ICAR
NATIONAL INSTITUTE OF BIOTIC STRESS MANAGEMENT
Baronda, Raipur - 493 225, Chhattisgarh

NEWSLETTER
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From Director's Desk

International Year of Plant Health 2020

The United Nations has declared 2020 as the International Year of Plant Health (IYPH). The main aim is to raise global awareness on how protecting plant health can help end hunger, reduce poverty, protect the environment, and boost economic development. FAO estimates that up to 40% of food crops are lost due to plant pests and diseases annually. This leaves millions of people without enough food to eat and seriously damages agriculture, the primary source of income for rural poor communities. Plant health is increasingly under threat. Climate change and human activities have altered ecosystems, reducing biodiversity and creating new niches where pests and pathogens can thrive. At the same time, international travel and trade has tripled in volume in the last decade and can quickly spread pests and diseases around the world causing severe damage to native plants and the environment. With this backdrop, declaration of 2020 as the International Year of Plant Health (IYPH) by the United Nations is indeed very timely.

Pest and disease incidences in crops are functions of ambient temperature and humidity. Therefore, crop-pest or crop-disease interactions would have significant ramifications with variabilities in weather conditions in this era of climate change. It is thus well-argued that "protecting plants from pests and diseases is far more cost-effective than dealing with full-blown emergencies" (FAO, 2019). The United Nations suggested Sustainable Development with the aim to achieve 17 goals by 2030 towards ending all forms of poverty, fighting inequalities and tackling climate change while ensuring that no one is left behind. India has been a sufferer to many invading insect pests, diseases, weeds, *etc.* in the last so many years. It would be in the long-term interest of the country to have a preventive approach rather than protecting the crop, by often resorting to costlier and not environment-friendly agro-chemicals. In view of the declaration of IYPH- 2020, we analyse the current status and argue for a framework of government interventions and public awareness generation. In fact, IYPH offers an excellent opportunity for all actors in agriculture productions and protection ecosystem to successfully join hands together and make Indian agriculture ecologically sustainable.

Plant health needs to be viewed as an important perspective of measures to ensure food security which involves a multi-disciplinary approach, reforms in much needed globally competitive human resources, natural resources management, agricultural research, and rural infrastructure. Investing in plant health research is necessary to withstand plant pests and diseases, reduce food insecurity, feed the growing population, and make our planet more safe and sustainable. Greater emphasis must be laid on identification of sources of resistance, molecular markers, MAS and MAB of economically important diseases and pests of major crops crucial for food security.

Various strategies pertaining to plant health must be addressed while pursuing the IYPH at national and international forums which include 1) Computing losses in individual crops due to pests and diseases, 2) Major food crops and estimating genuine share of losses due to biotic stresses, 3) Climate change induced pests and diseases- a hoax or reality, 4) Mapping threats of invasive pests and diseases due to increased globalization, 5) Pest risk analysis and gearing to quarantine the economically important invasive pests, 6) Redefining the list of quarantine pests of significance in Pesticides Management Bill (PMB) 2020, 7) How prepared are we to fight the threats of agro-terrorism, 8) Robotics and mechanization of small and large farms, 9) Are the three stakeholders of Plant protection-Government, Academic and industry in sync to make plant protection more effective, 10) Robust protection strategies of high value, low volume crops-species, 11) How safe is conservation agriculture for plant protection, 12) Are molecular diagnostics a mere cosmetic in Indian plant protection, 13) Mandatory use of available molecular diagnostics in decision making for crop protection intervention, 14) Mainstreaming epidemiology for effective pest and disease management, 15) Strengthening research on volatile organic compounds (VOC) in host-pathogen interaction and modeling pest prediction and diagnosis, 16) Acoustic in pest management, 17) Strengthening research and main streaming bio-herbicides for management of weeds, 18) Mainstreaming industry and Government with Academics for effective plant protection, 19) Managing limitations of bio-pesticides for mainstreaming IPM and bio-control, 20) Scope of nanotechnology in pest management and their regulation, 21) Bio-stimulant in plant diseases and pest management, and 22) Defining greater role of plant protection related societies by forging greater coordination with academia-government and industry and to promote their function in a "Federation" mode.

