NEWSLETTER

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ICAR-NATIONAL INSTITUTE OF BIOTIC STRESS MANAGEMENT

Baronda, Raipur - 493 225, Chhattisgarh

From The Director's Desk

Broad spectrum resistance (BSR) genes against plant diseases

Plant diseases reduce crop yields and threaten global food security. Developing disease-resistant cultivars is a major goal of crop breeding for improving productivity. Broad-spectrum resistance (BSR) refers to resistance of a crop species against more than one pathogen species or against most of the races or strains of the same species. Plant breeders have mostly depends on the use of single dominant or recessive resistance genes against the pathogen due to their strong desired effects and selection within short time. Most of this kind of resistance confers to a single or few strains or races of a pathogen or otherwise called qualitative resistance. Emergence of new races or strains in pathogen by mutation or virulence shift in pathogen breaks this high level of race-specific resistance. Another kind resistance is quantitative resistance, which is controlled by QTLs (Quantitative trait loci) and are race non-specific. This non-specific resistance provide partial resistance to all the races of a pathogen species, which is generally insufficient to defend the pathogen attack, especially during epidemic years to save the crop. Combining the above two resistance in the same genetic background is effective for disease control, however, combining both in elite cultivar is challenging and time consuming. Hence, the better way and newer approach to develop resistant crop cultivars with high degree of resistance against more number of races/ strain of a pathogen or many pathogens is adopting BSR method. Development of resistant cultivars using broad-spectrum resistance (R) genes with high breeding value is the most effective and economical approach to control this disease. Therefore, the identification and characterization of BSR genes in the crops of economic importance will be useful for developing varieties resistance to the multiple stress tolerance. The plant immune system has pathogen-associated molecular patterns (PAMPs) which recognize the pathogen by membrane associated pattern recognition receptors leading to Pathogen Triggered Immunity (PTI) and effector triggered immunity

(ETI) induced by recognizing avirulence (Avr) gene products of a pathogen. The PTI and ETI pathways involve numerous defense-signaling genes, RLCKs, MAPKs, enzymes for epigenetic regulation and protein degradation, TFs, other signaling molecules and PR proteins. Nowadays BSR genes have been identified which are involved in loss of susceptibility and non-host resistance (NHR) have recently been cloned and used in crop breeding. BSR genes resistance against pathogens have been reported in rice, wheat, potato, tomato, pepper etc. The BSR in crop protection may be developed through pyramiding of R gene, combining R genes with QTLs, modifying immune receptor, defence signaling and, pathogen-inducible expression of elicitors or Avr genes, genome editing of susceptibility genes etc. The challenges in developing BSR are identification and characterization of novel genes that balance BSR and yield, eliminating the negative effects of defense proteins on plant growth, choosing the right BSR gene combinations and pyramids or editing of susceptibility and executor R genes etc. Developing BSR cultivars for agriculturally important crops against disease would be more appropriate for the present need to save the crops from deadliest pathogen causing huge losses.

(P. K. Ghosh)
Director and Vice-Chancellor

Research Highlights

BIOTECHNOLOGY

Gene function analysis for mitigation of selected crops' biotic stress
(Ashish Marathe, P. N. Sivalingam, Vinay Kumar, Mallikarjuna J.)

The four isoforms of Flavonone-3-hydroxylase gene (*F3H1-4*) are known to be involved in diverting of naringenin pool to anthocynin, resulting the lowering of the isoflavone content. Expression analysis of four isoforms of *F3H* in resistant (DS-9712) and susceptible (JS-335) soybean lines to yellow mosaic disease was done using quantitative real-time PCR. The result suggests that among the four isoforms, *F3H1* showed higher expression in susceptible cultivar (JS-335) compared to resistant. This suggest that the mutation by gene editing of *F3H1* would be better candidate to increase the isoflavone content for imparting resistance to yellow mosaic disease in soybean.

Cloning of genomic components of begomovirus in bhendi
(P. N. Sivalingam, Ashish Marathe, Vinay Kumar, Mallikarjuna J.)

Genomic components of begomovirus isolate from Raipur (N21°22'44.7" E81°49'36.2") causing yellow vein mosaic disease of *bhendi* (BYVMD) were cloned by rolling circle amplification method in pUC18 vector and transformed to *E. coli* strain (DH5α). The transformed clones were screened for the presence of insert DNA size of ~2.7 kb and 1.35 kb by plasmid isolation and restriction analysis. Three randomly selected positive clones for each insert DNA size of ~2.7 kb and 1.35 kb were sequenced. The DNA A of this isolate had sequence identity of 94.6-95.8% with various isolates of *okra* enation leaf curl virus and the betasatellite had 88.2-90% with *Bhendi* yellow vein betasatellite and *Okra* enation leaf curl betasatellite. The preliminary data suggest that okra enation leaf curl virus associated with BYVMD from Raipur may be caused by monopartite begomovirus associated with betasatellite.

In-silico characterization of broad-spectrum resistance* (BSR) *genes from wild and cultivated Oryza species

(Vinay Kumar, P. N. Sivalingam)

Broad-spectrum resistance (BSR) genes are known to play a crucial role in plants to withstand several stresses. BSR genes have been selected on the basis of literature surveys which were having resistance to the different strains of bacterial leaf blight (BLB) disease and blast disease in Japonica and Indica rice and wild species namely *O. longistaminata* and *O. minuta.* Nucleotides and CDS sequences of BSR genes namely OsPAL4, OsGLP, OsLYP4, OsPAD4, Xa13 (SWEET11), Xa5 SWEET14, OsWAK25, Xa21, SPL33 were retrieved from the Genbank and Gramene database and were aligned to detect the structural variation and insertion/ deletion. The consensus sequences among the wild and cultivated species indicated that OsPAL4 gene alignment showed 12 nt addition in *O. longistaminata* and *O. glaberima* and absent in *O. rufipogen* and indica rice while 38 nt deletion was found in gene osLyp4 in *O. glaberrima*.

