



ICAR-NATIONAL INSTITUTE OF BIOTIC STRESS MANAGEMENT

Baronda, Raipur - 493 225, Chhattisgarh

NEWSLETTER

From Director's Desk

Effective crop protection requires early and accurate detection of biotic stress. In recent years, remarkable results have been achieved in the early detection of weeds, plant diseases and insect pests in crops. These achievements are related both to the development of non-invasive, high resolution optical sensors (air/space borne remote sensing) and data analysis methods (pattern recognition, machine learning) that are able to cope with the resolution, size and complexity of the signals from these sensors. With the advent of hyperspectral radiometry, it has been possible to have insights into more details and better understanding of the crop stress induced by insect pests and diseases. It was also feasible to differentiate between biotic and abiotic stresses with reasonable accuracy using hyperspectral radiometry. Reflectance data obtained by ground based remote sensing provides vital information to understand spectral interactions between pests damage on the host plants and also to collect fundamental ground-truth information required for interpretation of remote sensing data obtained from spaceborne and airborne platforms. Satellite remote sensing provides sufficient data for large scale studies, but it has limitations such as temporal and spatial resolution, and more importantly, availability of cloud free data. On the other hand, airborne systems have a higher resolution and time flexibility and provide sufficient lead time for dissemination of crop protection advisory. Several methods of machine learning have been utilized for precision agriculture such as support vector machines and neural networks for classification and self organizing maps for clustering. These methods are able to calculate both linear and non-linear models that require few statistical assumptions and adapt flexibility to a wide range of data characteristics. Nevertheless, airborne and space borne remote sensing along with machine learning techniques can facilitate analysis of spatial variability of biotic stress and a synoptic view of the large area in a non-destructive and non-invasive way. Hence it can supplement many of the on-going field surveillance programs, which is often expensive, time consuming laborious and many a times error-prone. It has been proved that remote sensing technology can provide accurate and reliable information whereas machine learning techniques can provide faster analysis to guide decision-making in crop protection and hence have great potential for use in pest management. Therefore, the institute is going to take up this new science as one of the flagship programme during the plan period (2020-2025). The major objectives of the programme will be (i) to develop near real time surveillance technology for biotic stress management using spatial and machine learning techniques and (ii) to develop prognostic analysis infrastructure and capability for trans boundary biotic stress management. The outcome of the project is expected to be forewarning of interstate/transboundary biotic stress and protection advisories.




Dr. P. K. Ghosh
 Director & Vice-chancellor

Research Highlights

AGRICULTURAL BIOTECHNOLOGY

Cloning and sequencing of viral genome infecting economically important crops

(P. N. Sivalingam, Vinay Kumar, Yogesh Yele)

Molecular characterization of viral genome was done by rolling circle replication method for the selected begomoviruses, infecting pulses and vegetables are found to be important. Among the pulse crops, *mungbean*, *urdbean* and cowpea and in vegetables tomato and ridge gourd were selected for molecular characterization. Total DNA was extracted from all these crops by CTAB method. Rolling circle amplification was done using $\phi 29$ DNA polymerase with these samples. The amplified products restricted with different usual restriction enzymes such as *Bam*HI, *Hind*III, *Kpn*I, *Pst*I, *Eco*RI, *Sal*I and *Xba*I as per the standard method and cloned in pUC18. The size of insert ~1.35Kb and ~2.7 Kb are selected for sequencing. These sequences submitted to NCBI GenBank database (Table 1).

Table 1. Details of viral clones, length of begomovirus genomic components and accession number

Host	Name of clone	Details	Number of nucleotide	NCBI Accession number
<i>Mungbean</i>	MRB-A3	DNA A of MYMIV	965	MN026270
	MRP-A3	DNA A of MYMIV	1111	MN026271
	MRH-A4	DNA B of MYMIV	951	MN026272
Tomato	TRI-Pst1	DNA A ToLCKV	916	MN026268
	TRI-Hind2	DNA A ToLCKeV	1032	MN026267
	TRN-Kpn1	DNA A of ToLCNDV	1133	MN026266
	TRP-A1	DNA B of ToLCNDV	1002	MN026265
	TRI-Bam1	Croton yellow vein mosaic alphasatellite	1104	MN026269

Identification of biotic stress induced promoters from resistant source plants

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

Infectious clones of Mungbean yellow mosaic India virus (MYMIV) infecting mungbean

The dimerized DNA A and DNA B of genome of *Mungbean yellow mosaic India virus* (MYMIV) infecting *mungbean* in Raipur sub-cloned into pCAMBIA2301 vector and transformed to *E. coli* DH5 α . The plasmids were isolated and mobilized to *Agrobacterium tumifaciens* strain EHA105 for agroinoculation. These culture containing

equally mixed viral constructs of DNA A and DNA B was inoculated by pin prick method on *mungbean*, *urdbean*, cowpea and soybean. The inoculated plants were kept under insect proof condition and monitored for symptom development. Yellow mosaic symptoms were observed only on *mungbean* (Fig. 1) and *urdbean* but not on cowpea and soybean (Table 2). These infectious clones will be used to study the promoter involving in resistance source plants against MYMIV.

Table 2. Agroinoculation of infectious clones of DNA A and DNA B of MYMIV

Host	No. of plants inoculated	No. of plants showing symptoms	Latent period	Symptoms	PCR detection
<i>Mungbean</i>	10	10	10-11	YM	+
<i>Urdbean</i>	10	10	11-12	YM	+
Cow pea	10	-	-	-	-
Soybean	10	-	-	-	-



Fig 1. *Mungbean* cv. Maha Gujarat inoculated with *Agrobacterium tumifaciens* containing dimeric construct of DNA A +DNA B of MYMIV

Identification of host factors to impart resistance to begomoviruses in crops

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

Dimerization of begomovirus infecting tomato

DNA A clone of begomovirus infecting tomato is in *HindIII*, DNA B was found to be absent with this samples. However, one *BamHI* clone was found to contain betasatellite. These viral genomes were dimerized in pUC18 vector and restricted with *PvuII* and ligated with *pRI101* and transformed to *E. coli* DH5 α . These construct further transformed to *Agrobacterium tumifaciens* strain EHA105 and are being used for agroinoculation to tomato cv. Pusa Ruby and *Nicotiana benthamiana*.

