



ICAR-NATIONAL INSTITUTE OF BIOTIC STRESS MANAGEMENT

Baronda, Raipur - 493 225, Chhattisgarh

From The Director's Desk

The ICAR-National Institute of Biotic Stress Management was established during 12th plan at Raipur, Chhattisgarh state with the mandate including 1) basic, strategic and adaptive research on biotic stresses in crops, and 2) development of quality human resources for academic excellence, linkage with various stakeholders for technology management and policy support research.

The research programmes of the institute was initiated during 2016 in four Sections mode, including Entomology and Nematology, Plant Pathology and Microbiology, Biotechnology and Resource management and technology transfer. The style of functioning of NIBSM has switched over to School mode from April 2021 onwards which includes 1) School of

Crop Health Biology Research (CHBR), 2) School of Crop Health Management Research (CHMR), 3) School of Crop Resistance System Research (CRSR) and 4) School of Crop Health Policy Support Research (CHPSR) to cover various facets of utilizing modern scientific tools to understand, educate and mitigate biotic stresses.

Standing Parliamentary Committee on Agriculture constituted under the Chairmanship of Shri. Gaddigauda, Hon'ble Member of Parliament for the purpose of reviewing the progress of institution visited ICAR-National Institute of Biotic Stress Management Baronda, Raipur on 8.9.2021. The committee was accompanied with 12



hon'ble members of Parliament and two local Member of Parliament, Smt. Chhaya Verma and Shri Mohan Mandavi. The Director Dr. P. K. Ghosh welcomed all the Hon'ble members and briefed the institute profile and activities carried out for the created modern infrastructure of new campus of ICAR-NIBSM. The Chairman and the committee were highly impressed by the infrastructure developed exclusively for the biotic stress mitigation, leads, educational programme and various outreach activities carried forward by this ICAR institute.

Periodical support and encouragement of ICAR authorities, New Delhi since inception in releasing of funds at stipulated time has been gratefully acknowledged. In a first phase, a sum of 58 crores was released to complete the construction of new infrastructures including administrative building, library building, auditorium, two school buildings and boys' hostel along with the developmental works including roads, water harvesting channels, drainage systems, water storage structure etc. in a plinth area of 15160 sq. m. An additional fund of Rs. 24.78 crores was provided by the Council to construct girl's hostel, electricity sub-station, roof top solar PV system, boundary walls and laboratories. The infrastructure of NIBSM including admin building, library, auditorium and school buildings and boys' hostel were inaugurated virtually by the honourable Prime Minister of India, Shri Narendra Modi ji on 28.9.2021 in presence of hon'ble Union Minister for Agriculture, Shri. Narendra Singh Tomar and Chief Minister of Chhattisgarh. The construction of remaining infrastructure such as girl's hostel, electricity sub-station, roof top solar PV system, boundary walls and laboratories are also in near completion.




(P. K. Ghosh)

Director and Vice-Chancellor
ICAR-NIBSM, Raipur



Research Highlights

BIOTECHNOLOGY

Micro-cage for single whitefly feeding and virus transmission studies

(P. N. Sivalingam, Vinay Kumar, J. Sridhar, Lalit L. Kharbikar)

A superior micro-cage was developed with micro-centrifuge tube and validated with crop plants including *mungbean*, soybean and tomato on acquisition and inoculation efficiency of two begomoviruses, *Mungbean yellow mosaic India virus* and *Tomato leaf curl Karnataka virus*. The micro-cage was useful to contain single whitefly on leaf surface of plant for feeding and transmission of virus (Fig. 1). The transmission efficiency was cent per cent in micro-cage while it was only 70-75% in macro-cage method. It has potential to use for screening cultivars/ lines for resistance against begomovirus and vector in a large scale.