As an initiative to fulfill the goals of SDGs, the ICAR-NIBSM has developed and proposed research programmes including flagship programmes such as 1) National strategic crop health monitoring network (NSCHMN), 2) Novel genes discovery and validation for pest resistance and 3) Forewarning and estimation of crop losses; inter-institutional programmes *viz*., 1) Stress-interaction biology, and 2) Disease and pest dynamics in climate change and One Health and many institute programmes of national/global importance *viz.,* 1) Characterization and sustainable use of pathogen and pest genetic resources (PPGR) for biotic stress management, 2) Molecular biology of host-pest/pathogen interaction, 3) Ecological foundation of pest dynamics and their control in emerging production systems, and 5) Bio-safety for sustainable agriculture in forthcoming EFC 2021-26.

(P. K. Ghosh)
Founder Director & Vice-chancellor
ICAR-NIBSM, Raipur

Research Highlights

AGRICULTURAL BIOTECHNOLOGY

Promoter activity of isoflavone synthase (ifs) gene from soybean

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

The promoter of isoflavone synthase (*ifs*) gene of 2kb in soybean was amplified by PCR from susceptible line (JS335). The amplified fragment was cloned in promoterless vector, pORE-R2 and transformed into *E. coli* DH5α and sequenced. The confirmed clone was transformed into *Agrobacterium tumifaciens* EHA105. Histochemical assasy for GUS expression in cotyledons driven by *ifs* promoter from soybean was done. The promoter activity observed in the cotyledon in susceptible line (JS335) was higher compared to resistance line (DS9712).

Infectious clones of ToLCKV infecting tomato

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

To identify host factors involving during the infection of begomovirus infecting tomato, the development of infectious clones of the genomic components of begomovirus is essential for inoculation. During the period of report, DNA A of *Tomato leaf curl Karnataka virus* (ToLCKV) dimerized in *Hind*III site in pUC18 vector and betasatellite in *Bam*HI (Fig. 1). These tandom oriented dimer clones of DNA A and betasatellite are being sub-cloned into pCAMBIA2301 vector and transferred to *Agrobacterium tumifaciens* strain EHA105 by liquid nitrogen method. The agroinoculation of these constructs on tomato and *Nicotiana benthamiana* produced typical symptoms of leaf curl (Fig. 1; Table 1). These viral constructs will be used for inoculation for identifying non-hosts and host factors essential for infection of these viruses in the susceptible host plants.

Fig 1. Agroinoculation of ToLCKV (Raipur isolate) on to *N. benthamiana* and tomato cv Pusa Ruby

Table 1. Agroinoculation of genomic components of ToLCKV

Host Name	No. of plants inoculated	No. of plants showing symptoms	Latent period	Symptoms
DNA A alone				
Nicotiana benthamiana	5	5	9-10	LC, reduced leaf size
Tomato	5	2	17-18	MLC, Y
DNA A +CYVMB				
N. benthamiana	5	5	9-10	LC, reduced leaf size
Tomato	5	3	16-17	MLC, Y

Super donor rice with multiple resistance

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

To introgress bacterial leaf blight, blast and brown plant hopper resistance genes from the pre-breeding lines or wild rice lines, crosses were made during the *kharif* season. The harvested seeds were sown in the pots for raising nursery. Marker assisted selection is being carried out for selection of plants containing desired resistance gene of interest to further deployment in breeding and generation advancement programme. Rice germplasm and wild species of *Oryza* procured from IRRI, Philippines, ICAR-NRRI, Cuttack and ICAR-DRR, Hyderabad are being multiplied and evaluated for the desired plant protection traits.

HOST PLANT RESISTANCE

Screening of rice germplasm for resistance to Bacterial leaf blight of rice

(Vinay Kumar, S. K. Jain)

A total of 226 rice lines/germplasm received from National Rice Research Institute (NRRI), Cuttack were screened for Bacterial blight (*Xanthomonas oryzae* pv *oryzae*) disease. The rice germplasm were transplanted in paired row and artificially inoculated using bacterial blight causing pathogen (Raipur isolate) under field condition for multi-location screening. In the screening process, it was found that 10 isolates did not contain any prominent known BLB resistance genes but showed BLB resistance reaction in two years of artificial screening. The identified lines can be explored as source for identification and isolation of novel BLB resistance genes.

Wheat disease monitoring nursery

(S. K. Jain)

Wheat disease monitoring nursery (WDMN) comprising of 20 wheat entries from ICAR-IIWBR Regional Station, Flowerdale, Shimla was planted in the *rabi* 2019-20 season at the experimental farm of NIBSM, Raipur. Brown rust (*Puccinia triticina*) was observed with severity up to 40% whereas 8 out of 20 entries were free from brown rust. Brown rust sample analysis revealed presence of three rust pathotypes namely, 104A, 77-1 and 77-9 in which pathotype 77-9 was the most predominant. Low incidence of leaf blight was also observed in the nursery.