Technique to identify virus replication and movement MYMIV in hosts and non-host plants

Initially the single whitefly inoculation technique within area of 1.57cm² has been standardized to assess the begomovirus replication and movement in *mungbean* and tomato. A single whitefly transmission was done from the agroinoculated *mungbean* plant with MYMIV to *mungbean* and tomato. The leaf samples were collected from the site of inoculation and two adjacent sites. The DNA from these samples was extracted and PCR was done with primers specific to DNA A of MYMIV. The replication of virus was confirmed with real-time PCR.

Mapping of genetic groups of *Bemisia tabaci* in India and their begomovirus transmission efficiency

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

The virus transmission efficiencies of various genetic groups of *B. tabaci* has been reported to be varying. Therefore, a basic scientific understanding on distribution of various genetic groups of *B. tabaci* and their transmission efficiencies with respect to begomoviruses is very much essential. Populations of *B. tabaci* were collected on diverse agricultural crops such as brinjal, bhendi, tomato, chilli, beans, cowpea, cotton, vegetable, cotton ecosystems of Andhra Pradesh, Tamil Nadu, Karnataka, Telangana, Odisha, Chhattisgarh, Rajasthan, Gujarat, Delhi and Maharashtra (South and Central India). Total genomic DNA was isolated, PCR amplified, purified and sequenced the mitochondrial *COI* gene of 280 individual samples of *B. tabaci*. The sequencing results were compared with reference sequences already reported globally. A total 11 distinct genetic groups of *B. tabaci* belonging to Asia I, Asia II-1, Asia II-5, Asia II-7, Asia III, Middle East Asia Minor I (MEAM I) have been recorded.

Role of isoflavones in differential reaction to Yellow Mosaic Disease in soybean

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

Designing Agro-infectious clones of MYMIV infecting soybean

In order to design the recombinant vector containing the dimerized *Mungbean yellow mosaic India virus* DNA A and DNA B, genomic DNA from virus infected soybean plants was isolated and subjected to Rolling Circle Amplification (RCA). The RCA product was analysed on 1% agarose gel (Fig. 2). Restriction digestion of RCA product with *PstI* and *BamHI* resulted in ~ 2.7 kb fragment which was expected to be MYMIV (Fig. 3). The ~ 2.7 kb fragment was cloned in pUC18 and transformed into DH5 α strain of *E. coli*. Colonies were screened for positive clones and confirmed through restriction analysis. The confirmed clones were further sequenced through Sanger di-deoxy sequencing. The *BamHI* restricted clone was confirmed to be A DNA while *PstI* clone was confirmed to be the B DNA of MYMIV. The monomer clones will be further dimerized in a suitable binary vector to generate the infectious clones.

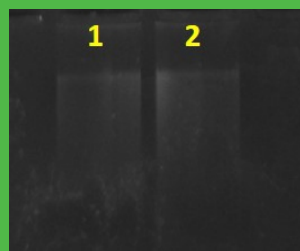


Fig 2. RCA product of genomic DNA isolated from infected soybean with *BamHI* (Lane 1) *PstI* (Lane 2)

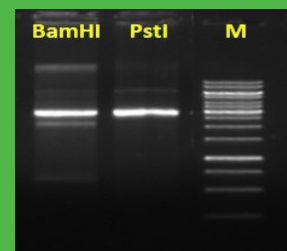


Fig 3. Restriction analysis of RCA with *BamHI* (Lane 1) *PstI* (Lane 2)

Foldscope as a research tool

(P. Mooventhan, Mamta Choudhary)

As a field application, foldscope was useful as a novel tool to test the semen quality in straw provided for Artificial Insemination (AI) of cattle at field level. This intervention has the significant scope to increase the conception rate in cattle which will pave the way for successful grading up of indigenous cattle. A total of 146 (images/videos) permanent slides were prepared from plant /animal /microorganism /insect samples, observed and documented through foldscope. As a capacity building initiative, a total 19 events were organised on foldscope demonstration cum hands-on training like awareness campaign on personal hygiene and zoonotic diseases to tribal farmers and school students. Totally, 846 participants benefitted from this initiative. Seven rural youths were trained at field level on usefulness of foldscope microscopy. More than 30 types of organisms identified with the help of Foldscope microscopy have been published in the online platform MICROCOSMOS Foldscope Community (URL: <https://microcosmos.foldscope.com/?author=2294>)



Foldscope demonstration to college students



Awareness creation on Personal Hygiene for Rural Women Health Workers (Mitani)

BIOLOGICAL CONTROL

Identification and characterization of bacteriophages against rice bacterial leaf blight pathogen *Xanthomonas oryzae* pv. *oryzae*

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

Bacterial leaf blight (BLB), caused by *Xanthomonas oryzae* pv. *oryzae* (*Xoo*), is one of the most important bacterial disease of rice worldwide. For the disease management, eco-friendly bio-control methodology of phage therapy can be a potent option. We attempted to isolate the bacteriophage against *Xoo* pathogen

isolated from field sample of Chhattisgarh. Growth conditions in solid and liquid culture medium were standardized for bulk culture of *Xoo*. The procedure for the isolation of bacteriophage using *Xoo* isolate was standardized. About 10 stagnant water samples from fields and pots and two BLB infected leaf samples were collected and processed for phage isolation. Out of 12 samples, one phage against *Xoo* was isolated as indicated by spot test, plaques and clearance of bacterial growth around streaked lines (Fig. 4,5).

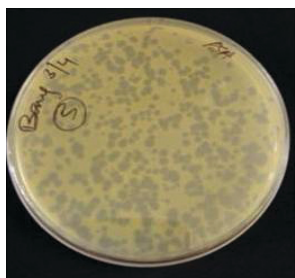


Fig 4. Plaques on overlay agar

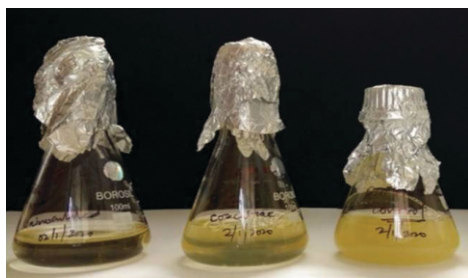


Fig 5. Visible turbidity clearance on liquid culture media in phage infected culture

Endophytes for biocontrol of crop diseases

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

In planta validation of plant growth promoting (PGP) activities of bacterial endophytes on chickpea and pigeonpea plants

Endophytic bacteria are known to have plant growth promoting potential by producing various products like phytohormones, enzymes, volatile organic compounds etc. The bacterial endophyte, 53P recovered from pigeonpea showed significant increase in different growth parameters in chickpea like root length (36.1%), fresh weight of root (206.3%), dry weight of root (125.3%) plant height (23.2 cm) and fresh weight of shoot (42.3%) over the control plants (without endophyte) (Fig. 6a). This bacterial endophyte also has antagonistic activity against

fungal pathogens. Bacterial endophytes were also tested for plant growth promotion activities on pigeonpea plants. Results showed the overall improvement in plant growth and development in endophyte treated plants (T) as compared to without endophyte control (C) plants (Fig. 6b) Hence, bacterial endophytes can be explored for plant growth promotion as well as bio control of fungal pathogens.