BIOLOGICAL CONTROL

Bacteriophages for rice bacterial leaf blight* (BLB) *mitigation

(Lata Jain, Vinay Kumar, S. K. Jain)

In recent years, the phage therapy for the control of bacterial pathogens has become an intriguing approach in agriculture. Among the 19 bacteriophages isolated, phage vB_XooS_NR08 was explored for bio-control of rice bacterial leaf blight pathogen (*Xanthomonas oryzae* pv. *oryzae*). Efficacy study of phage NR08 was conducted in highly susceptible TN-1 rice variety in pots. At the maximum tillering stage, rice plants were infected with *Xoo* pathogen (10^8 CFU/mL) using the leaf clip inoculation method. After 72 hours of infection, the plants were treated with a single application of NR08 phage (10^7 PFU/mL) using the spray method. The plants were daily observed for progression of diseased symptoms up to 21 days and the length of leaf lesions were recorded. The disease leaf lesion mean length was 3.43 ± 0.63 cm and 16.55 ± 3.02 cm at 21 dpi in NR08 phage treatment group and untreated infected control group, respectively which were significantly different. The NR08 treatment provided the disease control efficacy of 79.27% over the untreated infected control plants at 21 dpi.

Field evaluation of chemical elicitors against borer pests of chickpea and wheat

(R. K. Murali Baskaran, Yogesh Yele, K. C. Sharma)

Two rounds of foliar application of chemical elicitors at 10 days interval on 30th and 40th day after dibbling of chickpea seeds statistically reduced the population of pod borer larvae by 29.82% in chitosan @ 2.5 mM and 12.46% in jasmonic acid @ 5 mM and pod damage of 19.00% and 4.64%, respectively. When two rounds of chemical elicitors were applied topically at interval of 10 days on the 35th and 45th day after sowing of wheat seeds in field conditions, significant reduction in dead heart symptom (29.78% and 5.20%) and white ear symptom (24.43% and 6.49%) were recorded. As a result of the reduction of damage symptoms by borer pests, yield increase of 1.80% to 13.65% in chickpea and 5.40% to 19.74% in wheat were observed. Topical treatment of jasmonic acid @ 5 mM was found to be superior in reducing damages brought on by the borer pests in both crops.

Volatile profiles induced by borer pests of chickpea and wheat

(R. K. Murali Baskaran, Yogesh Yele, K. C. Sharma)

Volatile profiles induced by various external stressors including pod borer feeding (PB+), jasmonic acid topical treatment (JA+), combination of these two (PB+, JA+) and mechanical damage (MD+) were studied in chickpea and wheat. A maximum of 29 chemical compounds were detected in the profiles of chickpea pot plants, induced by PB+, JA+. 1-Nonadecene appeared predominantly in all profiles triggered various stressors. Various stressors including pink stem borer feeding (Pink stem borer+) induced the wheat pot plants to emit Oxirane, hexadecyl-; 1-Nonadecene and Benzenedicarboxylic acid, bis(2-methylpropyl) as major compounds (Fig. 1).

Thirteen synthetic plant volatiles selected from the profiles emitted by wheat and chickpea plants were evaluated at lab for their attractiveness to the foraging activity of *Trichogramma chilonis*. Synthetic form of volatiles, Octadecane, Eicosane and n-Hexadecanoic acid treatment elicited wasps to cause parasitism normally (more than 90%) in spite of removal of natural kairomones from eggs which was comparable to untreated eggs with natural kairomones (Fig. 2).

Fig 1,2. Trapping of volatiles induced by the borer pests of chickpea and wheat

EMERGING AGRICULTURAL PRODUCTION SYSTEM

Rhizospheric microbiome diversity in emerging production systems in agriculture

(Lata Jain, S. K. Sharma, Vijay Choudhary, T. K. Das)

Soil rhizosphere is rich in microbiome diversity, mediating plant–microbe interactions. Farming practices strongly influence taxonomic and functional diversities, as well as co-occurrence interactions of rhizosphere and phyllosphere microbes. Bulk and rhizospheric soil, and root samples were collected from maize-based conservation agricultural fields of Directorate of Weed Research (DWR) Jabalpur during *kharif* 2022 and *rabi* 2023 and processed to look for cultivable microbe. More than 200 bacterial isolates were recovered. For unculturable microbes, soil samples were processed for total genomic DNA extraction, using metagenomics approach (Fig. 3).

