



ICAR-NATIONAL INSTITUTE OF BIOTIC STRESS MANAGEMENT

Baronda, Raipur - 493 225, Chhattisgarh



NEWSLETTER

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From The Director's Desk

Applications of Plant Volatile Organic Compounds (pVOCs) in Agriculture

Volatile organic compounds (VOCs) are frequently produced by plants under a variety of stressors. The low molecular weight chemicals with high vapour pressure and low water solubility known as VOCs are released in gaseous form by plants and other living things. Different roles are played by the VOCs that plants produce in response to pressures for plant defense against biotic and abiotic challenges, as well as in competition with other plants.

It has been demonstrated that the isoprenoids, the most prevalent category of pVOCs, which are triggered by abiotic stress, increase plant resistance either directly by quenching reactive oxygen species (ROS) or indirectly by stabilizing cell membranes. Plants can be made more resistant and better equipped to deal with impending danger from biotic and abiotic stresses by being primed with exogenous applications of chemical compounds, fertilizers (either natural or synthetic), or other inducers. This process is referred to as "Green Vaccination". Many VOCs have been found to actively participate in the mechanisms leading to systemic acquired resistance (SAR) in plants against stressors. Anti-microbial activities of pVOC have been well demonstrated. Emission of pVOCs from leaves/roots can have allelopathy effects and impair the growth of other competitive hetero-specific plant species. Hexenal and isoprenoids play major role in controlling of weeds and thus enhance crop productivity through a more efficient acquisition of nutrients, water and light.

Herbivores, in particular, pose a persistent threat to plants, causing them to release herbivore-induced plant volatiles (HIPVs), an inducible defense mechanism against herbivores that allows plants to communicate with the herbivores' natural enemies and nearby plants. Terpenoids, phenylpropanoids/benzenoids, fatty acid and amino acid derivatives make up the majority of the HIPVs.

A total of 900 plant families have reported 2,000 HIPVs that can mediate indirect plant defense against biotic stress.

Some examples

of plant species releasing HIPVs include: *Oryza sativa* L., *Triticum aestivum* L., *Zea mays* L., *Z. mays* subsp. *mexicana* L., *Sorghum bicolor* (L.) Moench, *Vigna unguiculata* (L.) Walp., *Phaseolus vulgaris* L., *Phaseolus lunatus* L., *Lathyrus sativus* L., *Gossypium* spp., *Nicotiana tabacum* L., *Solanum lycopersicum* L., *Solanum melongina* L., *Abelmoschus esculentus* (L.) Moench, *Capsicum annum*, *Brassica oleraceae* L., *Citrus* spp., *Malus domestica* Borkh., *Vaccinium caesariense* Rybd., *Vitis vinifera* L. etc.

A research project was initiated at ICAR-National Institute of Biotic Stress Management, Raipur, Chhattisgarh to develop a repository for plant volatiles induced by herbivores (HIPVs) in major cereal, millet, pulse, oilseed, fibre and vegetable crops which will be useful as valuable data for the development of modern devices including biosensors, handheld, field-portable smart-phone based sensors etc., for *in situ* plant stress phenotyping/early detection of damage caused by biotic stress. Allelopathy property of plant volatiles can be explored for the development of 'bioherbicide' or 'biofungicide' for eco-friendly management of weeds and plant fungal pathogens.



(P. K. Ghosh)

Director and Vice-Chancellor
ICAR-NIBSM, Raipur

Research Highlights

BIOTECHNOLOGY

CRISPR/Cas9 mediated editing of Isoflavone synthase (IFS) gene in soybean

(Ashish Marathe, P. N.Sivalingam, Lalit L. Kharbikar)

To study the role of Isoflavone synthase (IFS) gene in imparting resistance to yellow mosaic disease in soybean, the targets

specific to IFS were designed for editing using the genome editing tool. For loss-of-function mutation, soybean (cv. DS-9712) was transformed with *Agrobacterium tumefaciens* EHA105 harbouring the Cas9 and sgRNA. CRISPR/Cas9 based edited soybean plants (T₁) generated through stable transformation were subjected to PCR analysis for transgene

PAT (phosphinothricin acetyl transferase) integration and were found positive (Fig. 1 a,b).