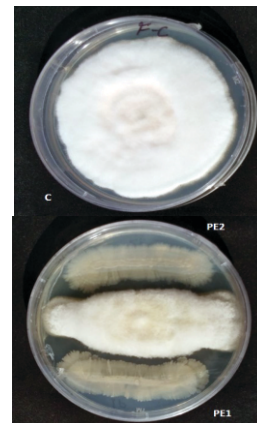


Fig 6a. Morphological appearance of chickpea plants with and without treatment of bacterial endophyte; 6b. pigeonpea plant and leaf with and without treatment of bacterial endophyte

Potential bacterial endophytes with antimicrobial activities against Fusarium pathogen

Bacterial endophytes isolated from different plant tissues of pigeonpea were screened *in vitro* for their antagonistic activities against pathogenic fungi, *Fusarium* sp. Variable inhibition of pathogen growth was recorded by bacterial endophytes (Fig. 7).

Fig 7. Antifungal activities of bacterial endophytes against fungal pathogens, bacterial endophytes PE1 and PE2 showing inhibition zone against *Fusarium*



Isolation and characterization of native biocontrol agents

Isolation and characterization of native Bacillus thuringiensis

(Lata Jain, R. K. Murali Baskaran)

Twenty six soil samples from 13 districts of Chhattisgarh and one sample from Odisha were processed for isolation of *B. thuringiensis* using standard

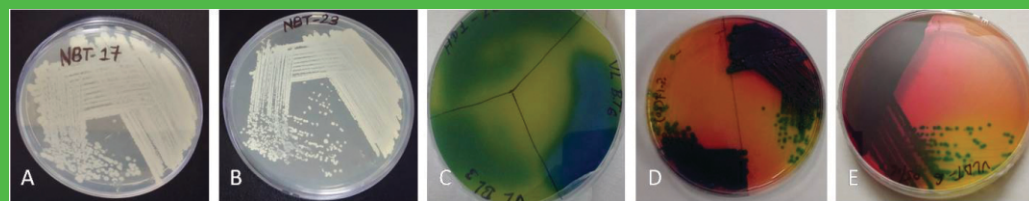


Fig 8. Growth characteristics of *Bacillus thuringiensis* on (A & B) nutrient agar; (C) *Bacillus cereus* agar and (D & E) Hichrome bacillus agar

procedure of sodium acetate treatment with slight modifications. Colonies on nutrient agar were further confirmed by gram's staining, growth on b. cereus agar and hichrome bacillus agar (Fig. 8) and finally by cry1 and cry2 gene (Fig. 9) specific PCR for confirmation of isolates as *B. thuringiensis*. About 13 isolates of *B. thuringiensis* were identified and preserved as glycerol stock for further efficacy studies.

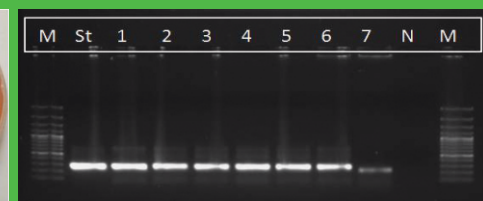


Fig 9. PCR amplification of cry 1 specific gene of *Bacillus thuringiensis* with amplicon size of 277 bp

Bio-assay of native Bt against Spodoptera litura

(R. K. Murali Baskaran, Lata Jain)

Two native *B. thuringiensis* isolated from the soil samples of forest ecosystem, Dhamtari (NBT 17) and vegetable eco-system, Durg (NBT 18) were mass-cultured, serially diluted into 5×10^8 CFL/ml, 5×10^7 CFL/ml and 5×10^6 CFL/ml. and bio-assayed with 3rd instar of *Spodoptera litura* in comparison with same three concentration of Almora VL-6 *Bt* (positive

control) and untreated check (negative control). On 3rd day after treatment (DAT), the per cent mortality of *S. litura* ranged from 6.6 to 29.8 per cent while no mortality was in control. The maximum mortality was observed in NBT 18 at 5×10^8 CFL/ml (56.7%) on 5th DAT which was significantly different from other treatments. Same trend was noticed on 7th DAT. The maximum mortality of 86.7 per cent was noticed on 9th DAT in NBT 18 at 5×10^8 CFL/ml, followed by NBT 17 at 5×10^8 CFL/ml (83.3%) and VL *Bt* 6 at 5×10^8 CFL/ml (76.7%) whereas it was 10 per cent in control (Fig. 10).

Native Trichogramma spp.

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

A total of 15 districts of Chhattisgarh including Kanker, Durg, Raipur, Rajnandgaon, Balod, Bemetara, Baloda Bazar, Mungeli, Bilaspur, Korba, Koriya, Surajpur, Balrampur, Surguja and Dhamtari were surveyed during 2019 to collect native biocontrol agents. Sentinel egg card were used to trap the native egg parasitoids in 47 places, belonging to different eco-systems of forest, vegetable, pulses, maize, cotton etc. Out of them, 14 eco-types of *Trichogramma* were recovered and identified at species level.

Super donor rice

(Vinay Kumar, S. K. Jain, P. N. Sivalingam, Mallikarjuna, J.)

Procurement of rice germplasm, multiplication and screening

Rice germplasm containing genes for bacterial blight disease, blast disease and brown plant hopper were procured from International Rice Research Institute (IRRI), Philippines. A total of seven wild species of rice namely *Oryza nivara*, *O. minuta*, *O. glumaepatula*, *O. grandiglumis*, *O. rufipogon* and *O. longistaminata* having different genomic composition and known to possess resistance genes for several diseases and insects are being multiplied for the breeding programme. To develop super donor in rice, crosses were made between

MTU 1010 and rice line (IRBB 66) having five genes for BLB resistance ($Xa4+xa5+Xa7+xa13+Xa21$) and F_1 seeds were produced. The presence of BLB resistance genes were confirmed using gene linked molecular markers. For recovery of MTU 1010 genome, F_1 plants were backcrossed with recipient parent. The seeds of back-cross were developed and being tested to the presence of BLB resistance gene using molecular markers for further advancement of generations. In order to introgress resistance genes for blast resistance and brown plant hopper from wild rice germplasm and the rice lines containing resistance genes, crosses were made during the *kharif* season and seed were produced.

