype under Irrigated and Partial Irrigated condition, identification of drought tolerant maize genotype is eleven ten viz. IL11 X IL12, IL1 X IL7, IL7 X IL8, IL3 X IL10, IL6 X IL7, IL7 X IL12, IL2 X IL7, IL6 X IL12, IL4 X IL6 and IL3 X IL11 showed good response with respect to all physiological traits and grain yield in both conditions. Thus, above physiological study that the drought tolerant genotypes giving more yield under drought condition are in a trend of having maintained higher turgid weight (TW), relative water content (RWC), saturation water deficit (SWD), membrane stability index (MSI) comparatively higher grain yield when subjected to drought stress.

BIOCHEMICAL ANALYSIS OF GROUNDNUT GERMPLASMS FOR YIELD ATTRIBUTING CHARACTERS

**Praveen Kumar Prajapati, R.S. Sikarwar, Sushma Tiwari,
M.K. Tripathi and S.S. Bimal**

Department of Genetics and Plant Breeding, College of Agriculture
RVSKVV, Gwalior (M.P.)

ABSTRACT

Groundnut (*Arachis hypogea*) is the King of oilseeds is a commonly known as “peanut” or “monkey nut” or “Wonder nut” or “Poor man's cashew nut”. It belongs to the sub-family papilionaceae of the family fabaceae. It is a self-pollinated crop with the basic chromosome number of $2n=4x=40$ (Surbhi Jain *et al.*, 2016). The present investigation was conducted in the session Kharif 2021-22, in biochemical lab, at biotechnology center, RVSKVV, Gwalior (M.P.) The experimental material comprised of 22 germplasm lines, 10 high yielding advance breeding lines and 8 Trombay groundnut genotypes (*Arachis hypogaea* L.). Total sugar, proline, total amino acid and lipid peroxidation were estimated using various biochemical techniques. In this estimation we have found low-high proline content in genotypes which is well corresponding to their growth pattern at field level. Similarly, total amino acid and lipid peroxidase contents were also responded as the growth patterns displayed by particular genotypes. In conclusion, this study showed the role of biochemical parameters in the crop fitness and thereafter in yield enhancement. It is further important to take these biochemical parameters into further consideration in crop improvement of groundnut.

**IN VITRO MORPHOGENESIS STUDIES
IN POMEGRANATE (*PUNICA GRANATUM* L.)**

**Ramawatar Choudhary, PKS Gurjar, MK Tripathi, Sushma Tiwari,
Mohini Sharma, Shashank Bhargava and Yashi Singh Tomar**

Department of Horticulture (Fruit Science)
Rajmata Vijayaraje Scindia Agriculture University, College of Agriculture, Gwalior

ABSTRACT

Pomegranate (*Punica granatum* L.) belongs to the family Punicaceae and commercially propagated through hardwood cuttings or air layering. Present investigation aimed to establish a micropropagation protocol for variety 'Ganesh' employing nodal segment as explants for commercial mass propagation. The planting material were disinfected by different concentrations and combinations of carbendazim-50%, kanamycin, streptomycin and mercuric chloride (HgCl_2). Among the twenty-five different treatments tested for control of exudation, three times sub-culture of the explants at a regular interval of every third day was found to be effective. Two different basal media viz., MS (Murashige and Skoog, 1962) and WP (Lloyd and McCown, 1981) were used for shoot induction. WPM amended with 1.0 mg l^{-1} BAP in association with 1.0 mg l^{-1} kinetin and 200 mg l^{-1} activated charcoal (AC) proved the best treatment for multiple shoot induction and produced 11.12 ± 0.12 shootlets. Treatment comprising of WP media supplemented with 5.0 mg l^{-1} cobalt chloride (CoCl_2) and casein hydrolysate (CH) proved very effective in control of defoliation as the number of defoliated leaves (3.58 ± 0.82) and desiccated shoots (0.60 ± 0.22) recorded was very low. Highest number of roots (5.59 ± 0.72) with higher root length ($6.72 \pm 0.50 \text{ cm}$) was evidenced on WPM supplemented with 0.2% activated charcoal (AC). The plantlets were obtained over 80% success rate after hardening in polyhouse.

STANDARDIZATION OF *IN VITRO* MASS PROPOGATION PROTOCOL FOR BLACK TURMERIC (*CURCUMA CAESIA* ROXB.)

Shashank Bhargava, M.K. Tripathi, Sushma Tiwari and Mohini Sharma

Department of Plant Molecular Biology and Biotechnology
College of Agriculture, RVS Agricultural University, Gwalior, M.P., India

ABSTRACT

Present investigation describes establishment of an efficient and reproducible micropropagation protocol for Black turmeric (*Curcuma caesia* Roxb.) employing rhizomal bud as an explant source acquired from 3-month-old plants. Sequential and combinatorial treatments of different concentrations of streptomycin, bavistin, HgCl_2 , NaOCl , H_2O_2 and 70% ethanol were applied for surface sterilization. Among different surface sterilizing agents, maximum cultures (85%) with minimum browning (5%) and contamination percentage (10%) were established by employing 0.5% streptomycin in combination with 2% bavistin, 0.1% HgCl_2 and 70% ethanol. Disinfected explants were inoculated on Murashige and Skoog medium supplemented with BAP in range of 0.5-5.0 mg l^{-1} , TDZ (0.1-1.0 mg l^{-1}) and 2-iP (0.1-1.0 mg l^{-1}). Maximum shooting (6.83 ± 0.85) was documented with application of 3.0 mg l^{-1} BAP with an average shoot length of 3.78 ± 0.51 cm followed by supplementation of 0.1 mg l^{-1} TDZ. The elongated shootlets were transferred for root initiation using different auxins IBA and NAA in range of 0.5-3.0 mg l^{-1} . Maximum rooting efficiency (15.66 ± 0.47) and root length (4.30 ± 0.13 cm) were evident with supplementation of 3.0 mg l^{-1} IBA after 60 days of transferring in rooting medium. Fully developed in vitro regenerated plantlets were acclimatized by transferring them in different potting mixtures (sand, soil, FYM, vermiculite, perlite, cocopeat) in different ratios. Sand: Soil: FYM (1:1:1) admixture showed highest survival (95%) and fast growth under polyhouse conditions. Hardened plants were finally transferred to field conditions after one month of hardening. This protocol may be employed for mass in vitro propagation, establishment of embryogenic cell suspension cultures and production of secondary metabolites of pharmaceutical importance.

GENETICS OF HEAT TOLERANCE IN BREAD WHEAT (*TRITICUM AESTIVUM* L.)

Shivani Upadhyay, Sushma Tiwari, M K Tripathi and Uttam Kumar¹

Department of Genetics and Plant Breeding, College of Agriculture
Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya, Gwalior (MP)

¹Borlaug Institute for South Asia, Jabalpur

ABSTRACT

Global climate change has led to increase in the overall temperature since few decades. As, wheat is one of the major cereal crops grown worldwide and sustains to be the most consumed staple food grain of almost 2.5 billion of the world's population, the impact of rising temperature is of huge concern for the wheat growing regions of the world. Wheat production seems to be declining by as much as 6% for every 1 °C rises in temperature. Such extreme weather condition known as heat stress (HS) is becoming more frequent and severer globally. HS alters the important physiological and biochemical activities of the plant. Heat tolerance is a complex trait that is controlled by multiple genes making it difficult for breeders to perform efficient selection. To assess the genetic basis of heat tolerance in promising genotypes, successful molecular strategies have proved to be of great significance. Identification of molecular markers linked to heat tolerance serves as a basic tool for marker assisted selection (MAS). Advanced breeding lines from South Asian Bread Wheat Genomic Prediction Yield Trial (SABWGPYT) panels were selected based on maturity, yield and thousand grain weight at BISA, Jabalpur. Phenological traits were recorded in timely sown and late sown management conditions in two replications. Molecular analysis of wheat genotypes with various Simple Sequence Repeats (SSR) and Inter Simple Sequence Repeats (ISSR) markers related to heat tolerance to study the polymorphism pattern and various genetic diversity studies were conducted. The aforementioned work contributes to the understanding of genetic basis of heat tolerance in hexaploid wheat and identifies the potential to assist studies on heat tolerance in future breeding programmes.