Resistance to wheat pink stem borer

(K. C. Sharma, Mallikarjuna, J., Yogesh Yele)

Two resistant varieties (WH147, WL 1562) and two resistant germplasm (WS 2014-07, WS 15-7) were screened under pot condition by artificial release of pink stem borer larvae. The dead hearts and white ears were recorded. Among four resistant materials, only one germplasm (WS 2014-07) was found resistant and remaining three (WH147, WL 1562, WS 15-7) were found moderately resistant (< 10 %) to pink stem borer infestation as compared to GW273 (13.04 %).

Screening pigeonpea mini-core for tolerance to pod borer complex

(R. K. Murali Baskaran, S. K. Jain)

The pigeonpea mini-core (146 nos., 4 controls) were screened during *kharif* 2019 for tolerance to *Helicoverpa armigera* and *Maruca vitrata*. During *kharif* 2019 and *rabi* 2019-2020, 27 (3 & 4 PSI), 12 (5 & 6 PSI), 16 (7 PSI) and 3 (8 & 9 PSI) lines were categorized as moderately resistant, susceptible, moderately susceptible and highly susceptible to pod borer, respectivley. Similarly 28, 37, 8 and 14 lines were designated as moderately resistant, moderately susceptible, susceptible and highly susceptible to pod fly (*Melanogromyza abtusa*), respectively. Three germplasm, ICP 7314, 7426 and 14819 have been reported to be moderately resistant to pod fly consecutively during *kharif* 2018 and 2019.

BIOLOGICAL CONTROL

Endophytes for biocontrol of crop diseases

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

Bacterial endophytes were screened for antimicrobial and plant growth promotion (PGP) activities under *in vivo* condition. The bacterial endophyte (53P) was potential to enlarge root length, enhance the protection of plants under drought stress and *Sclerotium rolfsii* pathogen stress conditions in chickpea plants. Chickpea plants coated with bacterial endophyte 53P showed higher tolerance to drought stress as compared to the control (without endophyte). The traits including plant height, root length, fresh weight of roots were significantly different from control plants. These endophytes can be explored for combating biotic and abiotic stresses in plants simultaneously.

Bacteriophages for biocontrol of rice BLB, Xanthomonas oryzae pv. oryzae

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

Due to the ineffectiveness of chemicals in controlling the disease, Bacterial leaf blight (BLB) of rice, development of effective and eco-friendly bio-control agent like phage therapy against *Xanthomonas oryzae* pv. *oryzae* (*Xoo*) can be an alternate approach to control this destructive disease. During the period of report, about 10 rice field water samples collected from Chhattisgarh were processed to identify potential phages. Phage efficacy study on liquid medium was conducted for six isolated bacteriophage against *Xanthomonas oryzae pv. oryzae* at 0.1 multiplicity of infection (MOI). Isolated phages were found to kill in a range of 60% to 95% bacteria within 24 hours. All the sixteen isolated phages were found to have no bactericidal effect against heterologous host *viz.*, *Salmonella*, *E. coli*, and *Staphylococcus* spp.

Bioassay of native Bacillus thuringiensis

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

During the period of report, eight soil samples of Chhattisgarh were processed for isolation of *Bacillus thuringiensis.* Colonies on nutrient agar were further confirmed by gram's staining, growth on bacillus cereus agar and hichrome bacillus agar and finally by *cry1* and *cry2* gene specific PCR for confirmation of isolates as *Bacillus thuringiensis*. In a lab experiment, three concentrations of five native *Bt* including NBT 19, 20, 22, 23 and 24 were bio-assayed against 3rd instar *S. litura* in comparison with Almora *Bt* and control. Out of five native *Bt*, NBT 22 and 23 caused around 45 per cent mortality to 3rd instar at 5×10^8 CFU/mL while it was 80 per cent in Almora *Bt* and 14 per cent in control (Table 2).