Fig 1. Micro-cage for begomovirus transmission

Inhibition effect of flavonoids on Tomato leaf curl Karnataka virus through seed priming

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

Seeds of *Nicotiana benthamiana* were sown in the pots after priming with crude extract of flavonoids. Plants were then agroinoculated with infectious clones of ToLCKV at four leaf

stage for symptom development. Leaves were then harvested at stage of symptom development for DNA isolation from primed and unprimed *N. benthamiana* plants. The absolute quantification of ToLCKV showed that the amount of ToLCKV was 28 times lesser in *N. benthamiana* primed with flavonoids extracted from soybean compared to unprimed seeds.

Begomovirus transmission efficiency of selected genetic groups of B. tabaci

(Sridhar, J., R. K. Murali Baskaran)

Transmission efficiency of two genetic groups of whitefly, MEAM-1 and Asia II-7 was studied for Tomato leaf curl Karnataka virus under laboratory conditions. The begomovirus transmission efficiency was estimated as 50-55% for genetic group of Asia II-7 and 80-85% for MEAM-1 in tomato. It is evident that MEAM-1 had high transmission efficiency as compared to Asia II-7 (Fig. 2).

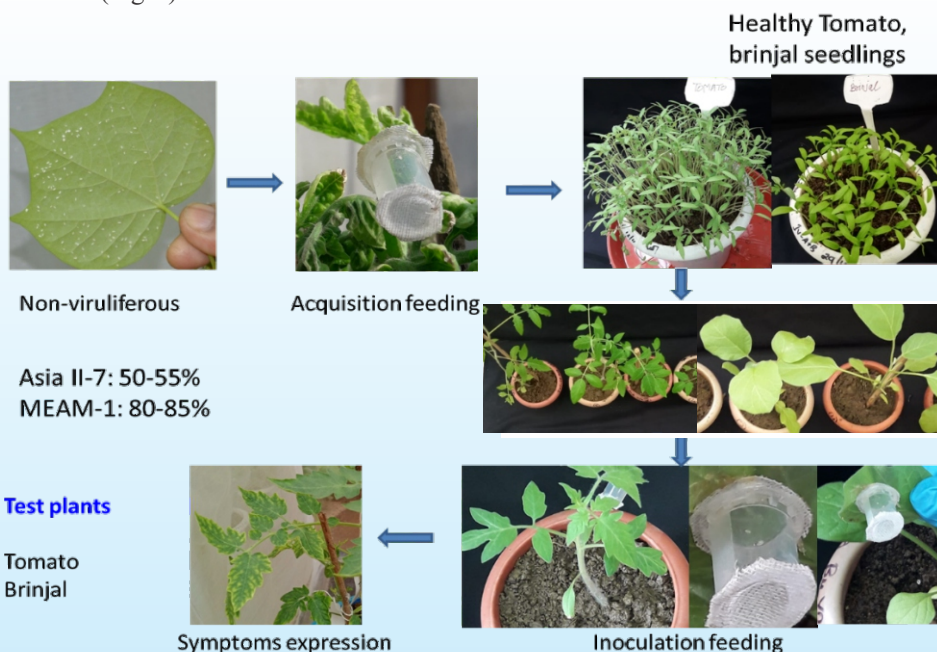


Fig 2. Experimental set-up of begomovirus transmission studies

BIOLOGICAL CONTROL

Effect of bacteriophage against rice bacterial leaf blight

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

Bacteriophages have been reported to control plant diseases. Application of selected bacteriophages at 2×10^7 cfu/ml on pot rice plants infected with BLB suppressed the symptoms significantly as compared to control plants (Fig. 3).

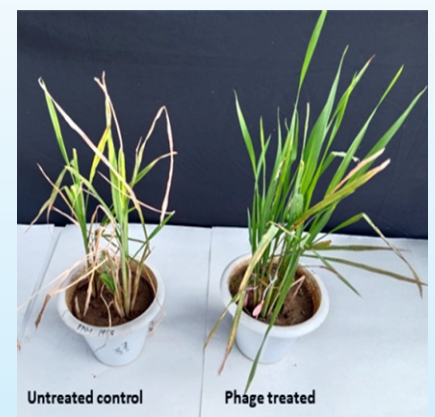


Fig 3. BLB symptoms in phage treated and control rice plants

cry gene profiling of native isolates of *Bacillus thuringiensis*
(R. K. Murali Baskaran, L. Jain, K. C. Sharma, J. Sridhar)

Three native *Bt* isolates (NBt 18, NBt 27, NBt 31) which caused significant mortality on *Spodoptera litura* under lab and *in planta* conditions were analysed for the presence of crystalline protein and cytolytic genes using genes specific primers viz., Cry3, Cry3, Cry4, Cry5, Cry7, Cry8, Cry9, Cry11 and Cyt1. Genes present in the selected isolates and positive control are listed in figure 4, table 1.