GENOTYPING BY SEQUENCING APPROACHES FOR CROP IMPROVEMENT

Sushma Tiwari, M K Tripathi, R S Tomar¹, Neha Gupta² and Sangeeta Singh³

Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya, Gwalior (M P)

¹Rani Laxmi Bai Agricultural University, Jhansi

²Biotechnology Department, Jiwaji University, Gwalior

²DBT-National Institute of Plant Genome Research, New Delhi

ABSTRACT

Next-generation sequencing (NGS) technologies has conferred new opportunities for high throughput Single Nucleotide Polymorphism (SNP) detection applications. Recent improvements in sequencing throughput allowing NGS to be applied to not only the evaluation of small subsets of parental inbred lines, but also the mapping and characterization of traits of interest in much larger populations. Such an approach, where sequences are used simultaneously to detect and score SNPs, is known as genotyping-by-sequencing (GBS). Genotyping by Sequencing is a novel application of NGS protocols for discovering and genotyping multiple SNPs in genomes. SNP markers are powerful tool for various molecular breeding approaches, although high costs is one of the major problem for the wider use of SNPs. However, genotype-by-sequencing (GBS), has opened new possibilities in crop improvement. The GBS method uses restriction enzymes, DNA barcoded adapters, PCR amplification and sequencing of the amplified DNA pool on a single lane off low cells. Bioinformatics pipelines are needed to analyse and interpret GBS data sets. GBS can simultaneously perform SNP discovery and genotyping with or without using reference genome sequences. Therefore, GBS can be applied to various approaches for plant breeding and plant genetics studies, including linkage maps, genomic selection, genome-wide association studies, molecular marker discovery and diversity studies. It is useful in cost effective genome wide screening and multiplexed sequencing.

**GENETIC STUDY OF YIELD ATTRIBUTING TRAITS AND
RUST RESISTANCE GENES USING GENE-BASED MARKERS
IN BREAD WHEAT (*TRITICUM AESTIVUM* L.)**

**Vinay Kumar Hardaha, Pradeep Kumar Yadav,
Sushma Tiwari, Ravindra Solanki and M.K. Tripathi**

Department of Genetics and Plant Breeding
Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya, College of Agriculture, Gwalior (MP)

ABSTRACT

In India, wheat is the second most important food crop after rice both in terms of area and production. It has been described as the 'King of cereals' because of the acreage it occupies, high productivity and the prominent position it holds in the international food grain trade. It is grown in temperate, irrigated to dry and high-rain-fall areas and in warm, humid to dry, cold environments. Wheat is consumed in a variety of ways such as bread, chapatti, porridge, flour, suji etc. Among several pathogens damaging wheat crop, rust pathogens are the most prevalent. They are reported from all wheat growing countries and cause a severe damage to the wheat production worldwide. The present investigation, was conducted during *Rabi* season of 2022 at Research Farm, RVSKVV, College of Agriculture, Gwalior (M.P.). The wheat genotypes were examined for rust resistant gene by using the molecular markers SSR and SCAR. On the basis of molecular study among the 96 genotypes. For morphological observations, wheat genotypes were significantly differed for all 16 characters i.e. viz., days 50% heading, days 50% flowering, days to maturity, grain filling period, spikes per plant, spike length, peduncle length, plant height, flag leaves area, spike weight, grains per spike, grain weight per spike, 1000 seed weight, biological yield per plant, harvest index and grain yield per plant.

CLUSTER ANALYSIS FOR GENETIC ASSESSMENT IN GROUNDNUT BY USING D² STATISTICS

**Yashi Singh Tomar, Sushma Tiwari*, M K Tripathi,
Shailja Chauhan and Ravindra Singh Solanki**

Department of Genetics and Plant Breeding
Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya
College of Agriculture, Gwalior (MP)

ABSTRACT

Groundnut (*Arachis hypogaea* L.) is a highly nutritious legume being used for farming globally. The present investigation was conducted for analysing genetic diversity among 59 local groundnut germplasm using Mahalanobis D² statistical analysis for quantify the degree of divergence at genotypic level during the Kharif 2020 at research farm, Biotechnology center, RVSKVV, Gwalior (M.P.). Based on D² values 59 genotypes were grouped into different seven clusters, in which Cluster I contain maximum number of genotypes i.e. 43 followed by seven in cluster II, four in cluster IV, two genotypes are in Cluster V and Cluster III, VI and VII consist of only one genotype each. Average inter cluster values were maximum between cluster II and IV on the basis of analysis. At intra cluster level, maximum values were recorded for cluster IV followed by cluster II, cluster I and then cluster V hence these clusters appeared to be divergent and might have different geographical genetic origin hence could be gainfully utilized in groundnut improvement programme. Cluster mean of 16 morphological characters was seen most extreme in Cluster V, followed by cluster VII and then Cluster VII. Check varieties KDG-128, Gangapuri, JGN-3 and GPBD-4 are grouped into Cluster I along with 39 local germplasms and SunOleic 95R is in Cluster IV along with Badwani-6, ICGV-13236, Shivpuri local-65 and thus by selecting such parents having high genetic diversity there are greater chances of achieving transgressive segregants.

**SCREENING OF INDIAN MUSTARD (*BRASSICA JUNCEA* L.)
GENOTYPE (S) AGAINST FUNGAL DISEASES BASED ON
DISEASE INDEXING AND MOLECULAR MARKERS**

**Aditi Shrivastava, M. K. Tripathi, Sushma Tiwari, Rajitha Sistu,
Purnima Singh and Ravindra Singh Solanki**

Department of Genetics & Plant Breeding
Rajmata Vijayaraje Scindia Krishi Vidyalaya, Gwalior (M.P.)

ABSTRACT

Indian mustard (*Brassica juncea* L. Czern and Coss), also known as sarson, rai or laha, is one of the country's most important oil seed crops, occupying a significant area within the *Brassica* family of oil seed crops. It is an amphidiploid (AABB) with a diploid chromosome number $2n=36$. Fungal Diseases in Indian mustard is emerging as major problem in India. The world's top importer of edible oil is India owing to the low productivity of Indian *Brassica* genotypes, so development of improved high yielding cultivars is urgently needed. During present research, a field experiment was carried out at Research Farm and laboratory work at Plant Molecular Biology Laboratory, Biotechnology Center, RVSKVV, Gwalior (M.P.). Experimental material consists of 75 genotypes with diverse reactions against different fungal diseases. Plants were evaluated for the incidence and severity of stag heads (the malformed inflorescence due to white rust) and yield loss due to the stag head infection phase. The appearance of white rust pustules coincided with the beginning of flowering on each genotype. White Rust is caused by *Albugo candida* and powdery mildew caused by *Erysiphe cruciferarum* was also investigated under field conditions on 0 to 9 rating scale. In addition to this, molecular characterization of Indian Mustard genotypes against different fungal diseases was also done employing gene-specific molecular markers. Furthermore, biochemical parameters were also estimated from infected and healthy mustard plants infested by different fungal diseases. Fungal diseases resistant/tolerant genotype (s) can be employed for further crop improvement programme that can stand with fungal infestation and harsh climatic conditions.

APOPTOSIS INDUCING ACTIVITY OF WILD LECTIN AGAINST ENDOMETRIAL CANCER CELLS

Neha Gupta and Sameer S Bhagyawant

Department of Genetics and Plant Breeding, Rajmata Vijayaraje Scindia Krishi
Vishwavidyalaya, College of Agriculture, Gwalior (MP)

¹FiBL Switzerland, Department of International Cooperation
Group Resilient Cropping Systems

ABSTRACT

Uterine cancer is most prevailing within a woman's reproductive system. Consequent to the earlier therapeutic demand for the treatment of this specific human debility, there is a continuing search for new molecules. The legume chickpea is a rich source of proteins and shows various bioactivities. Lack of reports concerned to wild chickpea lectin on cell cycle progression, the present study was conducted. *Cicerreticulatum*; one of the wild chickpea species showed incremental caspase-3 activity along with Reactive oxygen species (ROS) generation. The results suggest that the wild lectin inhibited cell growth of Ishikawa cells (Human endometrial adenocarcinoma cell line) by induction of cell cycle arrest and apoptosis. Increased ROS generation coupled with down regulating molecules Bcl-2 and upregulating Bax in Ishikawa cells. This communication presents the first report on the lectin from wild seed of *C. reticulatum* and serves to add new information to the dearth of literature on this wild chickpea species.