Table 2. Per cent mortality of 3rd instar *Spodoptera litura*, as treated by native *Bt*

Bt isolate	% larval mortality at			Mean
	5×10^8 CFU/mL	5×10^7 CFU/mL	5×10^6 CFU/mL	
NBT 19	26.0 (30.55)^{d}	26.0 (30.55)^{d}	26.0 (30.55)^{d}	NBT 19
NBT 20	34.0 (35.62)^{c}	34.0 (35.62)^{c}	34.0 (35.62)^{c}	NBT 20
NBT 22	44.0 (41.54)^{b}	44.0 (41.54)^{b}	44.0 (41.54)^{b}	NBT 22
NBT 23	46.0 (42.69)^{b}	46.0 (42.69)^{b}	46.0 (42.69)^{b}	NBT 23
NBT 24	20.0 (26.26)^{cd}	20.0 (26.26)^{cd}	20.0 (26.26)^{cd}	NBT 24
VL *Bt*-6	80.0 (63.74)^{a}	80.0 (63.74)^{a}	80.0 (63.74)^{a}	VL *Bt*-6
Control	14.0 (21.69)^{d}	14.0 (21.69)^{d}	14.0 (21.69)^{d}	Control

Native Trichogramma spp.

A total of eight districts of Chhattisgarh including Dhamtari, Kondagaon, Baster, Narayanpur, Mahasamund, Jangir Champa, Raigarh and Jashpur were surveyed during 2020 to collect native *Trichogramm* spp. Sentinel egg cards were used to trap the native egg parasitoids in bitter gourd, tomato, coriander, okra, maize, chilli and brinjal ecosystems. Three native populations were recovered and sent for identification.

Bio-efficacy of secondary metabolite of Chromobacterium

(B. K. Choudhary, M. Choudhary, R. K. Murali-Baskaran, J. Sridhar)

The secondary metabolite of *Chromobacterium* extracted and purified in two different methods were evaluated in two concentrations of 500 and 1000 ppm against 3rd instar of *Helicoverpa armigera* in comparison with two concentrations of ethyl acetate and ethyl alcohol (500 and 1000 ppm in each) and control. The maximum mortality of larva was 35% at 1000 ppm of metabolite purified in second method, followed by 1000 ppm of metabolite purified in first method. There was no mortality in larvae treated with ethyl acetate, ethyl alcohol and control (Table 3).

Table 3. Per cent mortality of chickpea pod borer, *Helicoverpa armigera*, as influenced by secondary metabolite of *Chromobacterium*

Details	Concentration (ppm)	% mortality*
T1 P1	500	7.7^{d}
T2 P1	1000	23.1^{b}
T3 P2	500	15.4^{c}
T4 P2	1000	35.0^{a}
T5 Ethyl acetate	500	0^{e}
T6 Ethyl acetate	1000	0^{e}
T7 Ethyl alcohol	500	0^{e}
T8 Ethyl alcohol	1000	0^{e}
Control	--	0^{e}

*Mean of three replications
P1: Purification method 1; P2: Purification method 2

Similar treatments were tested against fresh pupae of *H. armigera* and the inhibition of adult emergence in various treatments was recorded. The inhibition of adult emergence was 29.3% in 1000 ppm of metabolite purified in second method and 500 and 1000 ppm of ethyl acetate while the inhibition was 10 and 20% in ethyl alcohol at 500 and 1000 ppm, respectively and no inhibition in control (Table 4; Fig. 2, 3).

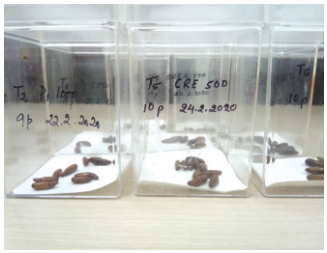

Fig 2. *H. armigera* pupa treatment Fig 3. Metabolite treated pupae

Table 4. Per cent inhibition of adult emergence in chickpea pod borer, as influenced by secondary metabolite of *Chromobacterium*

Treatment	Concentration (ppm)	% inhibition of adult emergence*
T1 P1	500	11.1^{b}
T2 P1	1000	11.1^{b}
T3 P2	500	0^{c}
T4 P2	1000	29.3^{a}
T5 Ethyl acetate	500	29.3^{a}
T6 Ethyl acetate	1000	29.3^{a}
T7 Ethyl alcohol	500	10^{b}
T8 Ethyl alcohol	1000	20^{a}
Control		0^{c}

*Mean of three replications
P1: Purification method 1; P2: Purification method 2

Chromobacterium violaceum TRFM-24: a Rare Bacterium

(Sushil K. Sharma, B. K. Choudhary, M. Choudhary)

The *Chromobacterium violaceum* is abundantly found in soil and water ecosystems of tropical and subtropical regions of the world. *C. violaceum* has the potential to be used in agriculture, medical, industry and biotechnology, including control of plant diseases caused by phytopathogens and insect pests, prevention of transmission of diseases by mosquitoes *Anopheles gambiae* and *Aedes aegypti*, hydrogen cyanide-mediated gold recovery from electronic waste, degradation of hydrocarbon and phenol and production of antitumoral, antiviral, anti-*Plasmodium*, antibacterial and antileishimanial substances, solubilisation of gold, production of biopesticidal molecules and chitinolytic enzymes.