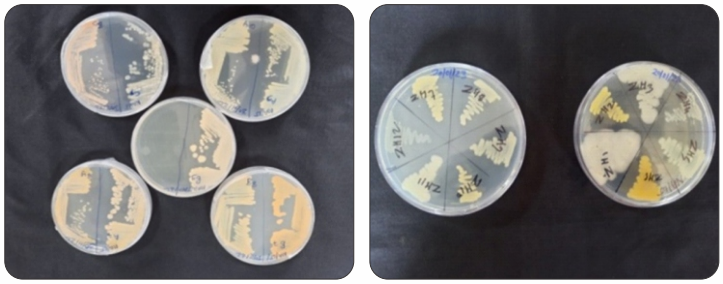

Fig 3. Culturable microbes isolated from rhizospheric soils of conservation agriculture

Pest dynamics in conservation agriculture

(J. Sridhar, L. L. Kharbikar, Anil Dixit, Vijay Choudhary, T. K. Das)

Conservation agriculture is an approach to farming that aims to improve agricultural sustainability, enhance productivity, and protect the environment. However, principles of conservation agriculture will have significant impact on insects, diseases, and weeds in the crop ecosystem. In the present investigation, the emergence of biotic stresses (Insect pests) and possible causes of such emergences in rice, maize, pigeon pea, and cotton-based conservation agricultural production system were studied in collaboration with ICAR-DWR, Jabalpur, and ICAR-IARI, New Delhi. Whitefly infestation in green gram was 1.49 to1.9 times higher in CT than in ZT. Leaf hopper infestation in direct-seeded rice-based green gram crop was 1.8 times and 1.2 times higher in rice based and maize based CT than in ZT. In Maize based green gram cropping system, a severe incidence and infestation of Bihar hairy caterpillar was observed during the 3rd week of May 2023. An unusual severe infestation of hairy caterpillar was reported significantly high in zero tillage than conventional tillage.

Bihar hairy caterpillar

Whitefly

CLIMATE CHANGE RESEARCH

Life cycle of fall armyworm in elevated temperature

(Yogesh Yele, R. K. Murali Baskaran)

Biological parameters of fall armyworm (FAW), *Spodoptera frugiperda* were studied under elevated temperature (eT) at 30°C under BOD conditions vis-à-vis ambient temperature (aT) during January to February, 2023. At eT, FAW took 32.33 ± 0.57 days to complete the life cycle as compared to ambient conditions (39.60 ± 0.43 days). The total larval duration was reduced significantly reduced at eT (15.07 ± 0.48 days) as compared to ambient conditions (22.20 ± 0.47 days). Similarly, the pupal duration and adult longevity were also reduced at eT. Stage-wise mortality was higher in aT than in eT. Studies suggest that, eT favours the growth and development of fall armyworm to complete life cycle earlier than aT during winter season.

Characterization of Mastitis causative organisms

(Binod K. Choudhary, Mamta Choudhary, Lata Jain, Soumya Dash, Yogesh Yele)

Mastitis is a highly prevalent and economically important disease among cattle. In order to identify and characterize causative organisms of mastitis in cattle in Chhattisgarh, 51 milk samples were collected from Durg, Sarona, Saragaon and Semariya. Among them, 28 samples were diagnosed as mastitis positive. Based on colony morphology, 76 bacterial isolates recovered from 15 selected positive milk samples were selected for further characterization. Antibiotic sensitivity of selected bacterial isolates indicated that samples collected from Sarona showed cent percent resistance to Aminoglycoside group of antibiotics. Bacteria collected from samples of Saragaon were highly resistant to Betalactam antibiotic (Fig. 4).

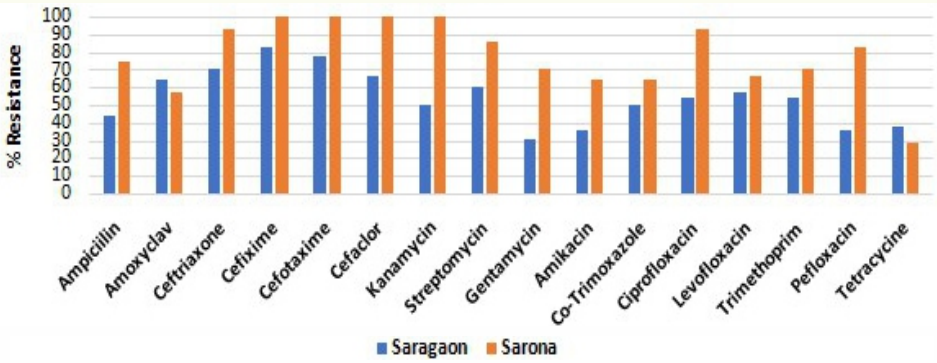

Fig 4. Antimicrobial resistance pattern of bacterial isolates from cattle affected with mastitis in Chhattisgarh

Pest Risk analysis of agriculturally important potential invasive biotic stress

(K. C. Sharma, S. K. Jain, Soumya Dash, P. Mooventhan)

Based on literature survey, using CABI, an attempt was made to document important transboundary insect pests and pathogens affecting agriculture which are not present in India, however, have the potential to enter in the country. New additions in the list include insect pests such as sugarcane scale insect, leafhopper and redbug, longhorn beetle, wheat stem sawfly, sunn pest, hessian fly, bristly black grass aphid, moroccan locust, fruit fly, black rice bug and black armyworm. Diseases caused by *Xylella fastidiosa* (Pierce's disease of grapevine and diseases in citrus, alfalfa, lucerne, almond, coffee, mulberry, peach, plum), tomato chlorosis virus, tomato brown rugose fruit virus, bacterial canker of kiwi, citrus bark cracking viroid, beet necrotic yellow vein virus, beet leaf curl and stem nematode (*Ditylenchus dipsaci*) are likely to invade India.