**ASSESSMENT OF GENETIC DIVERSITY USING MOLECULAR
BREEDING AND BIOCHEMICAL APPROACHES IN
KODO MILLET (*PASPALUM SCROBICULATUM* L.)**

Ayushi Soni, Sushma Tiwari, M K Tripathi, Ravindra Singh Solanki and Shailja Chouhan

Department of Genetics and Plant Breeding, College of Agriculture,
Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, M.P., India

ABSTRACT

Kodo millet (*Paspalum scrobiculatum* L.) is a small grained cereal belonging to the family poaceae (Gramineae). It is a tetraploid ($2n=40$) crop species. It comes under the category of minor millets. It provides low priced protein, minerals and vitamins in form of sustainable food. It contains 8% protein, 66.6g of carbohydrate, 1.4% fat, 2.6% minerals, 25.8 ppm to 39.6 ppm iron content and also due to its stress tolerance property it needs very less inputs for its maintenance. Due to all these properties, it serves as a good substitute for wheat and rice in near future. Field experiment was laid at research farm, behind the biotech centre in the campus of R.V.S.K.V.V Gwalior (M.P.) during kharif 2021, with 75 germplasm of kodo millet which were collected from different states of India for assessment of genetic diversity using molecular- breeding and biochemical approaches. Inbreeding approaches 12 morpho-physiological parameters i.e., days to 50% flowering, days to maturity, tiller per plant, plant height (cm), flag leaf length (cm), flag leaf width (cm), panicle length (cm), fresh weight (g), biological yield (g), test weight (g), harvesting index (g), yield per plant (g) were selected. In biochemical approaches 8 parameters i.e. chlorophyll content (mg cm^{-2}), malondialdehyde (MDA) test (lipid peroxidation Assay), H_2O_2 peroxidation, sugar content, carbohydrate (mg/g), amino acid (mg/g), proline (mg/g) were estimated. Diversity assessment using molecular approaches was done by using 83 SSR (Simple Sequence Repeats) markers for the selection of diverse kodo millet germplasm.

STANDARDIZATION OF AN EFFICIENT *IN VITRO* PLANT REGENERATION PROTOCOL IN POTATO

Rahul Sharde, Deepa Bhatt, M. K. Tripathi and Sushma Tiwari

Department of Plant Molecular Biology and Biotechnology
College of Agriculture, RVS Agricultural University, Gwalior, M.P., India

ABSTRACT

Potato (Solanum tuberosum L.) is herbaceous annual plant belongs to the Solanaceae family. It is one of the utmost competent food crops which yield more dry matter, dietary fibre, eminence protein, minerals and vitamins than wheat, maize and rice per unit area and time is accepted as a stable and nutritive food. Commercial propagation of potato mostly done by vegetative means. Nevertheless, this kind of multiplication can accrue many systemic fungi, bacteria and virus contaminations that aggravate disintegration in the plants, ending with yield and vigour fatalities. Plant tissue culture technique can be employed to potato production chain with the intention of competently promulgate the material of interest, preserve germplasm banks, enable genetic exchange, deliver the study of this species and of its connections with biotic and abiotic stresses, and to produce genetically altered plants and pathogen free seed potatoes. During present investigation, potato sprout was used as explants sources and cultured on MS medium amended with diverse auxins and cytokinins in varying concentrations as sole as well as in different combinations. Culture media MS3N/MS3BN/MS3NB/MS2BN (MS + 3.0 mg l⁻¹ NAA/ MS + 3.0 mg l⁻¹ BAP + 1.0 mg l⁻¹ NAA/ MS + 3.0 mg l⁻¹ NAA + 1.0 mg l⁻¹ BAP/ MS + 2.0 mg l⁻¹ BAP + 1.0 mg l⁻¹ NAA + 30.0 g l⁻¹ sucrose + 7.5 g l⁻¹ agar powder) proved well for callus initiation. Nutrient media MS3B/MS3NB/MS3BN and MS2BG (MS + 3.0 mg l⁻¹ BAP/ MS + 3.0 mg l⁻¹ NAA + 1.0 mg l⁻¹ BAP/ MS + 3.0 mg l⁻¹ BAP + 1.0 mg l⁻¹ NAA/ MS + 2.0 mg l⁻¹ BAP + 1.0 mg l⁻¹ GA₃ + 30.0 g l⁻¹ sucrose + 7.5 g l⁻¹ agar powder) exhibited higher *in-vitro* response *i.e.*, number of shoot proliferating explants and number of shoot (s) per explant. Higher *invitro* rooting response (root proliferating efficiency, numbers of roots and mean root length) was exhibited by rooting medium MS1B/ MS.51B (MS + 1.0 mg l⁻¹ IBA/ MS + 0.5 mg l⁻¹ IBA + 15.0 g l⁻¹ sucrose + 7.5 g l⁻¹ agar). The plantlets were transferred to pots and hardened in Environmental Growth Cabinet and Net House during initial weaning period and transferred to field successfully. Phenotypic normal plants were recovered.

**SCREENING OF CHICKPEA GENOTYPES AGAINST
FUSARIUM WILT USING GENE BASED SSR MARKERS**

Manisha Mihoariya, Sushma Tiwari, M K Tripathi and Rajitha Sistu

Department of Genetics and Plant Breeding
RVSKVV College of Agriculture, Gwalior (M.P.)

ABSTRACT

Chickpea is most important legume crop and is used to fix atmospheric nitrogen. Fusarium wilt is one of the most destructive biotic-stress reducing chickpea productivity worldwide. Fusarium wilt causes up to 30 to 40 per cent yield loss. The Experiment was laid at the research farm, field of Biotechnology Centre, Department of Plant Molecular Biology & Biotechnology, RVSKVV, College of Agriculture, Gwalior (M.P.). The experimental material comprised of 93 chickpea genotypes in Randomized Block Design with two replications. Current study was conducted to screen 93 genotypes at field level and molecular level. Molecular screening was done by using allele specific SSR markers. All genotypes were screened with 22 SSR primers out of which 10 primers showed polymorphism and rest were monomorphic. Here we are trying to correlate field disease data with molecular data to identify superior genotypes with good yield and resistant for wilt.

IDENTIFICATION OF STABLE WHEAT GENOTYPES USING AMMI MODEL AND DIVERSITY ASSESSMENT FOR RUST RESISTANCE USING MARKER ASSISTED SELECTION

**Pradeep Kumar Yadav, Vinay Kumar Hardaha,
R.S. Sikarwar, Sushma Tiwari and M.K. Tripathi**

Department of Genetics & Plant Breeding, College of Agriculture
Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, M.P., India

ABSTRACT

Wheat (*Triticum aestivum* L.) is the world's most staple food crop as well as most consumed cereal. It is known as “king of cereals” as its cultivation is easier, and ecologically. Among several pathogens damaging wheat crop, rust pathogens are the most prevalent. There are three types of rust majorly affect wheat production in India leaf rust caused by *Puccinia recondita*, stem rust by *Puccinia graministriticii* and stripe rust by *Puccinia striiformis*. Madhya Pradesh mostly suffers from leaf rust and stem rust. The experiment will be carried at experimental field at the 7 different centres of RVSKVV, Gwalior i.e., khandwa, indore, sehore, sheopur, bhind, morena, Gwalior, during Rabi 2021-2022. The experiment consists 34 advanced breeding line's of wheat grown in RBD in two replications. In current investigation assessment of 34 advanced breeding lines of wheat (*Triticum aestivum* L.) was carried out using 16 morph-physiological yield attributing traits. Validation of genes Lr24, Sr31 and Sr2 in these genotypes was done using gene specific Sequence Characterized Amplified Region (SCAR) and Simple Sequence Repeats (SSR) markers. The SSR marker Xgwm533 showed highest genetic diversity (0.6290) and PIC value (0.5542), whereas the SCAR primer SCS30.2 and SCSS26.1 revealed lowest gene diversity (0.1769) and PIC value (0.1612). The major allele frequency for Xgwm533 was observed (0.4706) which is lowest; while primer SCS30.2 and SCSS26.1 showed highest major gene frequency (0.9020). On the basis of molecular study using gene based markers SSR, and SCAR, out of 34 lines , 28 lines were show high degree of resistant for rust resistance by using SSR markers and 29 lines were high degree of resistance for rust resistance by using SCAR markers.