Fig 1a. Putative transformants of edited soybean plants

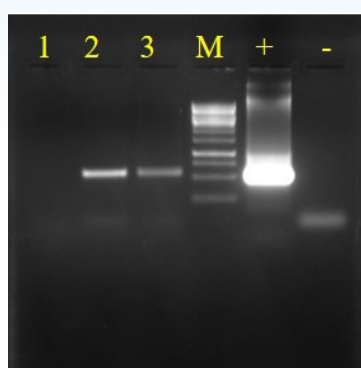


Fig 1b. PCR amplification of *PAT* gene in IFS gene edited plant of soybean Lane 1 - Non-transformed; Lane 2- Target-1, T1-3; Lane 3 - Target-1, T1-4; Lane 4 – 1 kb DNA ladder; Lane 5 - No template control

Promoter of Isoflavone synthase gene in chickpea against collar rot

(P. N. Sivalingam, Ashish Marathe, Vinay Kumar, Lalit L. Kharbikar, S. K. Jain)

The upstream region (~2kb) of IFS1 gene of chickpea (cv. Vaibhav) was amplified by PCR using specific primers and cloned in pGEM-T Easy vector and confirmed by sequencing. The DNA fragment was sub-cloned into pORE-R2 vector containing GUS gene. This recombinant vector was transformed to *Agrobacterium tumefaciens* EHA105. Fourteen days old chickpea plants infected with collar rot sclerotia were infiltrated with the *Agrobacterium* culture containing pORE-R2 and promoter region of IFS1 gene. Leaf samples collected 24 hr after infiltration were subjected to GUS assay. GUS staining was found higher in the infected samples compared to control indicating the inducible nature of IFS1 upon infection of *Sclerotium rolfsii* (Fig. 2a,b).



Fig. 2a



Fig. 2b

Fig 2. GUS staining of (a) Leaves of uninoculated chickpea plants (b) Leaves of Inoculated chickpea plants with *Sclerotium rolfsii*.

BIOLOGICAL CONTROL

Characterization of bacteriophages for rice bacterial leaf blight (Lata Jain, Vinay Kumar, S. K. Jain)

The proteins of 19 phages precipitated using acetone treatment were subject to SDS-PAGE. Totally, 8-15 structural proteins with 3-5 prominent proteins having molecular weight ranging from 10 to 175 kDa were observed. Out of 19 bacteriophages selected, total genomic DNA of 16 phages were isolated,

quantified and processed for whole genome sequencing, using illumina based sequencing approach. Whole genome size ranged from 43.6 kb to 203 kb with GC content from 52 to 67% and number of genes from 56 to 418. Genome sequence of these phages revealed the presence of structural genes for viral capsid and tail, functional genes and enzymes for viral transcription, viral capsid formation, defense genes to bacterium, viral termination, cellular metabolism *etc.*

Efficiency of native *Bacillus thuringiensis* against chickpea pod borer

(R. K. Murali Baskaran, Lata Jain, J. Sridhar, K. C. Sharma)

Native biocontrol agents are reported to possess better adaptations in management of insect pests. During *rabi* 2021-22, a field experiment was conducted to evaluate the field efficacy of NIBSM *Bt* 18 against pod borer (*Helicoverpa armigera*) in chickpea (cv. RVZ 202) in comparison with VL *Bt*, and Dipel.

Table 1. Larval population and pod borer damage in chickpea, as influenced by NIBSM *Bt* 18

Treatment	Mean % larvae/plant	% reduction of larva	Mean % pod damage	% reduction of pod damage	Yield (Q/ha)	% increase of yield
NIBSM <i>Bt</i> 18	3.2a ^b	52.24	7.07 ^{ab}	47.43	21.11 ^a	7.34
VL <i>Bt</i>	3.4 ^b	49.25	7.28 ^b	45.87	20.94 ^a	6.59
Dipel	3.0 ^a	55.22	6.32 ^a	53.01	21.44 ^a	8.76
Control	6.7 ^c	-	13.45 ^c	-	19.56 ^b	-

Two rounds of foliar application of NIBSM *Bt* 18 @ 1×10^8 CFU/mL at 10-day intervals reduced the larval population by 52.24% (3.2 larvae/plant) and pod damage by 47.43% (7.07% pod damage), besides increasing the grain yield by 7.34% (21.11 q/ha) (Table. 1).