C. violaceum TRFM-24 (NAIMCC-B-0-2276; MCC 4212, Fig. 4) was isolated from rhizosphere soil of rice cultivated in Tripura State. It is known for indole-3-acetic acid production and inhibition of saprophytic enteric bacteria inhabiting soils of Chhattisgarh state. Further work on control of protozoa, nematode, insects, phytopathogens etc., associated with plant, fish and poultry is underway. The *C. violaceum* is a bacterium of rare occurrence with poor viability under *ex-situ* condition.

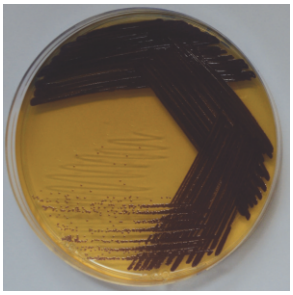

Fig 4. *C. violaceum* TRFM-24

Farmer FIRST Programme

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

Under field crop module rice-follow pulses sequence was demonstrated in 30 hectares, covering 150 farm families. Fodder crops were introduced in 0.5-hectare and planted fruit trees in bunds. The eco-friendly plant protection strategies including storage bins (100 nos.) and gadgets for the storage pest control in pulses and pheromone, yellow and blue sticky traps for field pests control were followed. In *kharif*, improved high yielding (Chandrahasini, IGKV R-1, IGKV R-2, Indira Aerobic, Swarna, HMT, Mahamaya) and drought tolerant rice variety (Indira Barani) seeds were supplied to 70 tribal farm families, possessing 28.8 hectares.

Under the horticulture module cherry and indeterminate type of tomato, strawberry and flower crops were planted in polyhouse and established three fruit orchards with guava, mango, citrus, jack fruit, papaya and custard apple in 0.5 hectares. Three modern nutritional terrace gardening units and vegetable cultivation in rice field bunds were initiated. Improved turmeric variety (Roma) was introduced to 15 farmers.

Under the livestock-based module, 1500 *Kadaknath* chicks were disbursed and training on health management and breed improvement practices of goat and Kadaknath was imparted to 26 farmers. Two model mushroom production units, one soil testing unit and four Agro-Processing Centers (APCs) were established.

A total of 16 low-cost Azolla production units were established to feed poultry and goat farming. Paddy straw mulching to minimize water loss and weed growth in vegetable field was undertaken in NRM based module. To disseminate the latest agricultural technologies and to provide need-based information WhatsApp group, Facebook page and YouTube channel were created, wherein more than 760 message, photos and videos were circulated and 274 farmers benefited in ICT based module.

As a part of capacity building, 12 trainings, demonstration, group discussions and farmers meetings were conducted to mitigate field level issues during the COVID-19 in which 347 tribal farmers actively participated and benefited.














Establishment of Biotech-KISAN Hub at ICAR-NIBSM, Raipur

(P. Mooventhan, R. K. Mahobia, B. S. Rajput, S. K. Verma, R. K. Murali Baskaran, Anil Dixit)

DBT - Biotech KISAN Project's launching workshop was organised on 18.03.2020 in the presence of Raipur District Collector, Dr. S. Bharathi Dasan IAS, Director of Extension Services, IGKV and Director, ICAR-NIBSM. In the event, the plan of work and other technological modules were discussed/brainstormed with Project Coordinators of three KVKs (Korba, Mahasamund, Rajnandgaon). In three KVKs jurisdiction, 150 farm families were selected from 15 clusters to cover 60 hectares.

Four interventions including zinc enriched rice, biocontrol agents, protected horticulture farming and scientific goat farming were demonstrated in selected farm families. Six Farmer Producer Group (FPG) were created for Nutri-rich biofortified Zinco MS rice to cover 90 acres. Seed treatment with biofertilizer such as *Azospirillum* and Phosphobacteria and bio-agents such as *Trichoderma viridi* and *Pseudomonas fluorescen* were demonstrated in the farmer's field. Pheromone traps were installed to minimize yellow stem borer damages. A total of 40 capacity building programme were organized to impart skill and knowledge on biotechnologically developed technologies.