GENETIC DIVERSITY ANALYSIS IN CHICKPEA USING SSR MARKERS

**Rajesh Ningwal, M.K. Tripathi, Sushma Tiwari,
Rakesh Kumar Yadav and Ruchi Asati**

Department of Genetics and Plant Breeding, College of Agriculture
Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, M.P., India

ABSTRACT

Chickpea (*Cicer arietinum* L.) is the third most significant pulse crop and rich source of protein. An array of biotic and abiotic factors is responsible for low productivity and stagnant production of chickpea world-wide. Present investigation was conducted at Research Farm, Department of Plant Molecular Biology & Biotechnology, College of Agriculture, RVSKVV, Gwalior, during *Rabi*2021-22. The experimental material comprised of 57 chickpea genotypes and were grown in Randomized Completely Block Design with two replications. Observation was recorded for days to flower initiation, days to 50% flowering, days to maturity, leaflet size, plant height, numbers of primary and secondary branches per plant, total numbers of pods per plant, numbers of seeds per pods, biological yield per plant, harvest index and seed yield per plant to estimate genetic parameters of variability viz., coefficient of variation, heritability, genetic advance as percentage of mean, genotypic and phenotypic correlation coefficient, path analysis, genetic divergence. Molecular characterization was also performed by using 33 SSR molecular markers. Genetic diversity assessment with different methods and their comparison could provide complimentary information for improvement of chickpea.

MOLECULAR, MORPHO-PHYSIOLOGICAL AND BIOCHEMICAL CHARACTERIZATION FOR DROUGHT IN CHICKPEA GENOTYPES

**Rajitha Sistu, Sushma Tiwari, M.K. Tripathi,
Aditi Shrivastava and Manisha Mihoariya**

Department of Plant Molecular Biology and Biotechnology
Rajamata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior (M.P), India

ABSTRACT

Chickpea (*Cicer arietinum* L.), also known as Bengal gram, gram or garbanzo bean is the country's most important leguminous crop growing in an area of 8.12 million ha, accounting for 65% of the total production in the world. It is an ultimate source of protein, carbohydrate, fiber, iron, etc... which plays a crucial role in preventing the development of several chronic diseases. It is a diploid with $2n=2x=16$ chromosomes and a genome size of 738.09Mb. Even though it is good in storing water in the soil within the root zone, Drought is one of the major abiotic constraints which limits the yield potential in chickpea. Therefore, a field experiment has conducted at research farm and laboratory at plant molecular biology laboratory, biotechnology centre, RVSKVV, Gwalior (M.P). 104 genotypes of chickpea were tested using randomized block design with two replications under stress and nonstress condition. The relative water content (RWC), drought stability index (DSI), harvest index (HI) is recorded to evaluate the drought resistance in the genotypes. Molecular characterization of genotypes using SSR markers has also done to study the polymorphism. The biochemical analysis is conducted during seedling and podding stage to evaluate the drought resistance by estimating proline, malondialdehyde, protein, catalase, superoxide dismutase, peroxidase. The genotypes have shown various significant reactions to the drought stress in molecular and field level of evaluation. This can be effective in the identification of drought tolerant genotypes of chickpea and to develop improved varieties with higher yield to grow under adverse conditions.

EVALUATION OF BIOLOGICAL FACTORS OF INDOOR PLANT SPECIES IN ARID REGION, INDIA

Rajbala Soni¹, Rajesh Dhankar² and Surender Verma³

Deptt. of Environmental Science, Vaish College of Engg., Rohtak,
Deptt. of Environmental Science, Maharishi Dayanand University, Rohtak
Deptt. of Pharmaceutical Sciences, Kurukshetra University, Kurukshetra

ABSTRACT

The present study was carried at Rohtak, Haryana, India to determine the changes in physiological and biological parameters of ornamental indoor plants-Chlorophytum comosum (Spider plant) vs. Chlorophytum comosum variegatum (Species of Spider plant) under normal and stress conditions. Parameters like total chlorophyll content, ascorbic acid concentration, relative water content, pH of the leaf extract and carotenoids were measured at different time intervals as at 1st day, after 7 days and after 20 days intervals by following the standard methods. Comparative study was done under these parameters and Air pollution tolerance index (APTI) of the indoor plants was calculated. Chlorophytum comosum variegatum is very sensitive indoor plant species among tested plants which followed by Chlorophytum comosum.

**NON-JUDICIOUS USE OF ANTIBIOTICS IN THE
FIELD OF AGRICULTURE AND ANIMAL HUSBANDRY IS
EXACERBATING THE PROBLEM OF ANTIMICROBIAL
RESISTANCE IN ENVIRONMENTAL SOURCES.**

Asghar Ali and Qazi Mohd. Rizwanul Haq

Microbiology Research Lab, Department of Biosciences
Jamia Millia Islamia, New Delhi

ABSTRACT

Due to rapid increasing contamination with antimicrobials and heavy metals, antimicrobial resistance has become a health threat worldwide. Non-judicious use of antibiotics in the field of agriculture, poultry, and animal rearing is adding to the burden of antimicrobial resistance making it not restricted to clinics but to the environment on whole. The present study focused on the microbial contamination of resistance genes: antibiotic resistant genes (ARGs), heavy metal resistant genes (HMRGs) in Hauz Khas lake Delhi, India. Isolates were screened for ARGs, HMRGs, and occurrence of their coexistence. Phenotypic screening of 140 morphologically distinct bacterial isolates collected from Hauz Khas lake, Delhi, India revealed that 28 (20%) isolates were extended spectrum β -lactamase (ESBL) positive. Antibiotic profiling of ESBL producing bacterial isolates with twenty different drugs including β -lactam and non β -lactam, showed 78% multidrug-resistant (MDR) phenotype. On comparing with non ESBL producer with ESBL producer, ESBL positive isolates were found highly resistant β -lactam and non β -lactam classes of antibiotics. Multiple antibiotic resistance (MAR) index varied from 0.1 to 0.75 among tested isolates. Molecular characterization showed, the occurrence of antibiotic resistance determinants $\text{bla}_{\text{CTX-M}}$, bla_{TEM} , bla_{SHV} , AmpC, qnrS, and heavy metal resistance genes (HMRGs) merB, merP, merT, silE, silP and silS. Co-transfer of different resistance gene were also investigated in a trans-conjugation experiment. Successful transconjugants had antibiotic and heavy metal resistance genes with similar resistance towards antibiotic and heavy metals as the donor. This study indicates that the aquatic environment is a major reservoir of bacteria harbouring resistance gene for antibiotics and heavy metals and emphasized the need to study the genetic basis of resistant microorganisms and their public health implications.

PRESENCE OF CERTAIN PLANT PARASITIC NEMATODES IN *LYCOPERSICON ESCULENTUM* (TOMATO) IN JHANSI DISTRICT

Manvendra Sengar¹, Abha Sachan¹ and Rajesh Pandey²

¹Department of Zoology in Bipin Bihari P.G. College Jhansi (U.P.),

²Department of Botany in Bundelkhand University Jhansi (U.P.)