Screening of rice germplasm for resistance to brown plant hopper (BPH)

A total of eighty (80) rice germplasm lines were selected and screened for brown plant hopper resistance in rice using standard seed box technique (IRRI, 1988). For the screening of rice lines, seeds were sown in tray and infected with BPH nymphs @ 10 per seedling, 10 days after sowing (Table 3) and observation was recorded after 10-12 days. Out of 80 line, 3, 12, 22 and 25 lines were resistant, moderately resistant, susceptible and highly susceptible (Fig. 11).

Table 3. Screening of rice lines for BPH resistance in rice

S. No.	Grade	Number of Rice lines	BPH reaction
1	0-1	03	Resistant
2	3	12	Moderately Resistant
3	5	18	Moderately susceptible
4	7	22	Susceptible
5	9	25	Highly susceptible



Fig 11. Screening of rice lines for brown plant hopper (BPH) resistance

HOST PLANT RESISTANCE

Screening of finger millet and pigeonpea germplasm accessions against biotic stress (S. K. Jain, R. K. Murali Baskaran, P. N. Sivalingam)

Screening of finger millet (432) germplasm accessions against diseases was conducted during *kharif* 2019 under natural field conditions. This year high incidence and severity of neck and finger blast caused by *Pyricularia grisea* was observed. Genotypes were categorized as resistant (0-1), moderately resistant (1.1-3.0), moderately susceptible (3.1-5.0), susceptible (5.1-7.0) and highly susceptible (7.1-9.0) in 0 to 9 scale. Thirty nine accessions were resistant to neck blast whereas 54 accessions showed resistance response to finger blast stage out of 432 accessions screened. In addition, 42 and 61 accessions were categorized as moderately resistant to neck and finger blast, respectively.

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During *kharif* 2019, 146 germplasm accessions of pigeonpea mini-core sub-set along with four controls received from ICRISAT, Hyderabad were screened against spotted pod borer. Observation during vegetative/flowering stage on the incidence of spotted pod borer, *Maruca vitrata* resulted that 20 germplasm including ICP 4307, 4392, 4575, 6815, 6845, 6992, 7223, 7314, 7426, 7507, 8227, 9414, 10228, 11321, 12515, 13431, 13884, 14444, 14722, 14819 recorded moderate damage, ranging from 0.6 to 2.4 leaf webbings/plant and 0.2 to 0.6 larvae/plant while in the controls, they were 9.5 to 10.6 leaf webbings/plant and 3.2 to 4.2 larvae/plant.

Response of different accessions of *Vigna* species to yellow mosaic disease (P. N. Sivalingam)

Totally 51 accessions of *Vigna* species have been evaluated for yellow mosaic disease under field conditions. Total DNA from all the samples were tested by PCR using the primers specific to DNA A of *Mungbean yellow mosaic India virus* (MYMIV). Out of 51 germplasm tested, 38 showed positive results to MYMIV. Some of the accessions which did not show any visible symptoms in the field found positive in PCR amplification, suggest the presence of symptomless carrier of virus.

Bio-ecology and management of pink stem borer in wheat (K. C. Sharma, Mallikarjuna, J.)

The effect of nutritional based systemic induced resistance using different levels of K and Si were studied against pink stem borer in wheat (var. GW-273). The biochemical analyses of Si-nutrition wheat stem samples indicated that there were enhancement of total sugars, total phenols and defense enzymes (peroxidase, polyphenol oxidase, phenylalanine ammonia lyase and Betal-3 glucanase) in plots applied with soil application of diatomaceous clay @ 300 kg ha⁻¹ in contrast to untreated control plots.

Developing and testing the effectiveness of interactive educational multimedia module on biotic stress management in rice and *Lathyrus* (P. Mooventhan, Anil Dixit, R. K. Murali Baskaran)

Lathyrus info mobile app and offline interactive educational multimedia module on biotic stress management in rice and *Lathyrus* were developed and demonstrated among the farmers.

Prototypes developed

Lathyrus info (Mobile Application)



Usage of *Lathyrus* info (Mobile Application) by farmers



Interactive Educational Multimedia Module on Biotic Stress Management in Rice and *Lathyrus*



Usage of Interactive Educational Multimedia Module on Biotic Stress Management in Rice and *Lathyrus* by farmers



Farmer FIRST Programme

(P. Mooventhan, Anil Dixit, K. C. Sharma, P. N. Sivalingam, Amit Kumar Gupta, Amit Dixit)

Table 4. Summary of Farmer FIRST Project (2019)

S. No.	Particulars	Number of farm families	Number of beneficiaries
I. Capacity Building Programme			
1.	Number of training/total farmers	21	436
2.	Number of Demonstration/ total farmers	34	889
3.	Number of Gosthi and group discussion/ total farmers	06	298
4.	Number of Exposure Visit/ total farmers	0	0/0
5.	Number of Farmer Scientist interface/ total farmers	0	0/0
6.	Number of Agricultural Film Shows/ total farmers	08	336
7.	Total Farmers Covered in CBP	--	1959
8.	Technology Introduced (Total 41)	--	03
9.	Area Covered under Pulses/ total farmers	33 ha	165
10.	Area Covered Under Vegetable/ total farmers	4 ha	34
11.	Household covered	--	507
12.	Cropping Intensity (%)	--	121%
13.	Migration reduced	--	23%
II. Income generated per farm family (in Rs.)			
1.	Crop Based Module	Rs. 9850	Rice fallow crops not harvested
2.	Livestock Based Module	Kadakhnath : Rs. 20,042 Goat: Rs. 39,150	Kadakhnath: Rs.28,414 Goat: Rs. 15,420
3.	Horticulture Based Module	Rs. 12,722	Rs. 6,500
4.	Enterprise Based Module	Rs. 14,000	Rs. 9,720
5.	NRM Based Module	Rs. 3,650	Rs. 4,230

Institute Activities

4th Research Advisory Committee Meeting (July 03, 2019)

The 4th RAC meeting (first of the present RAC) of the ICAR-NIBSM was held on 3.7.19 at ICAR-NIBSM, Raipur under the Chairmanship of Dr. C. D. Mayee, Former Chairman, ASRB, along with other members including Dr. V. V. Ramamurthy, Ex-Principal Scientist, Division of Entomology, ICAR-IARI, New Delhi, Dr. S. S. Singh, Ex-Director, ICAR-IIWBR, Karnal, Dr. M. Anandaraj, Ex-Director, ICAR-IISR Calicut and ICAR-IIHR, Bangalore, Dr. Jagdish Kumar, Director (Acting), ICAR-NIBSM and Dr. P. Kaushal, Joint Director (Research), ICAR-NIBSM & Member Secretary (RAC). Dr. P. K. Chakrabarty, Member, ASRB attended as a special invitee. This meeting was also attended by section in-charges. The RAC members and ICAR-NIBSM authorities visited the institute buildings under construction and discussed the overview of the administrative, library, auditorium, schools and hostel buildings. After this visit, the Chairman, RAC and other members inaugurated the Plant Growth Chamber and Whitefly Rearing Facility developed under ICAR-NASF project in the presence of staff of the NIBSM, followed with planting of tree saplings.