Institute Activities

7th Institute Management Committee Meeting (January 17, 2020)

The 7th Institute Management Committee (IMC) Meeting of the institute was held on January 17, 2020 under the Chairmanship of Dr. Jagdish Kumar, Director (Acting). The IMC members *viz*., Dr. Ratan Tiwari, Principal Scientist, ICAR-IIWBR, Karnal (Haryana), Dr. Ranbir Yadav, Principal Scientist, ICAR-IARI, New Delhi, Dr. Anil Dixit, Principal Scientist, ICAR-NIBSM, Raipur (Chhattisgarh), Dr. M. P. Thakur, Director, Instruction, IGKV, Raipur (Chhattisgarh) and Sh. S. K. Chandrawanshi, Joint Director of Agriculture, Raipur, Dr. S. K. Jain, Principal Scientist as Vigilance officer, Dr. P. N. Sivalingam, Senior Scientist and Dr. B. K. Choudhary, Senior Scientist as invited members and Dr. K. C. Sharma, Senior Scientist as Nodal Officer, 7th IMC and Sh. A. A. Goswami as Member Secretary attended the meeting. Dr. Jagdish Kumar welcomed all the members and special invitees and briefed about the genesis, mandate and objectives of the institute. Dr. P. N. Sivalingam delivered lecture on ICAR-NASF project. The member secretary presented the action taken report of 6th IMC. The proposed agendas items as per the council's guidelines were discussed in the meeting.

International women's day (March 08, 2020)

International women's day was celebrated at ICAR-NIBSM, Raipur on March 08, 2020. More than 85 women participants from nearby villages of our institute *viz*., Baronda, Adsena, Mura, Asonda, Mohadi including former Sarpanch, Baronda, Smt. Ishwari Gilhare, leaders and members of National Rural Livelihood Mission (NRLM) and women from self help groups participated. Smt. Gilhari expressed her happiness for establishment of the institute for benefits to farmers and students of Chhattisgarh state in general and nearby areas of Raipur in particular. On this occasion, Dr. Sushil K. Sharma highlighted roles and contributions of women in national development including agriculture sector. Dr. P. Mooventhan delivered lecture on role of women in doubling farmer's income. Dr. K. C. Sharma briefed about activities of ICAR-NIBSM for women empowerment. The overall programme was coordinated by Dr. Mamta Choudhary and programme ended with vote of thanks by Dr. J. Sridhar. The programme was formulated by Dr. P. K. Ghosh, Director, ICAR-NIBSM, Raipur.

International Day of Yoga (June 21, 2020)

On International Yoga Day, more than 60 members performed yoga at home with their family members. The event was co-ordinated by Dr. Sushil K. Sharma and Dr. Vinay Kumar.

Management of COVID-19

As on June 30, 2020, a total of 2545 positive cases of corona virus (COVID-19) infection was recorded from Chhattisgarh state. Out of them, 1914 patients recovered and 13 died till date. The death rate was 0.51 % in Chhattisgarh. ICAR-NIBSM has taken the following steps to prevent spread of COVID-19.

- ICAR-NIBSM has disseminated agro-advisory during *rabi* season by publishing in the local news papers for benefits of farmers and society.
- A thermal scanning of all the staffs and labourers are being routinely done. Social/physical distancing among staff members is being strictly followed in the office.

- All the staff members have been using mask and hand sanitizer, besides following social distancing to prevent COVID-19 spread.
- Sanitization of premises with sodium hypochlorite is being performed regularly. Vehicles and other farm equipments are also being sanitized from time to time.
- Arogyasetu App is being used by all technical and non-technical staff, labourers, security staff etc.
- Labourers of CPWD engaged in construction and electrical work in the premises of NIBSM are being monitored regularly by the COVID 19 committee to ensure social distancing and other norms of MHA guidelines.

All activities related to COVID 19 was co-ordinated by Dr. J. Kumar and his team

Extension and Outreach Activities

***Mera Gaon Mera Gaurav* (MGMG)**
(Jan-Feb, 2020)

The *Mera Gaon Mera Gaurav* teams of ICAR-NIBSM, Raipur scientists provided information to the farmers of selected villages (15) on various aspects in a time frame through monthly visit and meetings (02). The selected six villages visited twice and benefitted 75 farmers.