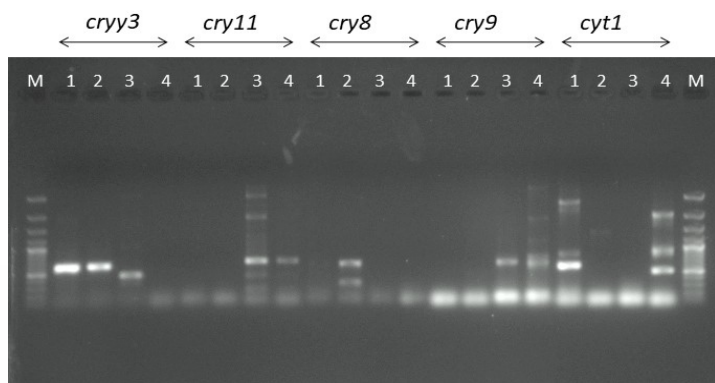


Fig 4. Agarose gel electrophoresis of *cry* gene specific PCR products of Cry1, Cry3, CryY3, Cry4, Cry5, Cry7, Cry8, Cry9, Cry11, Cyt1; Lanes M: 100 bp ladder; 1: VLBT-6; 2: NBT-18; 3: NBT-27; 4: NBT-31

In vitro antagonism against *Fusarium oxysporum* f. sp. *cicris*
(S. K. Sharma, Lata Jain)

Out of 82 *Bacillus* isolates screened against *Fusarium oxysporum* f. sp. *cicris*, 24 were superior to inhibit mycelial growth over control except KS-4 and RS-4. IS-10, GS-5 and GS-10 isolates were found most potent against *F. oxysporum* f. sp. *cicris* with inhibition percent of 67.14, 65.71 and 62.86 %, respectively.

Effect of crude extract of WB1-CG on whitefly and *Parthenium* seeds

(B. K. Choudhary, Mamta Choudhary,
R. K. Murali-Baskaran, J. Sridhar, Sushil K. Sharma)

Tomato pot plants were treated with different concentrations of crude extract of *Chromobacterium* spp. (WB1-CG) and introduced with known number of whitefly adults. Crude extract @ 1000 ppm caused adult mortality by 40%. Similarly, treatment of scarified seeds of *Parthenium* with crude extracts of WB1-CG inhibited seed germination by 43% in 1000 ppm and 17% in 500 ppm (Fig. 5).

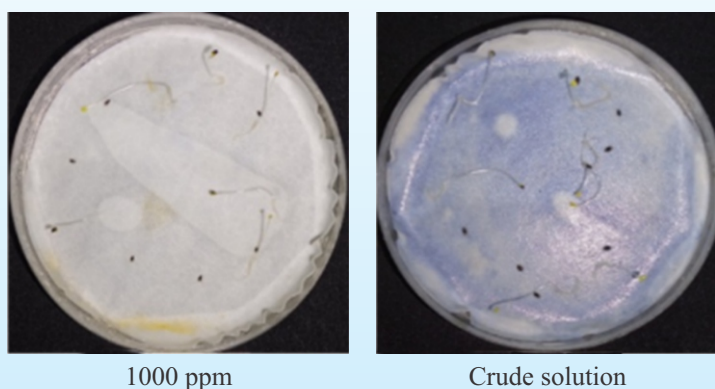
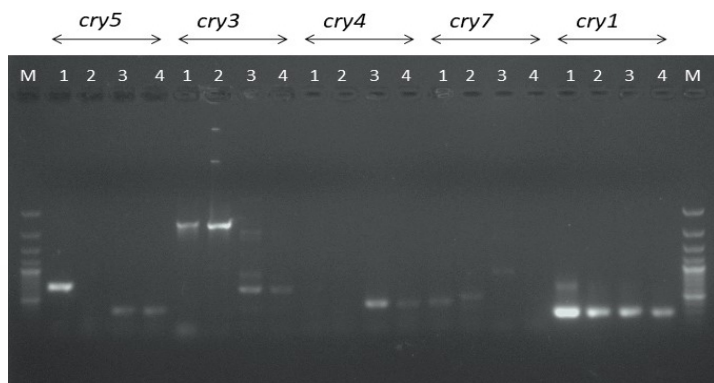


