



भाकृअनुप - राष्ट्रीय जैविक स्ट्रेस प्रबंधन संस्थान

ICAR - NATIONAL INSTITUTE OF BIOTIC STRESS MANAGEMENT

Baronda, Raipur - 493 225, Chhattisgarh



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From the Director's desk

The NIBSM gradually shedding its infancy is now moving forward with an added strength of twelve scientists, Joint Director (School of Crop Health Biology Research) and a designated Director. The scientific expertise of the institute is now well represented by the scientists belonging to the major disciplines such as plant pathology, entomology, agronomy, biotechnology as well as animal and fishery disciplines including extension.

The NIBSM is entrusted with a unique research mandate of devising novel mitigation measures of biotic stresses in farming sector through revamping the inadequacy of the ongoing national programmes for assuring national food and nutrition security menaced by vicious pests/pathogens in the pursuit of climate change, pathogenic mutations, intervention to keep a clean environment and global regulations under WTO/IPR regimes. To meet this goal, a long term strategy is required to be entailed. However, institute is now fairly equipped with scientific manpower to carry forward the mandated activities in the "warm up" perspectives. The NIBSM also envisages to generate intermediate products for tolerance to multiple stresses such as gene constructs and stress induced promoters, which will be made use of by crop based institutes to develop end products. Discerning molecular mechanisms of host- pest/pathogen recognition, pest/pathogenic invasion and colonization in the host tissue will be of prime concern and will be addressed as pre-requisite research themes. Another equally important issue of NIBSM mandate seeks to evolve novel technology of biotic stress management with respect to climate change and bio-risk fervor in the WTO and IPR regimes. HRD and capacity building befitting modern global trends in biotic stress management are still another crucial components under obligation of deemed university, the legal status bestowed on NIBSM. The institute will strongly complement the ongoing R&D in science and technology platforms under National Agricultural Research System (NARS).

Enhancing existing scientific strength along with an adequate administrative and technical manpower to pursue the mandatory activities in full spirit needs to be prioritized at the headquarter. A few preliminary research projects have been formulated to suit the available scientific capability. These projects include aspects of unravelling endophytes in legume crops, biotic stress management with nutrition regime in rice-wheat cropping system, developing multimedia knowledge tools on biotic stress management and



epidemiological studies. One year's undertaking of these projects have yielded some tangible informations narrated in the subsequent pages of this Newsletter. Implementation of awareness programmes on rodent control and *Listeria* management in various districts of Chhattisgarh deserve a mention as a collective voluntarily undertaken outreach effort of the scientists of NIBSM for the welfare of Chhattisgarh farmers. Periodical farmers-scientists interfaces were organised in collaboration with concerned district KVKs to update the farmers' scientific knowledge for the effective management of biotic stresses especially weeds.

The 125 acre area comprising farm and official campus is now well secured as protected by a robust barbed wire fencing erected by CPWD by spending four crores of plan money sanctioned in the 12th five year plan. A bunch of old buildings belonging to original seed farm of IGKV, Raipur turned NIBSM new campus have been renovated to house the preliminary set up of administration, finance and laboratories equipped with modern instruments required to undertake conventional research as well as fundamental experiments pertaining to proteomics, genomics and DNA fingerprinting.

I feel NIBSM is now geared up to undertake developments in infrastructure establishment and research endeavours.

Jagdish Kumar



RESEARCH ACTIVITIES

Studies on biotic stresses under varying crop nutrition regimes in rice-wheat cropping system

On application of nitrogen regimes $N_{0-125\%}$ with increment of 25 kg/ha, it was evident that omission of N increased the weed density and followed the trend as $N_0 > N_{25} > N_{50} > N_{75} > N_{100} > N_{125}$. In contrary to these, the dominance of weeds was highest with $N_{125\%}$ and lowest with N_0 . The highest rice grain yield was harvested with $N_{125\%}$ (6.48 t/ha), whereas, the lowest under N_0 (2.98 t/ha).