AGRICULTURAL EXTENSION

Farmer FIRST Programme

(P. Mooventhan, Anil Dixit, M. A. Khan, G. L. Sharma, L. K. Verma, Praveen Verma)

Under the crop-based module, 18.5 ha of rice fallow *rabi* pulses and oilseed crops such as *Lathyrus*, chickpea, and mustard and 2.5 ha under rice, following latest technologies were cultivated. Eco-friendly technologies including trap, trichocard, yellow and blue sticky trap were followed by 36 farmers. Under the horticulture-based module, tomato and bittergourd cultivation under polyhouse, nutritional gardening and post-harvest management of turmeric were demonstrated for the benefit of 60 farm families. Installation of Kadaknath and Quail farming yielded 243 Kadaknath and quail eggs in livestock-based module. Mushroom cultivation, using paddy straw, processing of rice, flour, dal, oil and spices in Agro-processing center etc., are some of the events occurred under enterprise-based module. Under the NRM-based module, low-cost Azolla production and use of waste-decomposer culture in vegetable and rice fields were demonstrated. As a part of e-Extension services, more than 1850 text messages, photos and videos were circulated to 620 farmers through social media platforms. A total of 43 capacity building events were conducted for the benefit of 580 tribal farmers.

Rice fallow pulses

Kadaknath Farming

Agro-processing Center

FFP Site Visited by QRT Team

Education

The meetings of the Board of Studies (BoS) of ICAR-NIBSM, Raipur were conducted on 2.2.22 and 28.6.23. Various issues relating to academics, faculty, students and infrastructure were discussed and finalized. Preparation for initiating UG program and allotment of research guides to newly admitted PG students were taken up and finalised. A total of six students have been admitted in three disciplines of M.Sc. courses for 2022-23. A Fresher Meet to welcome newly joined M.Sc. students (2022-23) was organized on 9.6.23 by the senior students.

Institute Activities

Visit of ADG (IPTM & PME), ICAR, New Delhi (January 9, 2023)

Dr. K. Srinivas, ADG (IPTM & PME), ICAR, New Delhi has visited ICAR-NIBSM, Raipur on 9.1.23 and delivered a lecture on intellectual property related issues.

Republic Day (January 26, 2023)

74th Republic Day was celebrated on 26.1.23 at NIBSM campus with Scientists and their families, admin staff, YPs and labourers.

World Pulses Day (February 10, 2023)

World Pulses Day was organized on 10th Feb., 2023 at ICAR-NIBSM, Raipur with theme of "Pulses for a Sustainable for Sustainable Future". Dr P. K. Ghosh, Director & Vice Chancellor, ICAR-NIBSM, Raipur spoke on importance of pulses in soil fertility maintenance, human health, reduction of carbon by carbon sequestration and other aspects. Dr Sushil K. Sharma, Principal Scientist briefed about the importance and constraints in pulses production in India and abroad.

Hands on training on biocontrol agents and biofertilizer applications for improving crop yield for farmers (February 2-3.2.23)

(Vinay Kumar, Sridhar, J, Mamta Choudhary)

ICAR-NIBSM organized two-day hands-on-training on biocontrol agents and biofertilizer applications for improving crop yield for farmers during 2-3 February, 2023. During the programme various lectures on major diseases and pest of cereals, vegetables crops, zoonotic diseases, storage grains and their management, biocontrol, biofertilizers and their applications, rat poison baits, apiculture, fish farming, success stories of agriculture technologies and drone in agriculture were delivered to the farmers by the NIBSM scientists. The Training programme was coordinated by Dr. Vinay Kumar and Dr. Sridhar J.

Secretary, DARE & DG, ICAR visit (February 18, 2023)

During the visit of Dr. Himanshu Pathak, Secretary, DARE & Director General, ICAR, at NIBSM on 18.2.23, he laid the foundation stone of main gate and residential premises and inaugurated the Climate Change Research Facility and Dispensary in the campus. During the visit, Dr. Pathak also visited infrastructural facilities at ICAR-NIBSM i.e. Boys and Girls Hostel, 535 KW Solar System and Administration-Library-Auditorium Complex. During the visit of laboratories in the schools, Dr Pathak also interacted with scientists, young professionals and postgraduate students. Dr. S. K. Ambast, PS cum JD(Edu) coordinated the program and Dr. S. K. Sharma presented the vote of thanks.

Two-days State Level Workshop cum Training on Sustainable farm income through integrated farming system by adopting biotic stress management (February 21-22, 2023)

Two-days state level workshop cum training on 'Sustainable farm income through integrated farming system by adopting biotic stress management' was conducted during 21-22.2.2023 at ICAR-NIBSM, Raipur. Distinguished guests including Prof. Shrimani Tripathi, Vice-Chancellor, Indira Gandhi National Tribal University, Amarkantak; Dr. Girish Chandel, Vice-Chancellor, IGKV, Raipur; Dr. P. K. Ghosh, Director and Vice-Chancellor, ICAR-NIBSM, Raipur and Dr. P. Kaushal and Joint Director (Research), ICAR-NIBSM, Raipur have joined with the chief guest, Dr. P. Das, Former DDG, Agriculture Extension, ICAR in inaugurating the workshop by lighting lamp on 21.2.23. Dr. Anil Dixit, Joint Director & Co-ordinator of this state level workshop introduced the mandate, vision and mission of the ICAR-NIBSM to the guests and audience. State departments including Agriculture, Horticulture, Fishery and Animal Husbandry of Chhattisgarh participated the programme. Exhibition stalls, bearing various agricultural technologies

were displayed wherein 250 farmers benefited. A team including Dr. Anil Dixit, and Drs. Mamta, Vinay Kumar, P. Mooventhan and J. Sridhar co-ordinated the programme.