Parthenium Awareness Week (August 16-22, 2019)

भारतीय कृषि अनुसंधान परिषद के अन्तर्गत राष्ट्रीय जैविक स्ट्रैस प्रबंधन संस्थान बरौण्डा रायपुर में 16-22 अगस्त 2019 गाजरघास जागरूकता सप्ताह मनाया गया। इसके तहत विभिन्न स्कूलों के बच्चों को एवं गाँव के ग्राम सभा में सरपंच, सचिव एवं गाँव के किसानों से परिचर्चा की एवं गाजरघास से होने वाले दुष्प्रभाव की विस्तृत जानकारी दी गई, एवं किस तरीके से इस गाजरघास का समय रहते नियंत्रण करने से हमारे आस-पास के पर्यावरण एवं स्वास्थ्य में होने वाले कुप्रभाव को रोका जा सकता है।

हिन्दी पखवाड़ा (13-27 सितम्बर, 2019)

संस्थान में दिनांक 13-27 सितम्बर, 2019 के दौरान हिन्दी पखवाड़ा डॉ. पंकज कौशल, संयुक्त निदेशक (अनुसंधान) ने 13 सितम्बर, 2019 को शुभारंभ किया। डॉ. कौशल ने सभी वैज्ञानिकों से कृषि तकनीकी और अपनी शोध उपलब्धियों को आम जनता/ किसानों तक हिन्दी में पहुँचाने का अनुरोध किया। हिन्दी पखवाड़ा के दौरान विभिन्न प्रतियोगिताओं जैसे निबन्ध, सुलेख व श्रुतिलेख आदि प्रतियोगिताओं का आयोजन किया गया। हिन्दी पखवाड़ा का समापन एवं पुरस्कार वितरण समारोह 27 सितम्बर, 2019 को निदेशक महोदय की उपस्थिति में सम्पन्न हुआ। मुख्य अतिथि, निदेशक, संयुक्त निदेशक (अनुसंधान) द्वारा प्रतियोगिताओं में विजेता कर्मचारियों को नकद पुरस्कार व प्रशस्ति पत्र देकर पुरस्कृत किया गया। इस अवसर पर निदेशक ने पन्द्रह दिन चले विभिन्न कार्यक्रमों में उत्साहपूर्वक भाग लेने के लिए अधिकारियों एवं कर्मचारियों को बधाई दी। हिन्दी पखवाड़ा के सफल आयोजन के लिए राजभाषा समिति के सभी सदस्यों की सराहना करते हुये राजभाषा के और अधिक प्रयोग के लिए सतत प्रयास पर बल देने को कहा।

Status of Biotic Stress in Crops of Chhattisgarh during 2019

Crop	Biotic Stress	Scientific Name	Intensity
Kharif 2019			
Rice	Brown planthopper	<i>Nilaparvata lugens</i>	5-30%
	Stem borer	<i>Scirpophaga incertulas</i>	Low
	Leaf folder	<i>Cnephalocrocis medinalis</i>	Low
	Bacterial blight	<i>Xanthomonas oryzae</i> pv. <i>oryzae</i>	Low to medium
	Neck blast	<i>Pyricularia oryzae</i>	Low to medium
	Sheath blight	<i>Rhizoctonia solani</i>	Low to high
	False smut	<i>Ustilaginoida virens</i>	Low to medium
	Root knot nematode	<i>Meloidogyne graminicola</i>	26 galls/seedling
Maize	Fall armyworm	<i>Spodoptera frugiperda</i>	10-20% in Southern parts of Chhattisgarh
Finger millet	Pink stem borer	<i>Sesamia inferens</i>	Low
	Earhead caterpillar	<i>Cryptoblabes aungustipennella</i> , <i>Eublemma silicula</i>	Low
	Foot rot	<i>Sclerotium rolfsii</i>	Low
	Neck and finger blast	<i>Pyricularia grisea</i>	Low to High
	Brown leaf spot	<i>Helminthosporium</i> sp.	Low to Medium
	Sheath blight	<i>Rhizoctonia solani</i>	Low
Pigeonpea	Spotted pod borer	<i>Maruca vitrata</i>	0.6-5% leaf or flower webs/plant
	Pod borer complex	<i>Helicoverpa armigera</i> <i>Maruca vitrata</i>	Medium
	Pod fly	<i>Melanogromyza obtusa</i>	Medium
	Fusarium wilt	<i>Fusarium udum</i>	Medium to high
	Phytophthora blight	<i>Phytophthora cajani</i>	Low to medium
Cowpea	Yellow mosaic	<i>Begomovirus</i>	Medium
	Anthraxnose	<i>Colletotrichum lindemuthianum</i>	Medium
Bhendi	Fruit borer	<i>Earias vittella</i>	Medium
	Powdery mildew	<i>Erysiphe cichoracearum</i>	Medium to high
	Cercospora leaf spot	<i>Cercospora</i> sp.	Medium to high
Brinjal	Shoot and fruit borer	<i>Leucinodes arbonalis</i>	15-30%
Chilli	Thrips	<i>Scirtothrips dorsalis</i>	Medium to high
	Die back	<i>Colletotrichum capsici</i>	Medium to high
	Leaf curl	Leaf curl virus	Medium to high
Cauliflower	Cut worm	<i>Spodoptera litura</i>	10-20% leaf damage
Rabi-Summer 2019-2020			
Wheat	Pink stem-borer	<i>Sesamia inferens</i>	10-17%
	<i>Pyrrilla</i>	<i>Pyrrilla perpusilla</i>	20 to 30 nymphs and adults/plant
Chickpea	Pod borer	<i>Helicoverpa armigera</i>	>50%
	wilt	<i>Fusarium oxysporum</i> f. sp. <i>ciceris</i>	Low to medium
	Collar rot	<i>Sclerotium rolfsii</i>	Low to medium
Lathyrus	Thrips	<i>Scirtothrips dorsalis</i> <i>Thrips florum</i>	3-4/leaf 3-4/flower
	Collar rot & wilt complex	<i>Sclerotium rolfsii</i> <i>F. oxysporum</i> f. sp. <i>lentis</i>	Up to 30%