Workshops/Symposia/Seminars/Trainings/Conference/other fora attended

S. No.	Title of symposia/seminar/training organized	Period	Venue/organized by	Name of scientist
1.	MDP on "Orientation-cum-Awareness and Implementation of ABS Guidelines"	22-23.01.2020	NAARM, Hyderabad, Telangana	Sushil K. Sharma
2.	Annual workshop on AICRP Biocontrol	21-22.5.2020	NBAIR, Bengaluru (virtual meeting)	R. K. Murali Baskaran
3.	Desert Locust Management: Current Status & Future Strategies	30.05.2020	Division of Entomology, IARI, New Delhi (virtual meeting)	K. C. Sharma
4.	Annual Review Meeting of NASF	20.02.2020	NAS Complex, Pusa Campus, New Delhi	P. N. Sivalingam
5.	Panel discussion on "Agri Microbiomes: Role and relationship with crop plants for higher productivity & sustainability" with Dr K R K Reddy-Managing Director, Sri BioAesthetics Pvt. Ltd.	13.06.2020		
6.	International Conference on Recent Advances in Biotechnology and Biochemistry (ICRABB)	8-9.01.2020	National Institute of Technology (NIT), Raipur, Chhattisgarh	Lata Jain Vinay Kumar
7.	Agriculture and Food during COVID-19 Pandemic	30.05.2020	Society for World Environment, Food and Technology (SWEFT)	Lata Jain Vinay Kumar
8.	XIV Biennial National Conference of "Association of Public Health Veterinarians" and National symposium on "Public health challenge mitigation strategies at the confluence of one health approaches"	24-25.01.2020	Deen Dayal Upadhyaya Pashu Chikitsa Vigyan Vishwavidyalaya, Mathura, Uttar Pradesh	Lata Jain
9.	Citizen Science, talk on Genome sequencing in search of vaccine for Coronavirus	13.05.2020	DST, Govt. of India and DST, Govt. of Gujarat	Lata Jain
10.	Next Generation Genomics and Integrated Breeding for Crop Improvement (VII-NGGIBCI) on Genomics for food, health and nutrition	14.5.2020	CEGSB, ICRISAT, Hyderabad	Vinay Kumar
11.	Genome sequencing in search of vaccine for Coronavirus 2020	12.05.2020	DST, Govt. of India and DST, Govt. of Gujarat	Vinay Kumar

Publications

Research/Review papers

Kumar, V., L. Jain, S. K. Jain, S. Chaturvedi and P. Kaushal. 2020. Bacterial endophytes of rice (*Oryza sativa* L.) and their potential for plant growth promotion and antagonistic activities. South African Journal of Botany. doi.org/10.1016/j.sajb.2020.02.017.

Mallikarjuna, J., Y. Yele, K. C. Sharma and N. B. Prakash, 2020. Exogenous application of different silicon sources and potassium reduces pink stem borer damage and improves photosynthesis, yield and related parameters in wheat. Silicon. doi.org/10.1007/s12633-020-00481-7.

Murali-Baskaran, R. K., J. Sridhar, K. C. Sharma, L. Jain, S. Senthil-Nathan, W. B. Hunter, J. Kumar and P. Kaushal. 2020. Kairomones effect on parasitic activity of *Trichogramma japonicum* against rice yellow stem-borer, *Scirpophaga incertulas*. Journal of Applied Entomology 144(5): 373-381.

Review paper

Baruah, A., P. N. Sivalingam, U. Fatima and M. Senthil-Kumar. 2020. Non-host resistance to plant viruses: what do we know? Physiological and Molecular Plant Pathology. 111. doi.org/10.1016/j.pmpp.2020.101506

Book chapters

Dubey, P., V. Kumar, K. Ponnusamy, R. Sonwani, A. K. Singh, D. C. Suyal and R. Soni. 2020. Microbe assisted plant stress management. **In**: S. D. Mandal, P. Bhatt (eds.) The Recent Advancements in Microbial Diversity 1st Edition. dx.doi.org/10.1016/B978-0-12-821265-3.00015-3

Jain, L. and V. Kumar. 2020. Molecular epidemiology of leptospirosis in bovines of Chhattisgarh, **In**: XIV Biennial National Conference of Association of Public Health Veterinarians and National symposium on Public health challenge mitigation strategies at the confluence of one health approaches at Pt. Deen Dayal Upadhyaya Pashu Chikitsa Vigyan Vishwavidyalaya, Mathura, Uttar Pradesh held on January 24-25, 2020.

Kumar, V., L. Jain, R. Soni, P. Kaushal and R. Goel. 2020. Bio-prospecting of endophytic microbes from higher altitude plants: Recent advances and their biotechnological applications, **In**: R. Goel, R. Soni, D. Suyal (eds.) Microbiological Advancements for Higher Altitude Agro-Ecosystems and Sustainability. Rhizosphere Biology. Springer, Singapore. doi.org/10.1007/978-981-15-1902-4_18.