Kairomone is an inter-specific semiochemical that can guide herbivores' natural enemies to access their immature stages. Octadecane-based nano-emulsion 1% (500 ppm) was evaluated in rice (cv. MTU 1010) during summer 2022 on biocontrol potential of *Trichogramma japonicum* against yellow stem borer.

Table 2. Damage by rice yellow stem borer due to application of octadecane nano-emulsion

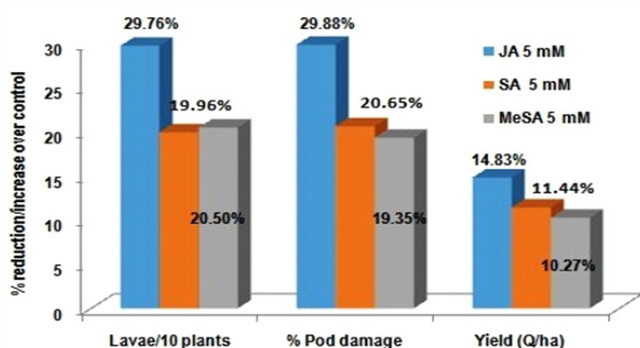
Treatment	Mean % Dead Heart	% reduction over control	Mean % White Ear	% reduction over control	% increase of yield
Octadecane nano-emulsion 1% + <i>T. japonicum</i>	6.18	18.68	0.82	18.81	11.18
Control	7.60	-	1.01	-	-

Application of octadecane nano-emulsion 500 ppm, 24 hr after each release of *T. japonicum* on 14th, 21st, 28th, 25th day after transplanting suppressed the dead heart damage by 18.68% and white ear by 18.81%, resulting the increase of rice grain yield by 11.18% (Table. 2).

Chemical elicitor for management of Lepidoptera pests

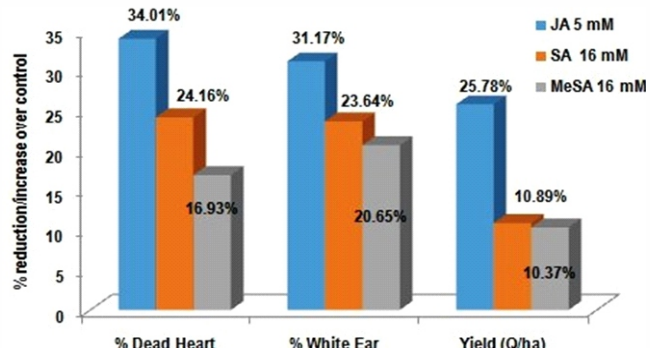
(R. K. Murali Baskaran, Yogesh Yele, K. C. Sharma)

Synthetic elicitors are small molecules that can induce plants' immune response and increase the preparedness of the plants to face the forthcoming herbivores' attacks. Two rounds of application of jasmonic acid (JA) at 5 mM in chickpea at 10 days interval on 30th and 40th days after sowing (DAS) resulted in the reduction of pod borer larvae by 29.76% and pod damage by 29.88%, besides increasing yield by 14.83% (Fig. 3).



JA: Jasmonic acid; SA: Salicylic acid; MeSA: Methyl salicylate; mM: Millimolar.

Fig 3. Damage by chickpea pod borer and enhancement in yield due to influence of chemical elicitors



JA: Jasmonic acid; SA: Salicylic acid; MeSA: Methyl salicylate; mM: Millimolar.

Fig 4. Damage by wheat pink stem borer and yield due to influence of chemical elicitors

Similarly, application of JA at 5 mM on 35th and 45th DAS in wheat suppressed the dead heart by 34.01% and white ear by 31.17% with an increase of yield by 10.37% (Fig. 4).

Trichogramma spp., production and supply

(R. K. Murali Baskaran, P. Mooventhan)

A total of 797 cc of Tricho cards (*T. japonicum*: 427 cc; *T. chilonis*: 370 cc) were produced and supplied to the beneficiary farmers of Mahasamund KVK which covered 127.52 ha of various crops to manage Lepidoptera pests.