150th Birth Anniversary of Mahatma Gandhi Celebrations

150th Birth Anniversary of Mahatma Gandhi was celebrated at ICAR-NIBSM, Raipur during a week preceding to 2.10.19. Various competitions based on the life of Mahatma Gandhi and importance of cleanliness were conducted on 28 & 30.9.19. Cleaning activities in the institute campus was organized when all the institute staff participated and removed the garbage including plastic material from the campus. The chief guest Dr. (Mrs.) Seema Shrivastava, Principal of Govt. Higher Secondary School, Saragaon, Raipur said that people become great by deeds not by birth as Mahatma Gandhi.

Swachhata Hi Sewa (October 02, 2019)

Swachhata Hi Sewa Pakhwara was inaugurated by Dr. Pankaj Kaushal, Joint Director (Research) by taking *Swachhta* pledge by all the staff members of the institute. The Director (Acting), Joint Director (Research) and all the staff of the institute actively participated in the drive and cleaned the premises. All the MGMG teams visited their respective adopted villages and conducted meetings, discussions and cleanliness drives as part of the SHS. The schools in nearby villages were visited by scientists and delivered lectures on importance of *Swachhata* in our daily life and urged students to hand wash after toilet use and maintain surroundings clean and neat. On the closing ceremony of SHS and 150th birth anniversary of Mahatma Gandhi on

2.10.19, various competition were held to scientists and other staff members. Chief Guest Smt. Seema Srivastav, Principal, Govt higher primary school, Saragaon delivered the lecture on importance of *Swachhata* and contribution of Mahatma Gandhi.

8th Foundation Day (October 07, 2019)

Eighth foundation day of the institute was celebrated on 7.10.19 at the ICAR-NIBSM Campus. Dr. Jagdish Kumar, Director (Acting) welcomed gathering. Dr. M. C. Sharma, Former Director, ICAR-IVRI, Izatnagar was the Chief guest of the function, Dr. A. R. Sharma, Director (Research), Rani Lakshmi Bai Central Agricultural University, Jhansi and Dr. M. P. Thakur, Director (Instructions), IGKV, Raipur were the guest of honour; Dr. P. Anand Kumar, Former Project Director, ICAR-NRCPB, New Delhi and Dr. V. K. Choudhary, Senior Scientist (Agronomy), DWR, Jabalpur were the special guests. Dr. P. Kaushal, Joint Director (Research), scientists and staff of the institute and farmers participated. During the meeting, various awards and inputs under different schemes were distributed to scientists and farmers, besides releasing books and Apps.

Vigilance Awareness Week (October 28-November 02, 2019)

The Vigilance Awareness Week 2019 was observed at the Institute during 28.10.19 to 2.11.19 with the theme of “Integrity-A Way of Life”. An integrity pledge was taken by all the officers, staff members and contractual workers of the Institute which was administered by the Dr. Jagdish Kumar, Director (Acting). Scientists visited nearby school to spread the message against corruption..

National Unity Day 2019 (October 31, 2019)

To commemorate the birth anniversary of Sardar Vallabh bhai Patel, “National Unity Day” was observed on 31.10.19. This day re-affirms the inherent strength and resilience of our people to withstand threats to the security, unity and integrity of the country. A pledge taking ceremony was held at 4.00 pm on 31st October, 2019 in the Institute. Scientists, officers and staff members of the institute participated in the pledge-taking ceremony.

Observance of the *Samvidhan Diwas* (November 26, 2019)

The *Samvidhan Diwas* (Constitution Day) was observed on 26.11.19, celebrating the 70th Anniversary of adoption of the Indian Constitution, at 11.00 am in the training hall of ICAR-NIBSM. Dr. Pankaj Kaushal, Joint Director (Research) presided over the function. Scientists, officers and staff members of the institute participated in the occasion.

Advisory Committee Meeting of ICAR-NASF (December 06, 2019)

The Advisory Committee met on 6.12.19 at ICAR-NIBSM, Raipur to review the progress of the NASF project on “Identification of host factors responsible for infection and development of nano-particle based dsRNA delivery system for imparting resistance to begomoviruses” under the Chairmanship of Dr. Krishna Reddy, Head, Division of Plant Pathology, ICAR-IIHR, Bengaluru. The members attended this meeting were: Dr. Enakshi Khular Sharma, Member & Professor, Department of Electronic Science, University of Delhi South Campus, New Delhi, Dr. Jagdish

Kumar, Member & Director (Acting), ICAR-NIBSM, Raipur, Dr. Pankaj Kaushal, Special Invitee & Joint Director (Research), ICAR-NIBSM, Raipur, Dr. Bikash Mandal, Member & CCPI, Principal Scientist, Division of Plant Pathology, ICAR-IARI, New Delhi, Dr. Senthil-Kumar Muthappa, Member & CCPI, Staff Scientist-IV, NIPGR, New Delhi, Dr. Neetu Singh, Member & CCPI, Associate Professor, Centre for Biomedical Engineering, IIT-D, New Delhi, Dr. K. C. Sharma, Member & Senior Scientist, I/c Finance and Account Officer, ICAR-NIBSM, Raipur, Dr. J. Sridhar, Member & Scientist, I/c Head of Office, ICAR-NIBSM, Raipur and Dr. P. N. Sivalingam, Member Secretary & PI, Senior Scientist, ICAR-NIBSM, Raipur. During the meeting, the progress and achievements made during 2018-19 was presented by PI of the each centre and suggestions were also given by members for further improvement.