Fig 5. Inhibition of *Parthenium* seed germination, treated with crude extract 1000 ppm

Table 1. *cry* gene profiling of potent native *Bt* isolates

Native <i>Bt</i> isolate	Name of <i>cry</i> genes	No. of <i>cry</i> genes
NBT-18	<i>cry1, cry2, cryy3, cry7, cry8</i>	5
NBT-27	<i>cry1, cry2, cry3, cryy3, cry4, cry9, cry11</i>	7
NBT-31	<i>cry1, cry2, cry3, cry4, cry9, cry11, cyt1</i>	7
VLBT-6	<i>cry1, cry2, cryy3, cry5, cry7, cyt1</i>	6



Effect of *Malachra* root extract on *Parthenium* seed germination
(Anil Dixit, B. K. Choudhary)

Scarified seeds of *Parthenium* were soaked in benzene root extract of *Malachra* and sown in the petriplates for germination test. Root extract inhibited seed germination by 56% while all germinated in the untreated control (Fig. 6a,b).

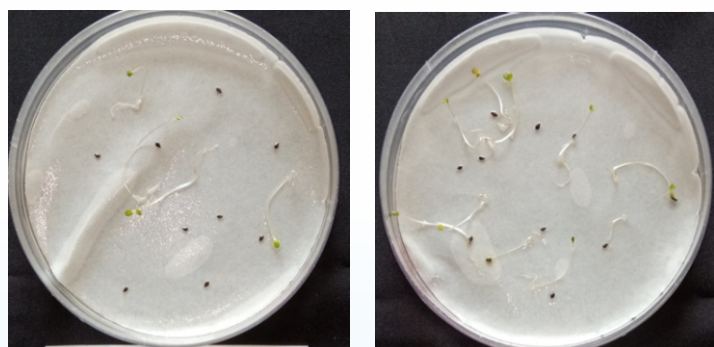


Fig 6a. Germination of *Parthenium* seeds treated with *Malachra* root extract

Fig 6b. Control

Establishment of biocontrol lab at main hub, ICAR-NIBSM, Raipur
(R. K. Murali Baskaran, P. Mooventhan)

Biological control is an environment-friendly method to manage biotic stress and best alternative to chemical pesticides. Trichogrammatid is a versatile egg parasitoid and have been reported to attack eggs of insects belonging to 11 orders with special preference on Lepidoptera pests. A unit was established for production of native *Trichogramma* spp., under DBT Biotech KISAN project, in which a total of 1749 cc of Tricho cards (796 cc of *T. japonicum*, 953 cc of *T. chilonis*) were produced and supplied to farmers which covered 279.84 ha of *kharif* and *rabi* crops for management of key Lepidoptera pests.

Institute Activities

Glimpses of Pigeonpea seed distribution programme under SCSP held on August 3-4, 2021

A total of 160 kg of certified seeds of pigeonpea variety Rajeevlochan were distributed to the farmers belonging to 8 villages of Raipur and 01 villages of Balodabazar districts. The seeds were distributed to cover



about 20 acres of pigeon pea cultivation area in the above-mentioned villages covering about 58 farm families to improve livelihood and nutritional security of farming community under the SCSP scheme. During the seed distribution programme farmers of different villages were given training on cultivation practices of pigeonpea and seed quality following COVID-19 protocol.