Seasonal occurrence of maize fall armyworm in ICAR-NIBSM farm

(Yogesh Yele, R. K. Murali Baskaran, Binod K. Choudhary, Mamta Choudhary)

Fall armyworm, *Spodoptera frugiperda* (S. E. Smith) is a polyphagous, invasive pest and invaded India in 2018. Wide spread occurrence of FAW in maize growing states of India has been

reported. The incidence of FAW was monitored in maize during late *rabi* 2021-22 and summer 2022 at ICAR-NIBSM. A peak incidence of 11% was noticed in maize during late *rabi* while it was 17.8% during summer (Fig. 5a). Chhattisgarh population of FAW mass-culture was initiated in greengram based artificial diet (Fig. 5b).



Fig 5a. Maize whorl damage by FAW

5b. Mass-culture of FAW in artificial diet

Monitoring of crop condition for real time estimation of crop losses due to biotic stress

(S. K. Ambast, Mallikarjuna, J., S. K. Jain, K. C. Sharma, R. K. Murali Baskaran)

Timely detection, forewarning and estimation of economic analysis due to biotic stresses are important for effective crop protection. High resolution optical sensors (air/space borne RS) along with data analysis techniques (machine learning/pattern recognition) enhances the scope of accurate detection and forewarning. A flagship programme was initiated to assess the real-time crop losses in rice and wheat due to biotic stress using satellite remote sensing data and machine learning technique. Few basic information including satellite remote sensing (SRS) data from Earth Explorer platform (Sentinel-2; Resolution-10 m; Date of Pass-22.10.2021 & 27.10.2021) were retrieved and pre-processed with base map to extract geometrically corrected image of the study area (Raipur district) (Fig. 6a,b,c).

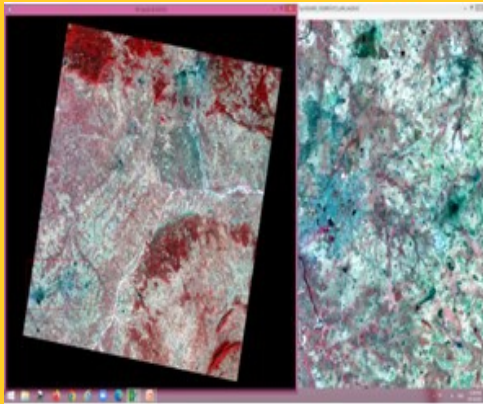


Fig 6a. RS Data (Sentinel: 22.10.2021)

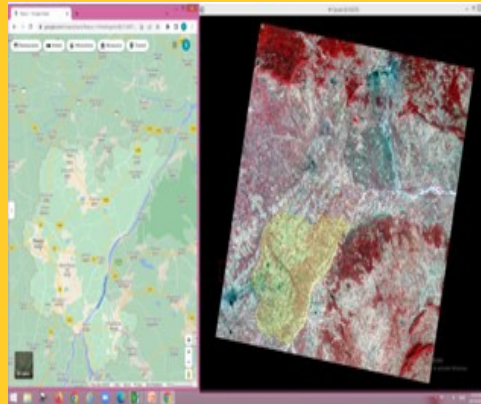


Fig 6b. Map of Raipur District: Overlay on RS image

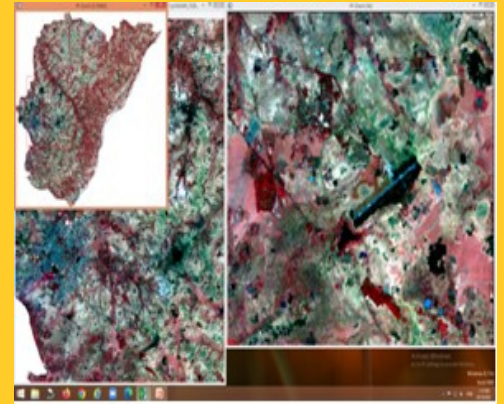


Fig 6c. Extracted RS image of Raipur District

AGRICULTURAL EXTENSION

Farmer FIRST Programme

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

A total of 42 hectares of rice fallow land were covered with *rabi* pulse and oilseed crops. Various technologies including eco-friendly pest management strategies in 86 farmers' fields, vegetable and gerbera production, nutritional gardening for 136 farm families, turmeric post-harvest processing, Kadaknath and Quail production, oyster mushroom production, processing of cereal, dal, spices *etc.*, based products in Agroprocessing centre, low cost Azolla production *etc.*, were demonstrated. A total of 2174 text messages, photos and videos were circulated for the benefit of 925 farmers using social media platform. HRD programmes of 44 were conducted for the benefit of 1070 tribal farmers. One hundred success stories on 'Doubling Farmers Income' were submitted to ICAR- ATARI, Jabalpur.