MANAGE sponsored five-day off-campus training (December 17-21, 2019)

Five-day off-campus collaborative training programme, sponsored by MANAGE, Hyderabad on "Good Agricultural Practices and Current Strategies for Improved Agro-chemical Use and Management " (17-21 December, 2019) was inaugurated at ICAR- National Institute of Biotic Stress Management, Raipur on 17.12.2019 with Dr. S. C. Mukherjee, Director Extension Services, IGKV, Raipur and Shri. B. K. Bijronia, Joint Director Agriculture, Raipur as special guests. Dr. Pankaj Kaushal, Joint Director (Research), ICAR-NIBSM, Raipur, briefed about the role and mandate of ICAR-NIBSM in crop protection. The main objective of the training is to introduce and create awareness among the extension functionaries on improved agro-chemical use and management for enhanced production and income generation with healthy environment. The reading materials like one training manual and one technical bulletin were prepared for the benefit of participants. Valedictory function was conducted on 21.12.19 with special lecture, delivered by Dr. T. P. Rajendran, former ADG (PP&B). Dr. M. P. Thakur, Director of Instruction, IGKV, Raipur graced the occasion. The off-campus training was conducted with course directorship of Dr. P. Mooventhan and Dr. R. K. Murali Baskaran in which, 25 participants were benefitted.

Extension and Outreach activities

Mera Gaon Mera Gaurav (MGMG)

The *Mera Gaon Mera Gaurav* teams of ICAR-NIBSM, Raipur disseminated technologies to the farmers of selected villages (15) on various aspects of Agriculture and Veterinary sciences in a time frame through monthly visit, demonstrations (06), meetings (08) and advisory (10) and literature support every month. The selected villages (15) visited for 29 times repeatedly in 14 visits and benefitted 746 farmers. Two farmers meeting and nine demonstrations were organized.

Infrastructure Development

An Administrative Approval and Expenditure Sanction to the budget of Rs. 52.87 crores was received for undertaking various work at ICAR-NIBSM, Raipur. Buildings constructed and on the verge of completion are Administrative Building, Library, Auditorium Building, School Building (2 Nos.), Boys Hostel and Development Works.

Workshops/Symposia/Seminars/Trainings

Workshops/Symposia/Seminars/Trainings organized

S. No.	Title of symposia/seminar/training organized	Period	Venue	Organized by
1.	Foldscope workshop and awareness creation on personal hygiene for Rural Women Health Workers (<i>Mitanin</i>)	15.9.19	Katgi, Chhattisgarh	P. Mooventhan
2.	Foldscope demonstration cum training	15.9.19	ICAR-NIBSM	P. Mooventhan
3.	Five days MANAGE sponsored off-campus collaborative training programme on “Good Agricultural Practices and Current Strategies for Improved Agro-chemical Use and Management” organised from 17.12.2019 to 21.12.2019.	17-21.12.19	ICAR-NIBSM	P. Mooventhan, R. K. Murali Baskaran

Workshops/Symposium/Seminar/Conference/other fora attended

S. No.	Title of symposia/seminar/training attended	Period	Venue	Sponsor	Name of scientist
1.	Veterinary Pathology Congress	6-8.11.19	Central Agricultural University, Aizawl	Department of Veterinary Pathology, CAU, Aizawl	B. K. Choudahry, Mamta Choudhary
2.	60 th Annual Conference of Association of Microbiologists of India (AMI-2019) & International Symposium on Microbial Technologies in Sustainable Development of Energy, Environment, Agriculture and Health	15-18.11.19	Central University of Haryana	Association of Microbiologists of India	Lata Jain, Vinay Kumar
3.	Symposium on "Endophytes and their Applications in Agriculture"	24-26.9.19	UAS, GKVK, Bengaluru	Department of Physiology, GKVK, Bengaluru	Vinay Kumar
4.	4 th Workshop of Nodal Officers of KRISHI-Knowledge Based Resources Information Systems Hub for Innovations in Agriculture (Management of ICAR Research Data Repository for Knowledge Management initiative)	10-11.12.19	IASRI, New Delhi	IASRI, New Delhi	Vinay Kumar
5.	14 th Annual Convention of Central Information Commission (CIC)	12.10.19	Vigyan Bhawan, New Delhi	Vigyan Bhawan, New Delhi	Vinay Kumar
6.	ISEE National Seminar 2019 on "Holistic Approach for Enhancing Agricultural Growth in Changing Rural Scenario"	14-16.11.19	Swami Keshwanand Rajasthan Agricultural University, Bikaner	ISEE	P. Mooventhan
7.	International Conference on Extension for Strengthening Agricultural Research and Development	14-16.12.19	KVK, Mysuru, Karnataka	eSARD 2019	P. Mooventhan
8.	International conference on Plant Protection in Horticulture: Advances and challenges (ICPPH- 2019)	24-27.7. 19	ICAR-IIHR, Bengaluru	Association for Pest Management in Horticultural Ecosystem, Bengaluru	J. Sridhar
9.	XIX International Plant Protection Congress	10- 14.11.19	ICRISAT, Hyderabad	PPC 2019	J. Sridhar, Lalit L. Kharbikar, Mallikarjuna, J.
10.	National Conference on Integrative Plant Biochemistry and Biotechnology, held at on 8 th and 9 th December 2019	8-9.12.19	ICAR-Indian Institute of Rice Research, Hyderabad	Society of Plant Biochemistry and Biotechnology, ICAR-IARI, New Delhi	Ashish Marathe
11.	Off campus training on Designing CRISPR targets using in-silico tools	16-25.9.19	ICAR-IARI, New Delhi	Division of Biochemistry, ICAR-IARI, New Delhi	Ashish Marathe

Publications

Research/Review papers

Bera, B., M. Choudhary, T. Anand, S. Karthik, N. Virmani, B. Choudhary and B. N. Tripathi. 2019. Detection and genetic characterization of porcine circovirus 3 (PCV3) in pigs in India. *Transboundary and Emerging Diseases*. doi: 10.1111/tbed.13463

Kharbikar, L. L., A. S. Shanware, M. S. Saharan, R. Aggarwal, S. K. Nandanwar and P. N. Sivalingam. 2019. *Fusarium graminearum* micro RNA-like RNAs and their interactions with wheat genome: A much-needed study. *Indian Phytopathology* 72: 565-573

Kumar, K., J. Sridhar, R. K. Murali Baskaran, S. Senthil-Nathan, P. Kaushal, S. K. Dara, and S. Arthurs. 2019. Microbial biopesticides for insect pest management in India: Current status and future prospects, *Journal of Invertebrate Pathology* 165: 74-81

Mallikarjuna, J., Y. Yele and S. K. Jain. 2019. Heavy infestation of sugarcane leafhopper, *Pyrilla perpusilla* on wheat and oats in Chhattisgarh. *Indian Journal of Entomology* 81(3): 516-517