Nematode awareness day-cum-farmers training (February 28, 2023)

One day nematode awareness day-cum-farmers training was organised at KVK Kanker on 28.2.23. Dr. Mallikarjuna J., Principal Investigator (AICRP Nematodes) delivered detailed lecture on identification, detection, diagnosis and integrated management of plant parasitic nematodes in various crops like cereals, pulses, vegetables, oil seeds and horticultural crops. Dr. P.N. Sivalingam, Principal Scientist, delivered a lecture on integrated management of viral diseases in various crops. More than 100 farmers benefitted during the one day training.

One-day awareness workshop on Intellectual property protection for Biotechnological research (March 15, 2023)

(Ashish Marathe, S. K. Jain)

ICAR-NIBSM organized a One-day IPR awareness workshop in hybrid mode on “Intellectual property protection for Biotechnological Research” on 15.3.23 under the NAIF scheme. Few lectures including 'Importance of integrating IP&T management part in biotech research projects', 'IPR and regulations in biotechnology research', 'Current status of IP issued pertaining to genome editing' and 'Filing of patents and designs'. More than 60 participants from ICAR-NIBSM, Raipur, ICAR-IIPR, Kanpur, ICAR-NBAIR, Bengaluru, ICAR-IIMR, Hyderabad, ICAR-DGR, Junagadh, ICAR-SBI, Coimbatore and students from State Universities like IGKV, Raipur, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad attended the workshop.

***Har Dil Dhyaan Har Din Dhyaan* (April 10-12, 2023)**

ICAR-National Institute of Biotic Stress Management, Raipur has organized three-day programme on *Har Dil Dhyan Har Din Dhyan* during 10-12.4.23. About 150 participants including Joint Directors, Scientists, Officers, Young professionals, students and contractual staffs, ICAR-NIBSM have attended the programme. The representatives from Heart fullness institute, Chhattisgarh branch, Mr. Kamaljeet Khurana, Mr. Deonarayan Sharma and Dr. Kirti Sisodia have conducted three days session. The programme was co-ordinated by Dr. Lata Jain, Senior Scientist.

QRT meeting at ICAR-NIBSM (April 26-28, 2023)

On 26.4.2023, the QRT visited the five adopted villages under the Farmers FIRST project (FFP) at Kasdol taluka of Baloda bazar district of Chhattisgarh and reviewed the performance of five crop-based models. The QRT appreciated various activities, being carried out at FFP sites which included introduction of second crop of lentil, *Lathyus* and chickpea in rice-fallows, polyhouse technologies, introduction of Kadaknath poultry and Quails, establishment of hatcheries etc. QRT consisted of Prof. S. S. Chahal, Former VC, as Chairman and Dr. B. L. Jalali, Former Director of Research, Dr. M. Krishna Reddy, former Head, Crop Protection, Dr. S. V. Sarode, Former Director Research, Dr. Kuldeep Singh, Head of Gene Bank, ICRISAT, Dr. J. S. Mishra, Director, Dr. Nitin V. Kurkure, Director of Research, Dr. Suresh Pande, Ex Principal Scientist as members and Dr. Anil Dixit, Joint Director as Member Secretary of the team. Final meeting of the committee was accomplished on 30.5.23.

World Intellectual Property Day (April 26, 2023)

ICAR-NIBSM celebrated World Intellectual Property Day 2023 on 26.4.23 with the theme, 'Women and IP: Accelerating Innovation and Creativity'. Dr. Pankaj Kaushal, Joint Director (Research) while chairing the event emphasized on the need for more active role in filing of IPs by women researchers in India as it is important to protect their inventions. The Guest Speaker on the occasion Dr. Ritu Saxena from IGKV, Raipur explained various components of Intellectual Property and stressed on the need for proper documentation of the inventions. Dr. Lata Jain (Senior Scientist) briefed the audience about the theme citing examples of women scientists who contributed significantly to the society and are inspiration to young researchers.

Workshop on Biosafety Issues in Research and Laboratory Functions (May 29, 2023)

On 29th May 2023, a one-day workshop on "Biosafety Issues in Research and Laboratory Functions" was conducted at the ICAR-NIBSM, Raipur, with an objective to address critical aspects of biosafety and provide the participants with a comprehensive understanding of the principles and practices required to maintain a safe working environment in research and laboratory settings. The inaugural lecture was delivered by Dr Neeti Sanan-Mishra, International Centre for Genetic Engineering and Biotechnology, New Delhi. Dr M.C. Sharma, Former Director, ICAR-IVRI, Izatnagar, highlighted the importance of biosafety in veterinary research. In the technical session lectures were delivered on GAPs, GLPs and relevant First aid procedures.

Mission LiFE and World Environment Day (June 5, 2023)

ICAR-National Institute of Biotic Stress Management, Raipur has organized World Environment Day under Mission Lifestyle for Environment on 5.6.23 under theme Mission LiFE and Beat plastic Pollution. During this programme, message on "Roles of forest in environmental protection" was given by Dr. Jagdish Kishwan, Former Director General, Indian Council of Forestry Research and Education, Dehradun. Guest Lecture on Solutions to plastic pollution was delivered by Er. A. C. Maloo, Head, Plastic Waste Management, Chhattisgarh Environment Conservation Board, Raipur. An essay Competition was conducted on the topic, 'Effect of Plastic pollution on marine and terrestrial life and solutions to plastic pollution'. Dr. Lata Jain, Senior Scientist and Nodal officer co-ordinated the conduct of programme.