Abstracts

Jain, L. and V. Kumar. 2020. Molecular epidemiology of brucellosis in bovines of Chhattisgarh, **In**: International Conference on Recent Advances in Biotechnology and Biochemistry (ICRABB) at National Institute of Technology (NIT), Raipur Chhattisgarh held on January 8-9, 2020.

Kumar, V., J. Jain, S. K. Jain and P. Kaushal. 2020. Unraveling Rhizospheric bacterial diversity associated with *Lathyrus sativus* using illumina sequencing approach, **In**: The International Conference on Recent Advances in Biotechnology and Biochemistry at National Institute of Technology (NIT), Raipur Chhattisgarh held on 8-9, 2020.

Technical Bulletin

Mooventhan, P., R. K. Murali-Baskaran, J. Kumar and P. Kaushal. 2020. Technical Bulletin on Current Status and Guidelines for Safe Use of Pesticides in Agriculture, ICAR-National Institute of Biotic Stress Management, Raipur, Chhattisgarh, India, 32 p.

Awards/Recognition/Membership in Professional Societies

S. No.	Awards/Recognition/ Membership in Professional Societies	Year/ Period	Offered/organized by	Scientist (Dr.)
1.	Plenary talk on "Dissimilatory Nitrate Reduction to Ammonium (DNRA)" in Integrated Workshop on Publication Ethics and Patenting & National Conference on "Environmental Sustainability: Innovation, Translational Dimension and Way Forward	2020	Department of Energy and Environment, BBAU, Lucknow, Uttar Pradesh	Sushil K. Sharma
2.	Editorial Board Member	2020	Current Biotechnology, Bentham Science, Sharjah, UAE	
3.	Member of Editorial Board of "Microorganisms for Sustainability"	2020	Springer, Switzerland	
4.	Women Scientist Award-2019	2020	Society for World Environment, Food and Technology, New Delhi	Lata Jain
5.	Second prize for best Oral Presentation	2020	Deen Dayal Upadhyaya Pashu Chikitsa Vigyan Vishwavidyalaya, Mathura, Uttar Pradesh	Lata Jain Vinay Kumar
6.	Young Biotechnologist Award	2020	Society for Agriculture & Allied Research (SAAR), New Delhi	Vinay Kumar
7.	Fellow Award	2020	Society for World Environment, Food and Technology, Lucknow, UP	Vinay Kumar

Infrastructure Development

Administration Complex and Schools Buildings

ICAR-National Institute of Biotic Stress Management, a Deemed-to-be-University, has been established to take up the basic and strategic research in biotic stresses, develop human resources and provide policy support for the national network of research and development organizations in health management and agriculture. As a centre of education, training and research in contemporary innovative areas of biotic stresses, NIBSM shall have four schools including (i) Crop Health Management Research (ii) Crop Health Biology Research (iii) Crop Resistance System Research and (iv) Crop Health Policy Support Research to address contextual issues. The institute is equipped with necessary infrastructural facilities for research on biotic stress management and going to start PG courses in the commencing academic year. The administration complex and school complex have been constructed by CPWD at a cost of Rs. 52.87 crores.

Administration Complex

The complex comprised of three connected buildings *viz.,* the administration, library and auditorium. The complex spreads over 7059 square meter area and has three floors with centrally air-conditioned facilities. The Administration building hosts the Director and two Joint Directors offices, two meeting rooms and Administrative offices. The library building consists of yoga-meditation-cafeteria hall for staff and students in ground floor and reading rooms and online library system in first and second floor. The Auditorium has a seating capacity of 350 persons and has two board rooms, two training halls and one exhibition room for conducting scientific programmes.

The entire building is access-friendly to physically challenged persons. The approved roof top solar PV system of 530 KW will be installed in second phase.

School Complex

Out of four schools, two school buildings have been constructed over an area of 5195 square meter in first phase and will be functioning as School of Crop Health Biology Research (SCHBR) and School of Crop Health Management Research (SCHMR), respectively. The school complex consists of two independent but connected buildings. Each school building has one Joint Directors office,18 research laboratories, four central laboratories, four modern hi-tech classrooms and one dedicated seminar room.

School 1: School of Crop Health Biology Research (SCHBR)

School 2: School of Crop Health Management Research (SCHMR)

Joining / relieving of staff

- Dr. P. K. Ghosh has joined as the Founder Director of ICAR-NIBSM on 14th February, 2020.
- Dr. S. K. Ambast has joined as Principal Scientist and Joint Director (Education) in-charge at ICAR-NIBSM on 10th February, 2020.

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