Foldscope microscopy

(P. Mooventhan, H. K. Singh)

Foldscope was identified as a novel tool for *in situ* diagnosis of plant diseases *viz.* foliar diseases. Seventeen pathogens and other organisms such as *Alternaria* spp., *Odium* spp., *Rhizoctonia* spp., *Uromyces* spp., *Aspergillus* spp., *Curvularia* spp., *Helminthosporium* spp., *Phomopsis* spp., *Mucor* spp., *Pleurotus* spp., *Trichoderma* spp. and *Aspergillus* spp. were diagnosed using foldscope. Eight demonstrations cum hands-on-training were organized for the benefit of 287 beneficiaries including farmers, students, scientists and extension functionaries wherein 22 rural youth/students were trained as master trainer.

DBT Biotech KISAN Hub Project

(P. Mooventhan, S. K. Upadhyay, B. S. Rajput, S. K. Verma)

During *rabi*, cultivation of pulses and oilseed crops was demonstrated in 150 acres along with dissemination of 26 interventions. A total of 100 capacity building programmes including two inter-institutional events under *Azadi Ka Amrit Mahotsav* were conducted for the benefit of around 1000 farmers. In addition, two Quail farming, three Kadaknath farming and 84 goats (Sirohi) units were established and provided to farmers. More than 20 project activities were published in the local newspapers and documented three success stories.



Capacity building on Foldscope



Azadi Ka Amrit Mahotsav at KVK, Korba

KADAKNATH INFO
कड़कनाथ जानकारी

CHOOSE LANGUAGE
ENGLISH हिन्दी

भारत सरकार, राष्ट्रीय जैविक तनाव प्रबंधन संस्थान
ICAR-National Institute of Biotic Stress Management,
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Indian Council of Agricultural Research
Department of Agricultural Research and Education,
Ministry of Agriculture and Farmers Welfare, Government of India

Developed by:
Dr. P. K. Ghosh, Dr. P. Mooventhan, Dr. Anil Dixit, Dr. M. A. Khan, Dr. Pranav Verma,
Dr. G. L. Sharma, Dr. Lokesh Verma, Mr. Uttam Singh and Dr. Parikaj Kaulthai

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Education

First Board of Studies (BoS) meeting of ICAR-NIBSM, Raipur was conducted on 02.03.2022 and an interim BoS meeting was conducted on 04.04.2022 in which various issues relating to academics, faculty, students, infrastructure *etc.*, were discussed and

finalised. A total 16 M. Sc. (Ag) students were admitted in six disciplines during 2021-22. The discipline wise allocation of students is list in table 1.

Table 1. List of M. Sc. (Ag) students admitted at ICAR-NIBSM during 2021-22

S. No.	NIBSM discipline	Name of students
1.	Agronomy	Diyan Mandal
		Shruti Sanjita Giri
2.	Agricultural Entomology	Malawanthkar Rani
		Gouranga Saw
		M. Sai Manoj
		Archita Das
3.	Genetics and Plant Breeding	H. S. Chandana
		C. E. Sai Prasad

S. No.	NIBSM discipline	Name of students
4.	Agricultural Microbiology	Sayan Banerjee
		S. K. Prajwal
5.	Molecular Biology and Biotechnology	S. Pallavi
		Ajay Kumar
		M. S. Usha
		S. Shakespear
6.	Plant Pathology	Prajwal Rai
		N. S. Manoj

Institute Activities

National Girl Child Day (January 24, 2022)



National Girl Child Day was celebrated at ICAR-NIBSM with a focus on the inequalities faced by girls, to promote the education, health and nutrition of the girl child, and to spread awareness about their rights. Dr P. K. Ghosh, Director

highlighted the importance of girl child for the society in the next generation if they are nurtured and groomed properly. Dr. Seema Srivastava, Principal, Senior Secondary School, Saragoan spoke on the “Girl Child Empowerment at Global Level for Next Generation” followed by Smt. Priti Chandrahasani on “Nutrition in Girl Child in the Villages for Strengthening India” Dr. Lata and Dr. Sushil K. Sharma of NIBSM co-ordinated the programme.