ABSTRACT

Tomato (*Lycopersicon esculentum*) is important perennial vegetable in Bundelkhand region. Plant Parasitic Nematodes (PPNs) cause huge loss to cultivation of tomato crops. Plant Parasitic Nematodes (PPNs) are known as one of the most important pest attacking various plants in conventional. The infection of PPNS in Tomato Plants may lead to the reduced growth, yellow leaf, formation of nodules in roots. The infected tomato plant samples (along with soil) were collected from Harpura and Basvan villages of Jhansi District. Soil extraction of infected soil was undertaken by using the "Modified Baerman Tray method". The presence of "*Meloidogyne*, *Criconea*, *Hoplolaimus*, *Tylenchorhynchus* and *Helicotylenchus*" five different genera was observed under the light microscope. The structure and distribution of above nematode genera are discussed in detail in the present submission.

ROLE OF BAMBOO RESOURCES IN SOCIO-ECONOMIC DEVELOPMENT IN TRIBAL COMMUNITIES

Ragni Bhargava and G.S Chouhan

SAM
Global University, Bhopal (M.P.)

ABSTRACT

Uncertain climatic condition, biotic and abiotic stresses of environment affect the crop yield and also results in crop failure. This is the main reason of poverty within Indian farmers and tribal communities. Non-timber forest products (NTFPs) play a very important role in rural livelihood especially among fringe forest area communities in India. Bamboo is one the fast growing NTFP and India is a home of 136 species of bamboo. It can be cultivated on farm, wasteland and outside forest because of easily adaptation of different site condition. Use of bamboo and its products is not only escalating in industries but also in socio-economic development of tribal people. Cultivation and processing of bamboo is comparatively easy and can be skilled to empower men, women of tribal communities and rural poor with limited resources for employment opportunities. One hectare of bamboo plantation can generate 200-man days of employment and 900-man days in cottage industry. Harvesting of bamboo from natural forests produce every year 2.25-million-man days equal to Rs.112.5 million wage earning. The present study enumerates various livelihood conditions and use of bamboo and its products to mitigate poverty among tribal communities in India.

BIOCHEMICAL STUDY ON SEED PROTEIN PROFILING OF MUNG BEAN GENOTYPES

**Jayant Nayak, R.S. Sikarwar, M.K. Tripathi, Sushma Tiwari,
Neha Gupta¹, Vimal Sujan and Shailja Chauhan**

Department of Genetics and Plant Breeding, College of Agriculture, RVSKVV, Gwalior (M.P)
Biotechnology Department, Jiwaji University, Gwalior

ABSTRACT

Mungbean crop widely cultivated for digestible protein and its palatable nature. It contains carbohydrate (51 %), protein (24-26 %), mineral (4 %), vitamins (3 %) and fat (1 %). Mung bean seeds are an invaluable source of digestible protein for vegetarians, Seed protein patterns obtained by electrophoresis have been successfully used to resolve the taxonomic and evolutionary problems of several plants. The present study was conducted with 35 genotypes for biochemical study in kharif season 2021-22. Analysis of seed protein provides a better understanding of biochemical profiling of the germplasm which used for differentiating the cultivars of a particular crop species. Seed storage protein profiling of mung bean genotypes was performed by SDS-PAGE. The total seed proteins from mung bean's seeds were resolved on 10% gels. While scoring SDS gel, we have found 32 protein polypeptide bands with molecular weights ranging from 24 to 104kDa. Therefore, we have observed wide range of variability among different yield range genotypes. Dendrogram was created based on molecular bands of proteins data scored by gel electrophoresis grouped 35 genotypes into three clusters at 93% homology. In conclusion, electrophoresis (SDS-PAGE) of seed storage proteins provided an economic way to assess genetic variation in mung bean germplasm. Furthermore, presently study provides further opportunity to use these genotypes in mung bean crop improvement program.

STUDIES ON EFFECT OF DIFFERENT EDIBLE OIL COATINGS ON SHELF LIFE OF GUAVA (*PSIDIUM GUAJAVA* L.) DURING STORAGE

Jyoti Sengar, Praveen Kumar Singh Gurjar, Sushma Tiwari and M.K. Tripathi

Department of Horticulture
Rajamata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior (M.P.), India

ABSTRACT

The present investigation entitled "Studies on effect of different edible oil coatings on shelf life of Guava (*Psidium guajava* L.) during storage" was conducted in the laboratory Of Department of Horticulture, College of Agriculture, Gwalior during the year 2021-22 to find out the best edible oil coating to extend the shelf life of Guava. The guava variety which was chosen for the experiment was Gwalior-27. The fruits were collected at the maturity at colour break change from green to scant yellow. The fruits were stored for 12 days at ambient temperature and the different physical, biochemical and sensory parameters were observed at 3, 6, 9, 12days. The Present experiment was laid out in Completely Randomized Design (CRD) with 7 treatments viz. T1 (coconut oil), T2 (Olive oil), T3 (Linseed), T4 (Sesame oil), T5 (Almond oil), T6 (mustard oil), T7 (castor oil). Each treatment was replicated three times and three fruits were taken in one replication. The results of the research revealed that the guava fruits treated with (T2) olive oil coating at ambient temperature greatly extend the shelf life of guava while, maintaining sufficient Total Soluble Solids (TSS), Sugar content and ascorbic acid content than control. Guava fruits coated with coconut oil showed minimum physiological loss in weight as compared to other treatments. Among the different edible oil coating treatments (T2) olive oil showed maximum marketable fruits retained, fruit colour, minimum fruit decay and better organoleptic quality as compared to control and other treatments.

**TRANSCRIPTOME, PROTEOME ANALYSIS AND GENETIC
DIVERSITY ASSESSMENT OF FOXTAIL MILLET GERMPLASM
FOR DROUGHT AND BLAST STRESS**

Kiran Makwana, Sushma Tiwari and M K Tripathi

Department of Genetics and Plant Breeding
Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya, College of Agriculture, Gwalior (MP)

ABSTRACT

The foxtail millet (*Setaria italica* (L.) Beauv.) is an important small millet crop which has been cultivated from ages all over the world. It ranks second in the total world's production among all millet crops and it is an important staple food for millions of people. Blast disease caused by (*Pyricularia setariae* Nishikado) is the biotic agents evolved as a major constraint for the production and is responsible for the economic loss up to 40% during congenial weather condition. Drought is the most limiting factors affecting plant development. It leads to serious reductions in yield. Advance biotechnological applications particularly 'omics' approaches could serve as the most immediate and prospective strategies for improving abiotic stress tolerance in millet crops. Omics approaches lead to understand the mechanism of stress response and tolerance at molecular level through insights into gene, protein or metabolite profile and their phenotypic effects. The experiment was conducted at breeding farm, RVSKVV, Gwalior (M.P.) during Kharif 2021. Experimental material consist of 93 genotypes, originated from different countries will be investigated based on morphological, molecular, biochemical and transcriptome level. Around 100 SSR markers were used for screening of drought and blast resistant genotypes. Nutritional and anti nutritional parameter like total sugar, protein, iron, zinc, carbohydrates, total phenolic content, tannin and proline were estimated using various biochemical method. Research help in selection of high yielding drought and blast resistant genotypes. Selected genotypes can be used for further crop improvement programme, that can withstand harsh climatic conditions.