Academician-Industry Meet (June 02, 2023)

An Academician-Industry meet was organized on 2.6.23 at ICAR-NIBSM, Raipur. At the outset, Dr. P. K. Ghosh, Director and Vice Chancellor introduced the gathering about the objectives of the meet and highlighted the need of collaboration in Public Private Partnership (PPP) mode. Later, Dr. S.K. Malhotra, Director, ICAR-Directorate of Knowledge Management, New Delhi, Dr. S.N. Sushil, Director, ICAR-National Bureau of Agricultural Insect Resources, Bengaluru and Dr Jitendra Kumar, ADG, National Agricultural Science Fund (NASF), New Delhi, as Guests of Honour, emphasized status and challenges in pesticides and biopesticides at national and international level. Subsequently, Dr. P. K. Chakrabarty, Former ADG (PPB) & Former Member, ASRB & currently the Scientific Advisor to Dhanuka spoke on "*Unlocking the Potential of India's Agriculture-Key to Unleash a Thriving Economy*'. There were three technical sessions during which 150 participants participated and benefited. The Academician-Industry meet was coordinated by Dr. S. K. Ambast, JD (Edu) and three sessions were convened by Dr. Sushil K. Sharma, PS, Dr. K.C. Sharma, PS and Dr. Binod Choudhary, PS of ICAR-NIBSM, Raipur.

International Day of Yoga (June 21, 2023)

ICAR-NIBSM has organized International Day of Yoga on 21.6.23 with a theme "Yoga for *Vasudhaiva Kutumbakam*". More than 75 participants including Scientsts, students, YPs and contractual staff of NIBSM have attended the programme. During this programme, Mr. Kaushal Kishore Gupta, Yoga Instructor gave a talk on the benefits of yoga and demonstrated various yogasanas to participants. The programme was coordinated by Dr. Lata Jain, Senior Scientist.

SCSP & TSP activities

(Mamta Choudhary, Binod K. Choudhary)

भा.कृ.अनु.प. – राष्ट्रीय जैविक स्ट्रैस प्रबंधन संस्थान बरोंडा,रायपुर ने वर्ष 2022–23 में अनुसूचित जाति उपयोजना के कार्यन्वयन के लिए रायपुर जिले के तहसील– तिल्दा, खरोरा एवं आरंग के अर्न्तगत आने वाले 17 गांवो को गोद लिया गया जिसमें निम्न गांव बुडेरा, धिवरा, केंवराडीह, बेलटुकरी, मादाडीह, सिर्री, देवरतिल्दा, बरडीह, बिठिया, पंडा परसवानी, भैसा, कुलीपोटा, अमसेना, बुडगहन, भडहा, देवसुन्दरा आदि है। इस योजना के उद्देश्य के तहत हमारा संस्थान हितग्राही किसानों के आजीविका उत्थान के लिए वैज्ञानिक विधि अपनाकर कृषि उत्पादकता को बढ़ाने के लिए प्रयासरत है। प्राकृतिक संपदा के सामुचित उपयोग के उद्देश्य से इस योजना के अर्न्तगत टपक सिंचाई एवं सौर उर्जा चलित सिंचाई पंप के पांच ईकाईयां प्रगतिशील किसानों के खेतों में स्थापित कर प्रदर्शन एवं प्रशिक्षण दिया गया जिसका लाभ हमारे लाभार्थी किसान के द्वारा लिया जा रहा है। जो कि समुदाय के लिये एक प्रेरणा श्रोत साबित हो रहा है। इस वर्श के योजना के अंर्तगत हितग्राही किसानों की सुविधा के लिए सामुहिक स्तर पर छोटे कृशि यंत्र जैसे– पावर टिलर, पावर रीपर, डीजल पंप, तेल घानी , फुट स्प्रेयर इत्यादि वितरण किये गये जो कि उनके कृषि कार्य एवं आमदनी के अर्जन के लिए मददगार होगा। संस्थान के निदेशक के नेतृत्व में यह संस्थान किसानों के हित में कार्य करने में अग्रसर है।

छोटे कृषि यंत्र का वितरण

टपक सिंचाई एवं सौर उर्जा चलित सिंचाई पंप का वितरण

NEH Activities

(P. Mooventhan)

A. Capacity building activities

S. No.	Particulars	No. of participants	State Covered	Districts covered
I. Training Programs			07 (Manipur, Arunachal Pradesh, Sikkim, Mizoram, Meghalaya, Tripura)	09 (Imphal East, Thoubal East Siang East Sikkim Serchhip Ri- bhoi West Tripura West Garo Hills, Meghalaya)
1.	Scientific pig rearing	40		
2.	Scientific poultry arming	25		
3.	Homestead farming system	85		
4.	Integrated farming System	69		
II. Demonstrations				
1.	Mushroom cultivation	65		
2.	Integrated farming system	64		
3.	Integrated pest management in vegetables	40		
Total	**04 Training and 03 Demonstrations**	**388**		

B. Input distribution

S. No.	Implementing center	Input distributed	No. of beneficiaries
1.	MTTC and VTC College of Horticulture, Bermiok, Sikkim	Vegetable seed (palak, coriander, pea, broccoli, cabbage) Trichoderma, Compost, Khurpi, Hand gloves, Neem oil	20
2.	MTTC & VTC, College of Fisheries, Lembuchhera, Tripura	Dragon fruits cutting, Mushroom spawn, Khurpi, Trichoderma, Fish seed	45
3.	Directorate of Extension Education, CAU, Imphal, Manipur	Poultry chicks and vegetable seed (pea, okra, sponge gourd, cucumber)	308

Hand's on training on Mushroom Production

Home Gardening

Input suport to farmers

Drone Technology Demonstration (2022-23)
(P. Mooventhan)

In order to educate and promote Drone's utilization in agricultural sector among the farmers ICAR-NIBSM, Raipur has organised three Agricultural Drone Frontline Demonstrations (FLDs) in applying pesticides on crops and covered 10 ha of crops. Around 200 farmers benefitted due to these demos.