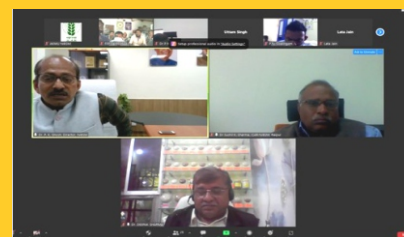
Supplementary IRC (February 7-8, 2022)

The supplementary Institute Research Committee meeting was held under the Chairmanship of Dr. P. K. Ghosh, Director, ICAR-NIBSM, Raipur. In this meeting, progress of the old projects which are about to be completed were reviewed and offered suitable recommendations. The Chairman emphasized the scientists for publications, applying for externally funded projects and effective time management.

World Pulse Day (February 10, 2022)

World Pulse Day was celebrated to increase the public awareness on nutritional and environmental benefits of pulses as part of sustainable food production. Dr. P. K. Ghosh, Director highlighted awareness creation on pulses. Dr. Deepak Sharma, Head, Department of Genetics and Plant Breeding, IGKV, Raipur delivered

a talk on “Challenges and Opportunities in Pulses”. In addition, a farmer interaction meet was organised to create awareness on pulse cultivation. The programme was co-ordinated by Dr. Lata and Dr. Sushil K. Sharma.



National Science Day (February 28, 2022)

National Science Day was celebrated to raise awareness on the importance of science with a theme of “Integrated Approach in Science and Technology for Sustainable Future”. Dr. C. R. Hazra, Ex-Vice-Chancellor of IGKV, Raipur highlighted the importance of this day and his own journey in the agricultural sciences.



International Women's Day (March 8, 2022)

During the celebration of International Women's Day at ICAR-NIBSM, 100 women from nearby villages, National Rural Livelihood Mission and self-help groups participated. On this occasion, Dr. Sushil K. Sharma, Nodal Officer highlighted the importance of International Women's Day, followed by the speech of Dr. P. Kaushal, Joint Director (Research) on 'Fodder Production and Grassland Conservation', Dr. S. K. Ambast, Joint Director (Edu.) on 'Role of Women Farmers in Conservation of Water for Agriculture' and Dr. Anil Dixit, Joint Director (SCHBR) on 'Role of Women in Weed Management'. Dr. Lata Jain, Sr. Scientist coordinated an interaction with women farmers and girls on women empowerments and their role in society.

Annadata Devo Bhavo (April 23, 2022)

Annadata Devo Bhavo programme was organised in the ambit of *Azadi Ka Amrit Mahotsav* at ICAR-NIBSM with the co-ordination of Dr. Lata Jain and Dr. Sushil K. Sharma. Dr. Anup Das, Principal Scientist, ICAR-Research Complex for NEH Region, Tripura has delivered a talk on "Promoting Organic and Natural Farming for Livelihood Security". Dr. P. K. Ghosh, Director emphasized adoption of organic farming system in the Chhattisgarh state. Farmers-scientists interface was organised to create awareness on organic farming.

Kisan Bhagidari, Prathamikta Hamari Abhiyan (April 28, 2022)



In order to highlight various achievements under flagship schemes of Government of India, *Kisan Bhagidari-Prathamikta Hamari* Campaign was organized at ICAR-NIBSM. Dr. S. C. Mukherjee, Professor of Entomology and former Dean spoke on 'Role of

Crop Diversification in Plant Protection', followed by two lectures on 'Promotion of crop diversification through KVK' and "Crop Diversification and Sustainable Intensification prospects in Chhattisgarh" which were delivered by Dr. S. K. Verma, Senior Scientist and PC, KVK, Mahasumand and Dr. Anil Dixit, JD (SCHBR), respectively. Finally Dr. S. K. Ambast, JD (Edu.) emphasized the role of water in crop diversification in Chhattisgarh state. More than 120 farmers participated. The programme was co-ordinated by Dr. Lata Jain and Dr. Sushil K. Sharma of NIBSM.