STANDARDIZATION OF AN EFFICIENT *IN VITRO* PLANT REGENERATION PROTOCOL IN POTATO

Rahul Sharde, Deepa Bhatt, M. K. Tripathi and Sushma Tiwari

Department of Plant Molecular Biology and Biotechnology
College of Agriculture, RVS Agricultural University, Gwalior, M.P., India

ABSTRACT

Potato (Solanum tuberosum L.) is herbaceous annual plant belongs to the Solanaceae family. It is one of the utmost competent food crops which yield more dry matter, dietary fibre, eminence protein, minerals and vitamins than wheat, maize and rice per unit area and time is accepted as a stable and nutritive food. Commercial propagation of potato mostly done by vegetative means. Nevertheless, this kind of multiplication can accrue many systemic fungi, bacteria and virus contaminations that aggravate disintegration in the plants, ending with yield and vigour fatalities. Plant tissue culture technique can be employed to potato production chain with the intention of competently promulgate the material of interest, preserve germplasm banks, enable genetic exchange, deliver the study of this species and of its connections with biotic and abiotic stresses, and to produce genetically altered plants and pathogen free seed potatoes. During present investigation, potato sprout was used as explants sources and cultured on MS medium amended with diverse auxins and cytokinins in varying concentrations as sole as well as in different combinations. Culture media MS3N/MS3BN/MS3NB/MS2BN (MS + 3.0 mg l⁻¹ NAA/ MS + 3.0 mg l⁻¹ BAP+1.0 mg l⁻¹ NAA/ MS + 3.0 mg l⁻¹ NAA+1.0 mg l⁻¹ BAP/ MS + 2.0 mg l⁻¹ BAP+1.0 mg l⁻¹ NAA + 30.0 g l⁻¹ sucrose + 7.5 g l⁻¹ agar powder) proved well for callus initiation. Nutrient media MS3B/MS3NB/MS3BN and MS2BG (MS + 3.0 mg l⁻¹ BAP/ MS + 3.0 mg l⁻¹ NAA+1.0 mg l⁻¹ BAP/ MS + 3.0 mg l⁻¹ BAP+1.0 mg l⁻¹ NAA/ MS + 2.0 mg l⁻¹ BAP+1.0 mg l⁻¹ GA₃ + 30.0 g l⁻¹ sucrose + 7.5 g l⁻¹ agar powder) exhibited higher *in-vitro* response *i.e.*, number of shoot proliferating explants and number of shoot (s) per explant. Higher *invitro* rooting response (root proliferating efficiency, numbers of roots and mean root length) was exhibited by rooting medium MSIB/ MS.5IB (MS + 1.0 mg l⁻¹ IBA/ MS + 0.5 mg l⁻¹ IBA + 15.0 g l⁻¹ sucrose + 7.5 g l⁻¹ agar). The plantlets were transferred to pots and hardened in Environmental Growth Cabinet and Net House during initial weaning period and transferred to field successfully. Phenotypic normal plants were recovered.

**ENHANCEMENT OF CHICKPEA AGAINST *FUSARIUM* WILT
EMPLOYING GENETIC, BIOCHEMICAL, MOLECULAR AND
IN VITRO SELECTION APPROACHES**

Rakesh Kumar Yadav, Manoj Kumar Tripathi and Sushma Tiwari

Department of Genetics & Plant Breeding, College of Agriculture
Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, M.P., India

ABSTRACT

Chickpea (*Cicer arietinum* L.) is the third most important pulse crop and economical source of protein, vitamin and minerals. The world-wide low productivity and stagnant production of chickpea is attributable to several factors like narrow genetic base of cultivated chickpeas and different biotic and abiotic stresses. Among different biotic stresses, the vascular wilt, caused by fungal pathogen *Fusarium oxysporum* f.sp. *ciceris*, is the major bottleneck towards its low productivity. This disease causes huge yield losses (10-50 %) annually. In present research, an effort was made to employing wholistic approach for screening of chickpea genotype(s), including genetic, biochemical, molecular and *in vitro* selection at cell level against *Fusarium* wilt. The experiment was carried out at experimental field, Department of Plant Molecular Biology and Biotechnology, RVSKVV, Gwalior, Madhya Pradesh, India during Rabi 2021-2022 with 70 genotypes and disease indexing was done under field and wilt sick plot condition. In present study, assortment of higher yielding variety along with wilt resistance employing different breeding parameters viz., genotypic coefficient and phenotypic coefficient variance, heritability and genetic advance. Correlated yield and yield attributing trait with correlation analysis and path coefficient analysis also performed. Biochemical and nutritional parameters included minerals i.e., Zn, Mn, Fe and protein / amino acid. Apart from this, a total 24 wilt resistant gene-specific SSR molecular markers was also employed for molecular characterization. Out of 24, only 11 SSR markers were found to be polymorphic whilst others were either monomorphic or not amplified. These findings may be proved helpful to breeder to develop resistant/tolerant cultivar (s) against fusarium wilt and that can reduce economic losses in upcoming days.

**EFFECT OF INTEGRATED NUTRIENT MANAGEMENT ON
GROWTH, YIELD AND QUALITY OF GARDEN PEA (*PISUMSATIVUM* VAR.
HORTENSE) UNDER GIRD AGRO-CLIMATIC ZONE OF MADHYA PRADESH**

Renu Jayant, Janmejay Sharma, D.S. Sasode, Sushma Tiwari and M.K. Tripathi

Department of Agronomy
Rajamata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior (M.P), India

ABSTRACT

The field experiment was conducted at Research Farm, College of Agriculture, Gwalior (M.P.) during rabi 2021-22, "Effect of Integrated nutrient management on growth, yield and quality of garden pea (*Pisumsativum* var. *hortense*) under gird agro-climatic zone of Madhya Pradesh." The experiment was laid out in randomized block design with ten treatments of inorganic fertilizers (NPK20:60:40 kg/ha) and integration with organic sources combinations (FYM 2.5 t/ha) were tested against the control. Application of 75% recommended fertilizer dose + Rhizobium + PSB through chemical fertilizers produced significantly highest green pod yield, Number of seeds/pod, number of pods/plant and other yield attributing characters significantly more with 75% recommended fertilizer dose + Rhizobium + PSB. Maximum grain yield was registered with full dose of RDF along with Rhizobium and PSB (26.74 q/ha) and remained at par with 75% recommended fertilizer dose + Rhizobium + PSB (25.08 q/ha). 75% recommended fertilizer dose + Rhizobium + PSB through chemical fertilizers proved to be the best treatments for enhancing productivity and profitability of garden pea under gird agro-climatic zone of Madhya Pradesh. Therefore, the practice of Rhizobium + PSB integration with 75% recommended fertilizer dose of chemical fertilizers may serve as alternative of NPK inorganic fertilizers and fear of pollution hazards and may also be recommended to exploit the better eco-friendly economic pod yield of garden pea.

ENHANCEMENT OF CHICKPEA AGAINST DROUGHT EMPLOYING GENETIC, BIOCHEMICAL, MOLECULAR AND *IN VITRO* SELECTION APPROACHES

Ruchi Asati, Manoj Kumar Tripathi and Sushma Tiwari

Department of Genetics & Plant Breeding, College of Agriculture
Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, M.P, India

ABSTRACT

Chickpea (*Cicer arietinum* L.) is the third most important pulse crop worldwide. It plays a crucial role for supplying protein sources; hence it's also called as the 'poor man's meat'. In global scenario, 40-50% reduction in chickpea yield is attributed to drought stress. An experiment was conducted at experimental field, Department of Plant Molecular Biology & Biotechnology, RVSKVV, Gwalior, Madhya Pradesh, India during Rabi 2021-2022. The experiment consists 78 genotypes grown in a RBD in three replications. Observation was recorded under stress and control conditions. Tolerant genotype(s) was screened employing different breeding parameters viz., genetic variance, correlation and path coefficient. Among biochemical parameters proline content, sugar content, MDA test, phenol content, flavonoid content, antioxidant enzymes determination, H_2O_2 and protein/amino acid were determined and morpho-physiological parameter including relative water content, saturated water deficit and total chlorophyll content was calculated. An effort has also been made to develop drought tolerant line (s) employing polyethylene glycol 6000 as selection agent. In addition to this, molecular characterization also performed using twenty drought-specific SSR molecular markers. Out of the 20 SSR molecular markers, 16 were found to be polymorphic. The selected tolerant genotype/line (s) against drought may be employed either as source of parents to develop drought tolerant or existing variation may be used as a variety.