Choudhary, M., B. K. Choudhary, B. C. Bera, S. P. Chaudhari, D. K. Giri, R. C. Ghosh and S. B. Barbuddhe. 2019. Association of *Myroides odoratimimus* in immunocompromized piglets with post weaning multisystemic wasting syndrome. *Journal of Applied Microbiology* 127(6): 1635-1645

Choudhary, M., B. K. Choudhary, R. C. Ghosh, S. Bhoyar, S. B. Kale, S. P. Chaudhari and S. B. Barbuddhe. 2019. Cultivable microbiota and pulmonary lesions in polymicrobial bovine pneumonia. *Microbial Pathogenesis* 134 (2019) 103577

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Sahu, R. K., M. L. Sharma, P. Mooventhan and M. A. Khan, M. A. 2019. Assessment of Socio-Economic Status and Communicational Characteristics of Farmers Using Bio-Control Agents. *International Journal of Current Microbiology and Applied Sciences* 8(12): 2894-2901

Sahu, R. K., M. L. Sharma, P. Mooventhan and M. A. Khan. 2019. Constraints perceived by the farmers while using bio-control agents. *International Journal of Chemical Studies* 7(6): 2547-2549

Books

Dixit, A. and A. Pradhan. 2019. ATLAS: Weed flora of Chhattisgarh, ICAR-National Institute of Biotic Stress Management, Raipur, 136p. (ISBN:978-81-942788-0-1)

Abstracts

Choudhary, B. K., M. Choudhary and S. B. Barbuddhe. 2019. Spectrum of Cultivable Pathogens of Fresh Water Production System of Central India. In: *Veterinary Pathology Congress 2019*, held during 6-8, November, 2019 at Department of Veterinary Pathology, Central Agricultural University, Aizawl

Jain, L. and V. Kumar. 2019. Molecular epidemiology of infectious bovine rhinotracheitis in bovines of Chhattisgarh. In: *Compendium of 60th Annual Conference of Association of Microbiologists of India (AMI-2019) & International Symposium on Microbial Technologies in Sustainable Development of Energy, Environment, Agriculture and Health* held during 15-18 November, 2019 at Central University of Haryana (CUH), Mahendergarh, Haryana

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strategies in the development of tribal farmers under Farmer FIRST Programme - A participatory approach, abstract No. B-45, p. 97. In: ISEE National Seminar-2019, held during 14-16 November, 2019 at Swami Keshwanand Rajasthan Agricultural University, Beechwal, Bikaner-334006 (Rajasthan), India

Mooventhan, P., J. Kumar, A. Dixit, and P. Kaushal. 2019. "Role of value-chain and Market-led extension approaches in the development of tribal farmers in rice fallow pulse cropping system - A participatory approach for doubling the farmer's income, abstract no. 14215 202-203pp. In: International Conference on Extension for Strengthening Agricultural Research and Development (eSARD - 2019), held during 14-16 December, 2019 at KVK Mysuru, Karnataka, India

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Technical Bulletins

Mooventhan, P., R. K. Murali Baskaran, J. Sridhar, P. Kaushal and J. Kumar. 2019. Technical Bulletin on Integrated control of fall armyworm in maize, ICAR-NIBSM, Raipur 24p.

Training Manual

Mooventhan, P., R. K. Murali Baskaran, G. Bhaskar, U. Singh and J. Kumar. 2019. MANAGE sponsored Off-campus Collaborative Training Programme on Good Agricultural Practices and Current Strategies for Improved Agro-chemical use and Management, ICAR-National Institute of Biotic Stress Management, Raipur, 228 p.

Popular articles

बिनोद कुमार चौधरी, ममता चौधरी, कैलाश शर्मा, जे श्रीधर, विनय कुमार, पी मूवेंथान 2019, सुर्मी पालन एवं उनका प्रबंधन, एक्सटेंशन फोल्डर नंबर NIBSM/EF2019-29

बिनोद कुमार चौधरी, ममता चौधरी, कैलाश शर्मा, जे श्रीधर, विनय कुमार, पी मूवेंथान 2019, किसानो की आय दुगुनी करने हेतु बकरी पालन एवं उनका प्रबंधन, एक्सटेंशन फोल्डर नंबर NIBSM/EF2019-30

बिनोद कुमार चौधरी, ममता चौधरी, कैलाश शर्मा, जे श्रीधर, विनय कुमार, पी मूवेंथान 2019, समेकित कृषि प्रणाली में पशु आहार प्रबंधन, एक्सटेंशन फोल्डर नंबर NIBSM/EF2019-31

बिनोद कुमार चौधरी, ममता चौधरी, कैलाश शर्मा, जे श्रीधर, विनय कुमार, पी मूवेंथान 2019, समेकित कृषि प्रणाली में तालाब प्रबंधन, एक्सटेंशन फोल्डर नंबर NIBSM/EF2019-32

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Repository Deposition

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Awards/Recognition/Membership in Professional Societies

S. No.	Awards/Recognition/Membership	Year/Period	Offered by	Scientist
1.	Member of RAC of ICAR-NCIPM	2019-2022	ICAR, New Delhi	Anil Dixit
2.	Member of IMC of ICAR-NIBSM	2019-2022	ICAR-NIBSM	Anil Dixit
3.	Dr. S. Sithanatham Biennial Award for Excellence in Biological Control Research with special emphasis in Horticultural crops	2019	Association for Advancement of Pest Management in Horticultural Eco-systems, IHR, Bengaluru	R. K. Murali Baskaran
4.	Outstanding contribution to Science Award – 2019 Commendable contribution to Agricultural Entomology With Specialization in Biological Control	2019	Dr. B. Vasantharaj David Foundation, Chennai	R. K. Murali Baskaran
5.	Best oral presentation Award at International Conference on Extension for Strengthening Agricultural Research and Development	2019	eSARD-2019	P. Mooventhan
6.	Young Investigator Talk Award	2019	International Centre for Genetic Engineering and Biotechnology, New Delhi	Lalit L. Kharbikar
7.	INSA Visiting Scientist Fellowship	2019	INSA, New Delhi	Lalit L. Kharbikar
8.	Fellow of ESI	2019	Entomological Society of India, New Delhi	Mallikarjuna, J.
9.	Young Investigator Award for Excellence in Plant Biology	2019	SPBB-Springer	Ashish Marathe

Joining/Relieving of staff of NIBSM

Dr. Sushil Kumar Sharma joined as Principal Scientist (Agricultural Microbiology) on 26.12.2019 at ICAR-NIBSM