Institute Monthly Seminars

S. No.	Topic of seminar	Date	Delivered by institute scientist/ international scientist
1.	Superbugs - The silent pandemic	27.01.2023	Dr. Lata Jain, Sr. Scientist (Veterinary Microbiology)

Publications

Research and Review Papers

Dokka, N., A. Marathe, B. Sahu, P. Kaushal, P. K. Ghosh and P. N. Sivalingam. 2023. *Cajanus scarabaeoides* yellow mosaic virus, a new bipartite begomovirus causing yellow mosaic disease in *Cajanus scarabaeoides* (L.) Thouars in India. Plant Disease (Accepted). https://doi.org/10.1094/PDIS-06-22-1473-SC.

Jain, L., V. Kumar, S. K. Jain, P. Kaushal and P. K. Ghosh. 2023. Isolation of bacteriophages infecting *Xanthomonas oryzae* pv. *oryzae* and genomic characterization of novel phage vB_XooS_NR08 for biocontrol of bacterial leaf blight of rice. Frontiers in Microbiology 14:1084025.

Pawar, P., R. K. Murali Baskaran, K. C. Sharma and A. Marathe. 2023. Enhancing biocontrol potential of *Trichogramma chilonis* against borer pests of wheat and chickpea. iScience 26: 106512. doi.org/10.1016/j.isci.2023.106512.

Verma, H. P., P. Mooventhan and P. K. Pandey. 2023. Farmers' uptake of oyster mushroom production through ADOPT model. Indian Research Journal of Extension Education 23 (2): 36-41.

Abstracts

Basak, A., V. Kumar, L. Jain, A. Marathe, P. N. Sivalingam and P. Kaushal. 2023. Bacterial endophyte, *Pseudomonas stutzeri* strain NTBSM_CaS37 induces endophyte mediated resistance against Fusarium wilt in Chickpea. Presented in the "International Conference on Pulses: Smart Crops for Agricultural Sustainability and Nutritional Security' organized by ISPRD, IIPR, Kanpur and held at National Agricultural Science Complex, New Delhi 110012 from February 10-12, 2023.

Sridhar, J., R. K. Murali Baskaran and P. N. Sivalingam. 2023. Status of genetic groups of *Bemesia tabaci* in vegetables and others in India. Presented in the International conference on vegetable oils (ICVO 2023) held at Hyderabad from January 17-21, 2023.

Thakur, S., S. K. Jain, G. Prakash, M. Jeer and P. Kaushal. 2023. Evaluation of finger millet core-collection accessions for blast (*Pyriculariagrisea*) resistance" Poster presented in the National seminar on Climate Resilient and Input efficient Agriculture for Food and Nutritional Security organized by *Uttar Banga Krishi Vishwavidyalaya*, Cooch Behar, West Bengal from January 19-20, 2023.

Verma, H. P., P. Mooventhan and P. K. Pandey. 2023. Farmers' uptake of Kadaknath poultry farming technology through ADOPT model. Presented in the International Conference on Innovative Agricultural Extension for Sustainable Food, Agriculture & Environmental Security (IEEC BHU 2023) organized by Department of Extension Education, IAS-BHU, Varanasi from January 27-30, 2023.

Yele, Y., S. Chander and S. S. Suroshe. 2023. Population dynamics of *Nilaparvata lugens* (Stål) under the interactive effect of elevated temperature, CO_2 and ozone. Presented in the Second Indian Rice Congress, an International event on Transforming rice research: Learning from recent scientific developments and global food crisis held at ICAR-NRRI, Cuttack from February 11-14, 2023.

Popular Articles

Choudhary, M., V. Kumar, B. K. Choudhary, L. Jain, S. Dash, L. Kharbikar, P. Mooventhan, J. Sridhar, K. C. Sharma, S. K. Sharma, A. Dixit and R. K. Murali Baskaran. 2023. Calendar on disease and its management in crops, livestock and poultry. ICAR-NIBSM, Raipur, Chhattisgarh, 12p.

Mooventhan, P., A. Dixit, M. A. Khan, G. L. Sharma, P. Verma, L. Verma, U. Singh and S. Xaxa. 2023. पॉलीहाउस में सब्जी उत्पादन तकनीक (Vegetable Production Techniques in Polyhouse), NIBSM/EF/2022-74, ICAR – NIBSM, Raipur.

Mooventhan, P., A. Dixit, M.A. Khan, G.L. Sharma, P. Verma, L. Verma, U. Singh and S.Xaxa. 2023. फसल अवशेष प्रबंधन तकनीक (Crop Residue Management Techniques), NIBSM/EF/2022-70, ICAR – NIBSM, Raipur.

Mooventhan, P., A. Dixit, M.A. Khan, G.L. Sharma, P. Verma, L. Verma, U. Singh and S.Xaxa. 2023. मक्का में फॉल आर्मीवर्म कीट और इसका प्रबंधन (Fall Armyworm Insect in Maize and their Management), NIBSM/EF/2022-71, ICAR– NIBSM, Raipur.

Mooventhan, P., A. Dixit, M.A. Khan, G. L. Sharma, P. Verma, L. Verma, U. Singh and S. Xaxa. 2023. श्री विधि से धान की खेती (Rice Cultivation through SRI Method), NIBSM/EF/2022-72, ICAR – NIBSM, Raipur.