Independence Day (August 15, 2021)

The institute organised Independence day 2021 by flag hosting. Flag hoisting was performed by the Dr P.K. Ghosh, Director & Vice-Chancellor in presence of all the scientists and other staffs. The Director also addressed gathering about the achievements of institute in the last year.



Chickpea seeds and vegetable seed kit distribution programme to beneficiaries under Scheduled Caste Sub Plan (SCSP) Scheme on November 22-23, 2021

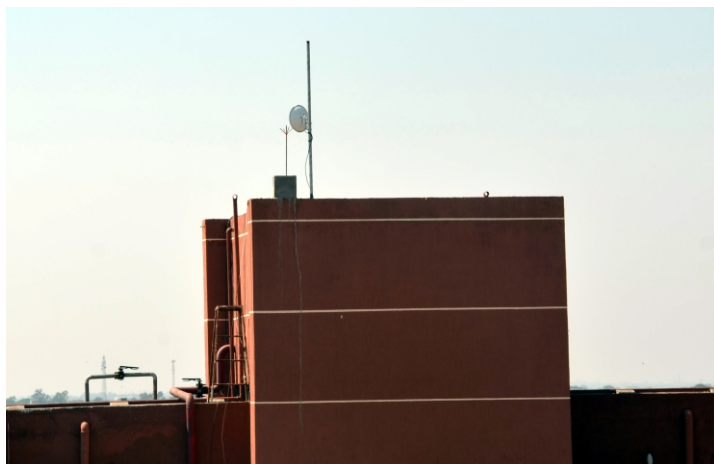
Total of 30 quintals of certified seeds of chickpea (cv. RVG 202), and vegetable seed kits purchased from IIHR, Bangalore were distributed to the farmers belonging to nine villages of Raipur districts. Nine villages namely Keoradih, Madadih, Kewatara, Amalitalab, Budeni and Sundara under Tilda blocks and Neurdi, Gidhauri and Tor villages under Dharsiwa Blocks of Raipur district were covered. The seeds were distributed to cover about 82 acre of chickpea cultivation area in the above-mentioned villages covering about 74 farm families to improve livelihood of farming community under the SCSP scheme. During the seed distribution programme farmers of different villages were given training on cultivation practices of chickpea and seed quality following COVID-19 protocol.



NIBSM-AKMU Activities

(P. Mooventhan and Ashish Marathe)

Agricultural Knowledge Management Unit (AKMU) has dedicatedly functioned to establish the essential IT infrastructures of the new campus such as increased the leased line bandwidth from 20 MBPS to 100 MBPS through OFC to meet out the bandwidth requirements of e-Office and Video Conferencing *via* online platforms. In addition, a dedicated RF link for 100 Mbps bandwidth



Radio frequency facility

installed from Mandir Hasod BSNL exchange, Raipur for uninterrupted data service. Further, AKMU worked with BSNL in the installation and commissioning for providing interconnectivity of intercom and internet connectivity for seven new buildings namely Administration, Library, Auditorium, School - 1, School - 2, Girls Hostel and Boys Hostel. The sum of Rs. 50 lakhs worth IT infrastructures, server lab facility, data and voice connectivity has been established to facilitate the institute activities.



Server room

Brainstorming sessions organized by NIBSM during 2021

S. No.	Title	Date	Participating institutes
School of Crop Health Management Research			
1.	Spatial and machine learning technique for biotic stress management	9.8.21	ICAR-IARI, New Delhi, IIIT, Raipur, VNMKV, Parbhani, ICAR-NCIPM, New Delhi, IIWBR, Karnal
2.	One Health under Climate-Change	9.8.21 & 13.12.21	ICAR-NRC on Meat, Telangana, ICAR-IVRI, Izatnagar, ICAR-IIAB, Ranchi, GADVASU Ludhiana, ICAR-CIFT, Kochi
School of Crop Health Biology Research			
3.	Pest dynamics relationship in the emerging production system	7.8.21	ICAR-IARI, New Delhi, ICAR-DWR, Jabalpur, ICAR-CSSRI, Karnal
4.	Exploring antimicrobial cyclic lipopeptides (AMLs) producing bacterial resources for biotic stress management: Prospects and challenges	1.12.21	ICAR-NBAIM, Mau, TNAU, Coimbatore, ICAR-IARI, New Delhi, SRM Science and Technology, Chennai
School of Crop Resistance System Research			
5.	Identification of novel genes for biotic stress mitigation in crops: Prospects and challenges	7.7.21	NIPGR, New Delhi, ICAR-DOG, Pune, ICAR-IIPR, Kanpur, ICAR-IIASM, Baramati, ICAR-NIPB, New Delhi, NCBS, Bengaluru