In rice-wheat cropping system, the least weed density was recorded in the fertilized plots while unfertilized plots recorded the highest grasses and sedges. Weed dry weight and weed diversity in plots followed the trend of highest to lowest as $N_0 P_0 K_0 > K > P > KP > N > NK > NP > NPK$. The highest grain yield was harvested with $N_{100} P_{60} K_{40}$ (6.93 t/ha), whereas, the lowest yield noticed with $N_0 P_0 K_0$ (3.53 t/ha).

Studies on biotic stress under crop management practice in rice-wheat cropping system

In wheat, broad leaved weeds were dominant and had 61.2% relative density followed by grasses (38.8%). Findings revealed that Fenoxaprop-p-ethyl @ 100 g/ha and Sulfosulfuron + Metsulfuron @ 20+4 g/ha had shown mild yellowing on leaf for 8-10 days. However, Clodinoxop-p-ethyl + Metsulfuron @ 60+4 g/ha gave the grain yield of 2.83 t/ha followed by two hand weedings (20 and 40 DAS), and lowest with control (1.42 t/ha). The weed control efficiency (WCE) was recorded up to 90% with three hand weedings at 20, 40 and 60 DAT. While in rice, among the herbicides, Bispyribac sodium followed by hand weeding at 40 DAT recorded 85.2% WCE, which was equally good to three hand weedings. Rice grain yield followed the trend of WCE and recorded the highest with three hand weedings (7.34 t/ha) followed by two hand weedings (7.13 t/ha) and was statistically at par with Bispyribac sodium followed by hand weeding at 40 DAT (7 t/ha) and pyrazosulfuron followed by Fenoxaprop (6.94 t/ha). The lowest yield was recorded in control (3.63 t/ha). Findings illustrated that pyrazosulfuron suppresses broad leaved weeds and sedges, Pendimethalin suppresses the emergence of grasses, whereas, Fenoxaprop was also effective in controlling grasses. Application of ready mix application of Pretilachlor and Pyrazosulfuron had suppressed wide range of weeds and also showed some phytotoxic effect on the crop. The WCE at 45 DAT was highest with two hand weedings at 20 and 40 DAT (93.9%), followed by Pyrazosulfuron followed by Bispyribac sodium (80.3%) and Pendimethalin followed by Bispyribac sodium (78.7%), ready mix of Pretilachlor



Control (no herbicide applied)

Bispyribac sodium sprayed field (at 15 DAS)

and Pyrazosulfuron (75.5%). Two hand weedings at 15 and 20 DAS recorded WCE of 88, 82.1 and 80.7% at 45 DAS, 75 DAS and at harvest respectively. Among herbicides, Fenoxaprop-p-ethyl, Pretilachlor + Pyrazosulfuron, Pyrazosulfuron + Bispyribac sodium, Bispyribac sodium were found to reduce the grassy weeds significantly. However, Bispyribac sodium is less effective against *Dactyloctenium aegypticum*. Among the tested herbicides, Pretilachlor + Pyrazosulfuron, Pyrazosulfuron + Bispyribac sodium, Bispyribac sodium and 2,4-D were found effective in controlling broad leaved weeds.

The density of grasses was highest with tall varieties and ranged from 10-10.8/m². The broadleaved weeds were higher with short stature varieties and highest with cultivars PKV, HMT and Mahamaya (13.8/m²), whereas, tall stature varieties had lower density of broad leaved weeds.

Metagenomic analysis of ticks for abundance of bacterial pathogens

Ticks are one of the most important blood-sucking vectors for infectious microorganisms in humans and animals. When feeding they inject saliva containing microbes into the host to facilitate the uptake of blood. Assessment of the microbial diversity residing in arthropod vectors of medical importance is crucial for monitoring endemic infections, surveillance of newly emerging zoonotic pathogens and for unraveling the associated bacteria within its host.

Tick specimens were collected from four villages namely, Baronda, Bodara, Pathri and Kapasada of Chhattisgarh State. The ticks were identified as *Rhipicephalus microplus* and *Haemophysalis bispinosa*.