Mooventhan, P., A. Dixit, M.A. Khan, G.L. Sharma, P. Verma, L. Verma, U. Singh and S. Xaxa. 2023. हल्दी की वैज्ञानिक खेती (Scientific Turmeric Cultivation), NIBSM/EF/2022-73, ICAR– NIBSM, Raipur.

Mooventhan, P., U. Singh and S. Xaxa. 2023. ट्राइकोकार्ड: जैविक कीट प्रबंधन में प्रभावी तकनीक (Trichocard: An Effective Technique for Biological Pest Management). Krishi World, 6: 14-15.

Mooventhan, P., A. Dixit, M. A. Khan, G. L. Sharma, L. K. Verma, P. Verma, P. Venkatesan, S. R. K. Singh, U. Singh and P. K. Ghosh. 2022. A successful model for socio-economic upliftment of tribal farmers of Chhattisgarh. Indian Farming 72(8): 76-79.

लता जैन, विनय कुमार एवं सूरज वारे. 2022. "दुधारू पशुओं में थनैला रोग - जानकारी एवं निदान" रोपण मासिक कृषि पत्रिका; दिसम्बर, 2022:31-32.

लता जैन एवं विनय कुमार. 2023. "ब्रुसेलोसिस – पशुओं का छूतदार गर्भपात : जानकारी एवं रोकथाम". रोपण मासिक कृषि पत्रिका; अप्रैल 2023:13-14.

Workshops/Symposium/Seminar/Conference/training/other fora attended

S. No.	Symposia/seminar/training attended	Period	Organized by	Name of scientist (Dr.)
1.	International conference on vegetable oils (ICVO 2023)	17-21.1.23	Hyderabad	Sridhar J.
2.	Winter school on "Development, Evaluation, and Biosafety Assessment of Genome Edited Crops: Hands-on Training	20.1.23 to 9.2.23	ICAR-IIRR, Hyderabad	Ashish Marathe
3.	International Conference on Pulses: Smart Crops for Agricultural Sustainability and Nutritional Security (icpulses2023)	10-12.2.23	ICAR-IIPR, Kanpur, ICAR-IARI, New Delhi	Anil Dixit Vinay Kumar
4.	2nd Indian Rice Congress, an International event on Transforming rice research: Learning from recent scientific developments and global food crisis	11-14.2.23	ICAR-NRRI, Cuttack	Yogesh Yele
5.	One-day awareness workshop on Intellectual property protection for Biotechnological research	15.3.23	ICAR, NIBSM, Raipur	All Scientists
6.	International conference on Natural Farming for Revitalizing Environment and Resilient Agriculture	17-19.3.23	CAU, Imphal	P. N. Sivalingam Mallikarjuna, J.
7.	National Seminar on 'Evolving extension science towards secondary agriculture for sustainable development	22-24.6.23	Indian Society of Extension Education, New Delhi	P. Mooventhan

Awards and Recognition

S. No.	Awards/Recognition/Membership in Professional Societies	Year/ Period	Offered by	Scientist (Dr.)
1.	Best poster award	27.1.23	International Conference on Innovative Agricultural Extension for Sustainable Food, Agriculture & Environmental Security (IEEC BHU 2023) organized by Department of Extension Education, IAS-BHU, Varanasi	H. P. Verma, P. Mooventhan P. K. Pandey
2.	Second Best Poster Award	19-20.1.23	National seminar on Climate Resilient and Input efficient Agriculture for Food and Nutritional Security organized by Uttar Banga Krishi Vishwavidyalaya, Cooch Behar, West Bengal	Thakur, Swagata, S. K. Jain, G. Prakash, M. Jeer, P. Kaushal
3.	Co-Chairman in the sessions, New Vistas in biotic and abiotic stress; Innovative extension methodologies	10-12.2.23	International Conference on Pulses: Smart Crops for Agricultural Sustainability and Nutritional Security (icpulses2023) at NASC complex, Pusa Campus, New Delhi	Anil Dixit
4.	Research Excellence Award 2022	2023	Institute of Scholars (InSc), INSC International Publishers, Bengaluru, Karnataka	Lata Jain
5.	Member in Bureau of Indian Standards, GoI	2023	Food and Agriculture Department, GoI	R. K. Murali Baskaran
6.	Young Scientist Award	2023	Indian Society of Extension Education, New Delhi	P. Mooventhan

Special lecture delivered

S. No.	Title of special lecture	Year/Period	Delivered in	Scientist (Dr.)
1.	Special lecture on Bio-fertilizers, their production and applications	2-3.2.23	Hands on training on biocontrol agents and biofertilizer applications for improving crop yield for farmers, NIBSM, Raipur	Vinay Kumar
2.	Special lecture on IPM for pests	21-22.2.23	Sustainable Farm Income through Integrated Farming System by Adopting Biotic Stress Management" held at ICAR-NIBSM, Raipur	K. C. Sharma
3.	Special lecture on Integrated Pest Management of Plant Diseases			S. K. Jain
4.	Special lecture on Gene manipulation and biosafety risk	29.5.23	Biosafety Issues in Research and Laboratory Functions, NIBSM, Raipur	Vinay Kumar
5.	Special lecture on Good Field Practices			J. Sridhar

Joining and Relieving of Staff

Dr. Vinod Kumar Wasnik has joined as Senior Scientist (Agronomy) at NIBSM on 23.3.23 on transfer from ICAR-IGFRI, Jhansi.

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