Garib Kalyan Sammelan (May 31, 2022)



On the occasion of celebrating '*Azadi Ka Amrit Mahotsav*' to commemorate the Indian Independence, Hon'ble Prime Minister of India interacted with the beneficiaries of about sixteen schemes/programmes spanning in nine Ministries/

Departments of the Government of India. The event was presided by Shri. Prahlad Singh Patel, Hon'ble Union Minister for State Food Processing and *Jalshakti* along with Shri. Sunil Soni, Member of Parliament, MLAs and other dignitaries. Event organized by ICAR-NIBSM was linked with Hon'ble Prime Minister speech. A total of 18,023 farmers belonging to various districts of Chhattisgarh participated and benefitted under different schemes. The programme was co-ordinated by Dr. Anil Dixit, Dr. Sushil K. Sharma and Dr. P. Mooventhan.

7th RAC meeting (June 8-9, 2022)



The 7th Research Advisory Committee (RAC) Meeting of ICAR-NIBSM, Raipur was conducted under the Chairmanship of Prof. A. N. Mukhopadhyay, Former Vice-Chancellor, Assam Agricultural University, Jorhat, Assam. Dr. T. R. Sharma, DDG (Crop

Science), ICAR, in his inaugural address appreciated the efforts of NIBSM in developing research leads and identifying areas of national interest to be targeted, besides developing strong linkages to address key researchable

issues. The Chairman, RAC appreciated major transformation in the infrastructure development of the institute and released the publications. Dr. P. Kaushal, Joint Director (Research) presented an overview of research progress of NIBSM and the new programmes initiated. Suitable interactions were made among the Directors of plant protection institutes including ICAR-NCIPM, ICAR-NBAIR, ICAR-NBAIM, and ICAR-DWR and identified possible research areas for collaborations.

Programme on Yoga, Balanced use of Fertilizer and Agroforestry (June 21, 2022)

During the organization of 'Yoga, Balance Use of Fertilizer and Agroforestry' under *Azadi Ka Amrit Mahotsav* at ICAR-NIBSM, Yoga Teacher of Pandit Ravishankar University, Raipur, Shri. Kaushal Kishore Gupta talked on 'Practice of Yoga for Better Health'. Dr. Anil Dixit, JD (SCHBR) spoke on balanced use of fertilizers in India in general and Chhattisgarh in particular, Dr. Sushil K. Sharma, delivered a talk on 'Biofertilizers and their Uses'. A total of 96 farmers participated and benefitted. The programme was conducted in co-ordination with Dr. Lata Jain and Dr. Sushil K. Sharma.

SCSP Activities

Apiculture kit distribution (February 25, 2022)

(S. K. Sharma, Vinay Kumar, Lalit L. Kharbikar, Anil Dixit, K. C. Sharma, J. Sridhar)



A total of 50 apiculture kits were distributed to 10 farm families belonging to four villages of Tilda and suitable training was given to handle kits in beekeeping.

Vegetable seed kit and medicinal plants (March 08, 2022)

Vegetable seed kit and medicinal plants were distributed to farmers under SCSP.

Solar pump distribution (March 28, 2022)

(S. K. Sharma, Vinay Kumar, Lalit L. Kharbikar, Anil Dixit, K. C. Sharma, J. Sridhar)



Two solar pumps (3 Hp) were distributed to the farmers of Tilda and Dharsiwa blocks.

Climate resilient livestock based IFS and Agroforestry based IFS (April 18, 2022)

(Anil Dixit, Binod K. Choudhary, Lata Jain)

Livestock based integrated farming system (LIFS) and Agroforestry based IFS (AIFS) were inaugurated on 8.4.2022 at ICAR-NIBSM



TSP Activities

Rice seed distribution (June 10-20, 2022)



(J. Sridhar,
Mamta Choudhary)

During the seed distribution programme organized by the ICAR-NIBSM, 140 quintals certified seeds of rice (Swarna, Mahamaya, Rajeswari, MTU 1010) were distributed to 134 farm families belonging to Tilda

block of Raipur district under TSP. Similarly paddy seeds were distributed to 370 farm families of Tilda block in SCSP.