Two specimen of ticks, *Rhipicephalus (Boophilus) microplus* and *Haemophysalis bispinosa* were subjected to metagenomic analysis. Genomic DNA-derived sequences were taxonomically profiled. *Coxiellaceae* (57.69%) followed by *Moraxellaceae* (32.95%) in *Rhipicephalus (Boophilus) microplus* (T1) whereas *Borreliaceae* (24.24%) were assigned followed by *Paenibacillaceae* (19.51%) in *Haemophysalis bispinosa* (T2) at family level. *Acinetobacter* (32.90%) were assigned followed by *Coxiella* (0.45%) in T1 sample whereas in *Borrelia* (24.24%) followed by *Paenibacillus* (19.46%) in T2 sample at genus level. *Borrelia* (24.20%) was found abundantly followed by *Paenibacillus* (19.50%) in T2 and *Acinetobacter* (32.90%) was present abundantly in T1 at genus level.

The results showed that potential pathogens of livestock resident in ectoparasitic ticks can be enumerated in population of livestock. The health challenge of farm animals through ectoparasitic activity of ticks and vector-based pathogenic load in the study area can give bionomics of ticks as potential health threats.

EXTENSION ACTIVITIES

• Rodent management campaigns at two identified villages were organized at Pathri village of Dharsiwa block on 12th February, 2015 and Kapsada village of Dharsiwa block, district Raipur on 16th February, 2015. The campaigns were organized in collaboration with Departments of Agriculture, Central Integrated Pest Management Centre, and All India Network Project on Rodent Control, CAZRI, Jodhpur. The objectives of these campaigns were to educate farmers on basic principles of rodent vector management, sensitizing the department officers on the role of rodents as vectors as well as reservoirs of several diseases



Rodent damaged wheat field



Placement of poison bait in the live burrow



Briefing farmers about scientific rodent management

transmitted to animals as well as human beings.

Village level meetings were organized with the farmers and community leaders and officials from development departments. The villagers were advised about the importance of the campaigns and ill effects of rodents on crops, animals and humans. Later, the farmers were taken to their fields and identification of live burrows of the rodents was demonstrated. A significant number of farmers' fields was assessed for number of live burrows with the help of farmers. The pre-campaign data were analysed and the campaigns were planned. Before commencement of campaign, socio-economical data were also collected from the villages. To inculcate sense of participation and responsibility, farmers were asked to bring broken rice for preparation of poison baits. Farmers were advised on preparation and application of poison baits for management of rodents in farm environments. Samples from animals and humans from the target villages were also collected for analysis of zoonotic infections. During the pre-campaign assessment, heavy infestation of rodents in rice, wheat, potato, tomatoes, maize and chick pea crops were noticed. At Pathri village, a total of 110 kg of the poison bait was prepared, while 65 kg at Kapsada village and applied to over 800 acres of agricultural fields.

Besides officers from development departments, Dr. T. P. Rajendran, Officer on Special Duty, NIBSM, Raipur, Dr. A.M.K. Mohan Rao, FAO Consultant and former Joint Director, Vertebrate Pest Management, National Institute of Plant Health Management, Hyderabad and other scientists from NIBSM, Raipur participated in the campaign and advised the farmers.

• Farmers-scientist interface was organized at Dhamtari district on 22.09.2015. Dr. Anil Dixit explained the role of weed in the

economic losses of different crops. Dr. V.K. Choudhary, Scientist, briefed the rodent management techniques, INM and IWM strategies. Dr. P. Mooventhan, Scientist, collected the feedback and problem identification through participatory mode.

• One day training programme was organized in Durg district on 22.09.2015 in collaboration with KVK, Durg. Dr. Anil Dixit demonstrated the pesticide application technique and economical usage of herbicides. Dr. V.K. Choudhary, Scientist, demonstrated the rodent management techniques. Dr.P.Mooventhan, Scientist, conducted the socio-economic profiling and collected feedback. Dr. Dharendra Bonsle, Programme Coordinator, KVK, Durg and subject matter specialist of the concerned KVKs assisted in successful organizing of the interface.

• Farmer-student-scientist interface cum training programme was organised at Rajnandgaon district on 29.09.2015 in collaboration with KVK, Durg. Dr. Anil Dixit, Principal Scientist elucidated the importance of biotic stress factors and its role in yield loss, herbicide usage, safety measures, and methods of sprayers and nozzles usage. Dr. V.K. Choudhary, Scientist, explained poison bait preparation, method of bait administration and safety disposal of poisoned baits in rodent management. Dr.P.Mooventhan, Scientist, conducted the constraint and livelihood analysis in the study area.