MAPPING QTLS AND GENES FOR FERTILITY RESTORATION IN PEARL MILLET (*Pennisetum glaucum*)

Vinod Patel, M. K. Tripathi, R K Srivastava¹, Sushma Tiwari and Shailja Chouhan

Department of Genetics and Plant Breeding
Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya, College of Agriculture, Gwalior (MP)
¹ICRISAT, Hyderabad

ABSTRACT

Pearl millet is highly nutritious cereal providing food and nutritional security. CMS maintenance genes (Rfs) are essential tools for commercial hybrid seed production in pearl millet and thus can be used for hybrid variety production. Mapping of Rf genes in A₁ and A₄ CMS system in pearl millet would enable more efficient introgression of both dominant male-fertility restoration alleles. To study inheritance of fertility restoration of A₁ and A₄ cytoplasm in pearl millet. Genetic map construction and QTL mapping for Identification of fertility restorer gene in pearl millet. The experimental material consists of CMS lines ICMA 843-22,04999 and 02333 of A₁ and A₄ cytoplasm and fertility restorer lines ICMR 01004, 20233 and 20342. CMS lines were used as female parents and restorers in hybridization program. Experiment was conducted in two phases, in first phase F₂ mapping population was developed in ICRISAT, Hyderabad. In second phase F₂ population were evaluated at two locations College of Agriculture, Gwalior and ZARS, Morena, RVSKVV. Mode of inheritance of fertility restoration for A₁ and A₄ cytoplasm using pollen fertility and seed set per cent as criterion for determining the fertile and sterile plants. In each F₂ population 50 fully fertile and sterile plants were selected for genotyping. Around 500 simple sequence repeats markers will be employed for QTL mapping and gene for fertility restoration in pearl millet. Results will be identified as a major male - fertility restoration gene for A₁ and A₄ CMS system of pearl millet. Knowledge of the gene location will offer pearl millet breeders more efficient strategies to develop male parents carrying the major allele. MAS will save time as compared to introgression of restoration allele based on purely phenotyping selection. Identified genes could be used for hybrid seed production programme which will be beneficial for farmers as hybrid seeds are necessity in today's changing climatic condition.

INTEGRATED NUTRIENT MANAGEMENT (INM): MEANING, CONCEPT AND GOAL

Prabhu Lal Kantwa, A. K. Dixit and Awanish Kumar

Bundelkhand University, Jhansi
ICAR-Indian Grassland and Fodder Research Institute, Jhansi

ABSTRACT

The increasing food demands of a mounting human population and require for an environment friendly approaches for sustainable agriculture development involve significant attention when addressing the issue of enhancing crop productivity as well as soil fertility. Here we discuss about the role of integrated nutrient management (INM) in determining these concerns, which have been proposed as a promising plan for addressing such challenges. INM has comprehensive potential for the improvement of productivity and natural resource efficiency whereas also facilitating the protection of the environment ecosystems and natural resource quality. In this review we discussed about the meaning, concepts, objectives, principles and relations with soil and yield sustainability through INM. A comprehensive literature search revealed that INM enhances crop yields compared with conventional practices, increases water-use efficiency, and the economic returns to farmers, while improving grain quality and soil health and sustainability. The key objectives of integrated nutrient management (INM) system is to manage and sustain the agricultural productivity and improve the farmer's profitability with maintaining soil fertility all the way through the sensible and efficient use of inorganic fertilizers (N, P and K), organic fertilisers like; organic manures, green manures, and compost together with vermicompost, crop residues and bio-fertilizers like; Azotobactor, Azospirillum, Rhizobium, phosphorous solubilising bacteria (PSB), vesicular-arbuscular mycorrhiza (VAM), blue green algae (BGA) and azolla. However, this does not indicate adding together every one of all over the place; rather, a well-considered convenient and efficient mix together of various nutrient sources is required which can produce required yields and sustain soil health on long-term basis. INM system facilitates to restore and maintain soil and crop productivity, and also supports in the examination of emerging micro-nutrient deficiencies. In addition, it expresses financial system and efficiency in the use of fertilizers. In this chapter, the key components of INM system are discussed. Various approaches and perspectives for further development of INM in the near future are also proposed and discussed. Strong and convincing evidence indicates that INM practice could be an innovative and environmentally friendly strategy for sustainable agriculture worldwide.

**MARKER ASSISTED FOREGROUND SELECTION THROUGH
MICROSATELLITE MARKERS FOR IDENTIFICATION OF
LATE LEAF SPOT DISEASE RESISTANT IN TWO BACKCROSS
INDIVIDUALS IN GROUNDNUT (*ARACHIS HYPOGAEAL*.)**

Shailja Chauhan^{*1}, D. L. Savithramma¹, Manoj Tripathi² and Sushma Tiwari²

¹Department of Genetics and Plant Breeding
University of Agricultural Sciences, GKVK, Bengaluru

²Department of Genetics and Plant Breeding
Rajmata Vijayaraje Scindia Krishi Vishwa Vidhyalaya Gwalior M.P.

ABSTRACT

Groundnut is the second-most important legume grown worldwide. Foliar fungal disease late leaf spot (LLS) disease cause severe yield losses upto 70%. In the present investigation field screening of 225 germplasm samples for LLS disease infection identified the ICGV 86699 and GBFDS272 genotypes resistant to LLS disease. Agronomically superior and LLS disease susceptible variety TMV 2 was used as female parent were used for hybridization. This Study we developed F_1 , BC_1F_1 , BC_1F_2 , and BC_1F_3 plants were developed. True F_1 's from cross $TMV\ 2 \times ICGV\ 86699$ and $TMV\ 2 \times GBFDS\ 272$ were backcrossed to their recurrent parent TMV 2 to develop 150 and 250 BC_1F_1 progeny. Fifty three SSR markers flanking 38 QTLs reported in literatures were used to for parental polymorphism and identification of introgressed LLS disease resistant QTLs. *Foreground selection*, in which we selects plants having the marker allele of the donor parent at the target locus. Out of 53 SSR marker 12 SSR markers governing six QTLs for parents TMV 2, ICGV 86699 and 10 SSR marker governing 10 QTLs for $TMV\ 2 \times GBFDS\ 272$. Based on genotyping of 150 BC_1F_1 plants [$(TMV\ 2 \times ICGV\ 86699) \times TMV\ 2$] using 12 flanking SSR markers were identified in 31 plants with one introgressed QTL, 12 plants with two QTL, three plants with three QTL and one plant with four QTL. While in another backcross 240 [$TMV\ 2 \times GBFDS\ 272$] $\times TMV\ 2$] plants were identified in 43 plants with one introgressed QTL, eight plants with two QTL, five plants with three QTL and one plant with four QTL. Selected individuals will be genotyped for the recovery of recurrent parent along with QTL conferring LLS disease resistant through background selection. The most vital aspect of marker-assisted backcross breeding is the recurrent parent genome recovery. This enables the selection of only parents with recovered recipient/recurrent parent genome in addition to the targeted genes. For the cross [$(TMV\ 2 \times ICGV\ 86699) \times TMV\ 2$] *Per cent* genome recovery of 47 plants was varied from 64.84 *per cent* to 90.62 *per cent* and for the cross [$TMV\ 2 \times GBFDS\ 272$] $\times TMV\ 2$] *recovery per cent* ranging from 77.4 to 95.72 *Per cent*. The improved lines had good agronomic performance and resistant to LLS disease. Using marker assisted backcross selection will helpful for development of superior groundnut varieties and such molecular marker technologies also could speed up breeding programme in all crops.

BIOPLASTICS - PLANT BASED PLASTICS SUSTAINABILITY FOR ALL

Deepa Dhatwalia*

Chandigarh Group of Colleges, Landran
Mohali Punjab

ABSTRACT

Plastic is a material that is extensively used. Most commonly used plastics today are petroleum-based, which means they can take over a century to disintegrate. Because polyurethane and polyethylene are artificial polymers that microbes do not recognise as food, nothing in our natural environment can easily break them down. When plastics are burned, carcinogenic chemicals are released that are detrimental to both individuals and the environment. The world is awash with environmentally hazardous plastic generated from oil, which is a finite resource.

Bioplastics are an environmentally beneficial alternative to conventional commercial plastics. Bioplastics are biodegradable plastics made from renewable basic plant materials. Their polymers are manufactured from plant resources, and when they decompose, they turn into natural materials that blend in with the soil without harming it. Some bioplastics can degrade in as little as a few weeks. Bioplastics are being used in a variety of industries, including food packaging, agriculture and horticulture, composting bags, and hygiene. Bioplastics are being used in biological, structural, electrical, and other consumer goods. With the rise in global plastic consumption, a lot of effort is being put into researching green materials and novel processing methods.