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

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

S. No.	Symposia/seminar/training	Period	Venue/organized by	Name of scientist (Dr.)
1.	World Farmers Day	23.12.2021	NIBSM, Raipur	P. Mooventhan R. K. Murali-Baskaran

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

S. No.	Symposia/seminar/training attended	Period	Venue/organized by	Name of scientist (Dr.)
1.	One Health Approach for Controlling Zoonoses (Virtual)	6.7.2021	ICAR-National Research Centre on Camel, Bikaner	Lata Jain
2.	28 th Zonal Review Workshop of KVKs of ICAR-ATARI, Jabalpur (Virtual)	26-28.7.2021	ICAR-Agricultural Technology Application Research Institute, Jabalpur, Madhya Pradesh	P. Mooventhan
3.	International Workshop on Policy Initiatives for Attracting Youth and Preventing Attrition in Agriculture (Virtual)	6-8.4.2021	Asian Productivity Organization (APO), Japan at Indonesia	P. Mooventhan
4.	26 th Meeting of ICAR Regional Committee No. VII (Virtual)	25.8.2021	ICAR-Central Institute of Agricultural Engineering, Bhopal, Madhya Pradesh	P. Mooventhan
5.	International Conference on Recent advances on Agriculture, Engineering & Biotechnology (ICRAAEBFS) for food Security (Virtual)	25-26.9.2021	Mahima Research Foundation and Social Welfare, BHU, Varanasi and Lovely Professional University, Phagwra (Punjab)	P. Mooventhan
6.	International Conference on “Vegetable Research and Innovations for Nutrition, Entrepreneurship and Environment (Virtual)	14-16.12.2021	ICAR-IIVR, Varanasi	P. Mooventhan
7.	First Asian PGPR-Indonesia Chapter International E-conference on Sustainable Agriculture & Eco-tourism (Virtual)	28-30.8.2021	Udayana University, Bali, Indonesia	Sushil K. Sharma
8.	International Agronomy Congress on Agri Innovations to Combat Food and Nutrition Challenges	23-27.11.2021	Indian Society of Agronomy, ICAR and PJTSAU, Hyderabad	Anil Dixit Vinay Kumar Mallikarjuna, J. J. Sridhar
9.	Virtual MDP on Priority Setting, Monitoring and Evaluation (PME) of Agricultural Research Projects	25-30.10.2021	ICAR-NAARM, Telangana	S. K. Jain
10.	Virtual training on Wheat Blast and Fusarium Head Blight	16-17.12.2021	CIMMYT in collaboration with ICAR-IIWBR and lead institutions of other countries in S Asia and S East Asia	S. K. Jain
11.	6 th Asian PGPR Conference (Virtual)	3-4.9.2021	Barkatullah University, Bhopal	Sushil K. Sharma

Publications**Research/Review papers**

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Sivalingam, P. N., N. Dokka, M. M. Mahajan, B. Sahu, A. Marathe, P. Kaushal and P. K. Ghosh. 2021. Achieving maximum efficiency of Mungbean yellow mosaic India virus infection in mungbean by agroinoculation. *3Biotech* 12: 29

Book chapters

Mooventhan, P. and Uttam Singh. 2021. Alternative Livelihood Options for Tribal farmers, 25-38pp. In: (M. L. Sharma, A. K. Gupta, M. A. Khan eds.), Sustainable livelihood Options for Rural Communities, Biotech Book Publishing Agency, New Delhi, 119p. (ISBN 978-81-7622-517-5)

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Mooventhan, P., A. Dixit and U. Singh. 2021. Role of farmer FIRST programme in doubling Tribal farmer's income and food security. Presented in the Online International Conference on "Recent advances on Agriculture, Engineering & Biotechnology (ICRAAEBFS) for food Security" organized by Mahima Research Foundation and Social Welfare, BHU, Varanasi and jointly in collaboration with Lovely Professional University, Phagwra (Punjab) held during September 25-26, 2021.