NEH Activities

(P. Moventhan)



Custom Hiring Centres (CHCs), one in each of the state of Mizoram, Manipur, Arunachal Pradesh, Tripura and Meghalaya were established with the help of KVKs (Imphal, Aizawl, Imphal East, East Sinag, Sephaljala, East Garo Hills, South Garo Hills) of Central Agricultural University,

besides providing 25 trainings in each of by Multi Technology Testing Centre & Vocational Training Centre and Directorate of Extension Education in which 165 farm families benefitted.

Webinars/seminars organized by NIBSM

S. No.	Topic of seminar	Date	Delivered by institute scientist/international scientist
1.	Promoting Organic and Natural Farming for Livelihood Security	23.4.22	Dr Anup Das, Principal Scientist, ICAR Research Complex for NEH Region, Tripura Centre, Agartala, Tripura
2.	Prospects of Managing Biotic Stresses through Biotechnological and PGPR Strategies	6.6.22	Dr. M. S. Reddy, Founder & Chairman, Asian PGPR Society for Sustainable Agriculture, Consultant & Entrepreneur, Auburn University, Auburn, AL, USA
3.	Application of biotechnological tools in imparting disease resistance	6.6.22	Dr. V. Ramesh Sonti, Indian Institute of Science Education and Research, Tirupati, India
4.	Identification and characterization of candidate gene(s) for crop stress management	13.6.22	Dr. Manoj Prasad, Staff Scientist VII & J. C. Bose National Fellow, National Institute of Plant Genome Research, New Delhi

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

S. No.	Symposia/seminar/training attended	Period	Venue/organized by	Name of scientist (Dr.)
1.	National symposium on "Emerging Innovations in Plant Molecules for achieving Food and Nutritional Security	6-7.12.2022	DPMBB, ACHF, NAU, Navsari & Division of Biochemistry, IARI in association with SPBB, New Delhi	Ashish Marathe
2.	Training on Metagenomics data analysis	19-24.1.2022	ICAR-IASRI, New Delhi	Vinay Kumar
3.	National Workshop on Shiitake Mushroom: As Nutraceutical and Next Generation Functional Food	22-24.2.2022	ICAR-NEH Manipur Centre & Society for Plant Biochemistry and Biotechnology	Ashish Marathe
4.	Two-day Workshop on Emerging IP Issues and Innovation Changes for better Technologies	15-16.3.2022	ICAR-NIBSM, Raipur	All scientists
5.	National Conference of Virology on Emerging and re-emerging Viral diseases – Climate change impacts and mitigation (VIRCON-2021)	26-28.3.2022	Department of Microbiology, AIIMS, Hyderabad under the aegis of Indian Society of Virology	Lata Jain
6.	National Seminar on Contemporary Issues in Fisheries and Aquaculture	19-20.5.2022	College of Fisheries, GBPUAT, Pantnagar, Uttarakhand	B.K. Choudhary
7.	57 th Annual Rice Research Group meeting	25-27.4.2022	ICAR-IIRR, Hyderabad	S. K. Jain, Vinay Kumar, Mallikarjuna, J.
8.	Annual Group meeting of 33 rd AICRP on small millets	28-29.4.2022	ICAR-IIMR, Hyderabad	S. K. Jain
9.	40 th Annual Group Meeting of AICRP on Vegetables	15-17.6. 2022	ICAR-IIVR, Varanasi	P. N. Sivalingam

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Awards and Recognition

S. No.	Awards/Recognition/Membership in Professional Societies	Year/Period	Offered/organized by	Scientist (Dr.)
1.	National Network of Agricultural Extension Management Experts	2022	MANAGE, Hyderabad, Telangana	S. K. Jain P. Mooventhan
2.	Associate Editor	2022	Frontiers in Microbiology	Vinay Kumar
3.	Member, Editorial Board	2022	Journal of Natural Pesticide Research (Elsevier)	R. K. Murali Baskaran
4.	Dr. S. K. VASAL Award for utilization of PGR	2022	Indian Society of Plant Genetic Resources	P. Kaushal

Joining/Relieving of Staff

Shri. Ashok Kumar joined NIBSM as Assistant Administrative Officer (on deputation) on 7.2.2022. Shri. Mahesh Chand Jetwani and Shri. Asif Mohammed joined NIBSM as Administrative Officer (AO) and Finance & Account Officer (FAO) on 4.3.2022 and 13.6.2022, respectively.

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