**GERMINATION AND EARLY SEEDLING GROWTH ASSESSMENT
OF THIRTY *MORINGA OLEIFERA* LAM. GERMPLASM
COLLECTED FROM BUNDELKHAND REGION**

Hirdayesh Anuragi*, K. Rajarajan, A. K. Handa, and A. Arunachalam

ICAR-Central Agroforestry Research Institute, Jhansi

ABSTRACT

Moringa oleifera Lam., also known as 'Moringa,' 'Drumstick,' 'Sahjan,' or 'Ben oil,' is a moringaceae family member and is considered as a "Superfood, Wonder Tree, or "Tree of Life" owing to its exceptionally high nutritional and medicinal therapeutic potential to treat over 300 ailments. Furthermore, its drought tolerance and fast growing nature makes moringa an excellent choice for agroforestry to ensure farmland ecosystem restoration, food, nutrition, and livelihood security under the current scenario of climate change. Interestingly, India being world's largest producer, owns around 80 percent of global moringa market with a worth of above US\$ 8 billion. However, its potentialities need to be thorough quantified for further improvement and exploitation. In this backdrop, a thirty moringa germplasm with varied characteristics were collected by exploring different Bundelkhand districts of Madhya Pradesh and Uttar Pradesh. The germplasm were evaluated for seed germination and initial seedling growth attributes under partial controlled shade net condition. The result indicated the existence of significant variation ($p \leq 0.05$) for seed germination and seedling survival in all the germplasm. Young seedlings at 30 days after sowing (DAS) also exhibited significant differences for seedling length, seedling fresh, seedling dry weight, seedling vigor index-land II, mean germination rate, mean germination time, synchronization index, germination index, coefficient of velocity of germination and speed of germination in all the germplasm which might be attributable to their inherent vigor. The cluster and principal component analysis was also carried out to reduce the dimensions and dissect the potential relationships among the traits. Four germplasm viz., CMC-3, CMC-8, CMC-12, and CMC-24 were found to be more prominent in terms of initial seedling growth performance. This existing variation between germplasm at seed and seedling stage which could be further utilized for futuristic moringa breeding programs.

NANOTECHNOLOGY AND PLANT PATHOGENS: AN EMERGING DISEASE MANAGEMENT APPROACH

**Satya Narayan Saini, Suman Choudhary, Meenakshi Arya,
P.P. Jambhulkar, Shubha Trivedi, Maharshi Tomar, Shailendra Singh,
Ruchira Bajpai and S.K. Chaturvedi**

Department of Plant Pathology
Rani Lakshmi Bai Central Agricultural University, Jhansi, Uttar Pradesh, India

ABSTRACT

Existing plant disease management relies predominantly on toxic pesticides that are potentially harmful to humans and the environment. Nanotechnology can offer advantages to pesticides, like reducing toxicity, improving the shelf-life, and increasing the solubility of poorly water-soluble pesticides, all of which could have positive environmental impacts. Nanotechnology has led to the development of new concepts and agricultural products with immense potential to manage the aforementioned problems. The use of nanotechnology in agriculture is currently being explored in plant hormone delivery, seed germination, water management, transfer of target genes, nanobarcoding, nanosensors, and controlled release of agrichemicals. Material scientists have engineered nanoparticles with desired characteristics, like shape, pore size, and surface properties, so that they can then be used as protectants or for precise and targeted delivery via adsorption, encapsulation, and/or conjugation of an active, such as pesticide. Nanoparticles, as carriers, can provide several benefits, like (i) enhanced shelf-life, (ii) improved solubility of poorly water-soluble pesticides, (iii) reduced toxicity, and (iv) boosting site-specific uptake into the target pest. In plant disease management using nanoparticles themselves as protectants, as well as nanoparticles as carriers for insecticides, fungicides, herbicides, and dsRNA for RNA-interference (RNAi)-mediated protection. Nanoparticles are materials that range between 10 to 100 nanometers (nm), and can be designed with unique chemical, physical, and biological properties, to distinctively differ from those of their molecular and bulk counterparts. Recently, silver nanoparticles have increased in popularity, due to “green synthesis” production in plants, bacteria, fungi, or yeast. Silver nanoparticles have shown antifungal inhibition of *Alternaria alternata*, *Sclerotinia sclerotiorum*, *Macrophomina phaseolina*, *Rhizoctonia solani*, *Botrytis cinerea*, and *Curvularia lunata* by well diffusion assay. the application of NPs may trigger a burst of defensive activity, including elevated phytohormonal [salicylic acid (SA), jasmonic acid (JA), abscisic acid (ABA), zeatin riboside (ZR), and brassinosteroids (BR)] levels, production of reactive oxygen species (ROS) and antioxidants and enhanced expression of the genes involved in ABA and SA mediated defense signaling pathways.

**NON-JUDICIOUS USE OF ANTIBIOTICS IN THE FIELD OF
AGRICULTURE AND ANIMAL HUSBANDRY IS EXACERBATING
THE PROBLEM OF ANTIMICROBIAL RESISTANCE IN
ENVIRONMENTAL SOURCES**

Asghar Ali, Qazi Mohd. and Rizwanul Haq

Microbiology Research Lab, Department of Biosciences
Jamia Millia Islamia, New Delhi

ABSTRACT

Due to rapid increasing contamination with antimicrobials and heavy metals, antimicrobial resistance has become a health threat worldwide. Non-judicious use of antibiotics in the field of agriculture, poultry, and animal rearing is adding to the burden of antimicrobial resistance making it not restricted to clinics but to the environment on whole. The present study focused on the microbial contamination of resistance genes: antibiotic resistant genes (ARGs), heavy metal resistant genes (HMRGs) in Hauz Khas lake Delhi, India. Isolates were screened for ARGs, HMRGs, and occurrence of their coexistence. Phenotypic screening of 140 morphologically distinct bacterial isolates collected from Hauz Khas lake, Delhi, India revealed that 28 (20%) isolates were extended spectrum β -lactamase (ESBL) positive. Antibiotic profiling of ESBL producing bacterial isolates with twenty different drugs including β -lactam and non β -lactam, showed 78% multidrug-resistant (MDR) phenotype. On comparing with non ESBL producer with ESBL producer, ESBL positive isolates were found highly resistant β -lactam and non β -lactam classes of antibiotics. Multiple antibiotic resistance (MAR) index varied from 0.1 to 0.75 among tested isolates. Molecular characterization showed, the occurrence of antibiotic resistance determinants $\text{bla}_{\text{CTX-M}}$, bla_{TEM} , bla_{SHV} , AmpC, qnrS, and heavy metal resistance genes (HMRGs) merB, merP, merT, silE, silP and silS. Co-transfer of different resistance gene were also investigated in a trans-conjugation experiment. Successful transconjugants had antibiotic and heavy metal resistance genes with similar resistance towards antibiotic and heavy metals as the donor. This study indicates that the aquatic environment is a major reservoir of bacteria harbouring resistance gene for antibiotics and heavy metals and emphasized the need to study the genetic basis of resistant microorganisms and their public health implications.

*With best compliments
from*

GSTIN : 07BMVPS7052Q1ZT

////// ARYAN INDUSTRIES /////

Deals In : All types of Agricultural Tools, Equipments & Govt. Contractors

B-62/8, Naraina Industrial Area, Phase-II, New Delhi-110028

Ph. : 9999260223 Email : sekhri.neel@gmail.com



Climate Change Is Real. Our Climate Action Too.



NABARD Leads

India's Climate Change Agenda Through
Adaptation & Mitigation Initiatives

www.nabard.org |    /nabardonline



The green farmlands, the golden harvest, the livestock represent life.
The concrete roads and bridges lead the path to prosperity.
From oppression to empowerment, SHGs show the way to women folk.
Artisans not only create crafts, they create boundless possibilities.
Financial inclusion makes village communities inclusive too.

NABARD is proudly at the forefront of creating countless such success stories.

38 YEARS OF TRANSFORMING LIVES IN RURAL INDIA



Development Bank of the Nation

www.nabard.org



[/nabardonline](https://www.youtube.com/nabardonline)