Jain, L., V. Kumar and S. K. Jain. 2021. Isolation and characterization of bacteriophages against *Xanthomonas oryzae*

pv. *oryzae* as a potent bio-control for bacterial leaf blight of rice presented in 61st Annual International Conference of Association of Microbiologists of India (AMI-2021), organized in collaboration with INSCR, TERI, DU, IARI and INSA on "Microbial World: Recent Development in Health, Agriculture and Environmental Sciences" held during February 3-5, 2021.

Extension Bulletins

Mooventhan, P., Anil Dixit, M. A. Khan, G. L. Sharma, L. K. Verma, Praveen Verma and P. K. Ghosh. 2021. FFP Photo Atlas 2021. Farmer FIRST Innovation: A role model for doubling of Chhattisgarh tribal farmers income, 74p.

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Mallikarjuna, J., P. Mooventhan, M. Choudhary and R. K. Murali-Baskaran. 2021. ICAR-NIBSM: Rendering solution to biotic stresses, ICAR-NIBSM publication, Raipur, 32p.

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- कृषि अवशेष कम्पोस्ट के फायदे
- ट्राइकोडर्मा: जैविक खेती का अमूल्य उपहार

- कम्पोस्ट: एक नैसर्गिक खाद

कुमार, वी., एस. के. शर्मा, एल. जैन, एल. एल. खरबिकर, एम. चौधरी, जे. श्रीधर, के. सी. शर्मा, बी. के. चौधरी, पी. मूर्वेथन एवं ए. दीक्षित. 2021. जैव उर्वरकों (बायोफर्टिलाइजर) की आधुनिक खेती में उपयोगिता

चौधरी, एम., बी. चौधरी, एल. एल. खरबिकर, वी. कुमार, एल. जैन, जे. श्रीधर, के. सी. शर्मा, पी. मूर्वेथन, एस. के. शर्मा, ए. दीक्षित एवं एस. के. वर्मा. 2021. आयुस्टर मशरूम उत्पादन

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Awards and Recognition

Awards and recognition received by NIBSM scientists

S. No.	Awards/Recognition/Membership in Professional Societies	Year/Period	Offered/organized by	Scientist (Dr.)
1.	Excellence in PGPR Research	2021	Indian Chapter of Asian PGPR Society	Sushil K. Sharma
2.	PEARL Foundation Best Scientist Award	2021	PEARL Foundation, Madurai	Sushil K. Sharma
3.	Mahima Best Extension Scientist Award, and Best Oral Presentation Award	2021	Mahima Research Foundation and Social Welfare, Banaras Hindu University (BHU), Varanasi and Lovely Professional University, Phagwara (Punjab)	P. Mooventhan
4.	Fellowship from Tamil Nadu Scientific Research Organization (TNSRO), Bose Science Society (BSS)	2021	Vigyan Prasar, DST, Govt. of India, New Delhi (Authorization No: V. 2919001 / VP-TN0090 / 27.10.2017)	P. Mooventhan
5.	NIBSM - Best Review Paper Award	2021	ICAR-NIBSM 10 th Foundation Day	R. K. Murali Baskaran
6.	NIBSM - Best Scientist Award	2020-21	ICAR-NIBSM 10 th Foundation Day	P. N. Sivalingam

Joining/Relieving of Staff

Mr. Malay Bisht joined as Senior Administrative Officer at ICAR-National Institute of Biotic Stress Management, Raipur on 11.11.2021

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