• Farmers-scientist interface cum training programme was organised at Bilaspur district on 30.10.2015 in collaboration with KVK, Bilaspur. Dr. Anil Dixit, Principal Scientist explained the importance of Integrated Weed Management and herbicide handling safety measures. Dr. V.K. Choudhary, Scientist, explained about scientific rodent management. Dr. P. Mooventhan, Scientist, collected the feedback from the farmers in the adoption of biotic stress management technologies. Dr. K.R. Sahu, Programme Coordinator, KVK, Bilaspur and subject matter specialists assisted in successful organizing of the interface.

• As a part of transfer of technology programme to manage the biotic stress factors, a Scientist-Farmer Interface in the district of Kondagaon, Bastar was organised on 31.12.2015. The interface was conducted in a participatory mode along with Department of Forest (C.G.). Dr. Jagdish Kumar, Joint Director, (School of Crop Health Biology Research) stressed the importance of good quality seed, using resistance varieties, role of organic farming and integrated disease management. Dr. Anil Dixit explained the importance of weed management and biotic stress factors and its role in yields loss.



Experimental plot at KVK, Bilaspur



Farmer-scientist interface at Dhamtari



Training programme at Kondagaon



Farmer-scientist interface at Rajnandgaon

Dr. V.K. Choudhary explained about scientific rodent management and agronomical measures to increase the yield. Dr. P. Moventhan assessed the information need of the farmers towards biotic stress management through focused group discussion.

TRAINING/WORKSHOP/CONFERENCE/EVENTS

- Dr. Anil Dixit participated in 25th Asia Pacific Weed Science Conference at Hyderabad from 13th -16th October, 2015 at Professor Jayashankar Telangana State Agricultural University, Hyderabad.
- Dr. B.K. Choudhary attended (i) AUS-AID-DFAT- workshop on “Safe Waters” from 23rd-27th March 2015 at ICAR-National Bureau of Fish Genetic Resources (ICAR-NBFG), Lucknow, India. (ii) training programme on “Analysis of Experimental Data” during 17th-22nd August, 2015 at NAARM, Hyderabad. (iii) short term training course on “Metagenomics: Role of Next Generation Sequencing and Bioinformatics” held on 26th October to 4th November, 2015 at Department of Animal Biotechnology, College of Veterinary Science and Animal Husbandry, AAU, Anand.
- Dr. Mallikarjuna J. attended (i) K S Krishnan School of Chemical Ecology training on “Chemical Ecology” at NCBS, Bangalore from 16th-27th February, 2015. (ii) Annual group meeting of AICRP Nematodes from 6th-7th July 2015 at BCKV Kalyani, West Bengal. (iii) Refresher course in Nematology from 28th September, 9th October, 2015 at TNAU Coimbatore. (iv) International Rice Symposium 2015 at IIRR, Hyderabad.
- Dr. S.B. Barbuddhe attended meeting of (i) ICAR-ICMR Working Group on Zoonoses on 18th November, 2015 at ICMR, New Delhi. (ii) National Symposium on “Concepts in Zoonoses and Health in New Millennium” held during 19th-20th October, 2015 at MAFSU, Nagpur and delivered a talk on “Rodent borne zoonoses in India”. (iii) Management Development Programme on Leadership Development organized by ICAR-NAARM, Hyderabad during 30th November to 11th December, 2015.
- Dr. Vinay Kumar attended (i) Training programme on Statistical Analysis System (SAS) software, basic installation and analysis procedures at Indian Agricultural Statistics Research Institute, New Delhi from 9th-12th February, 2015. (ii) National Symposium on Germplasm to Genes: Harnessing Biotechnology for Food Security and Health on 9th-11th August, 2015 at IARI, New Delhi.
- Dr. Vijay Choudhary participated (i) National Conference on Global Research Initiatives for Sustainable Agriculture and Allied Sciences (GRISAAS-2015) on 12th-13th December, 2015 at Rajmata Vijayaraje Sciendhia Krishi Vishwavidyalaya, Gwalior (M.P.) (ii) XII Agricultural Science Congress on Sustainable livelihood security for smallholder farmers at ICAR-National Dairy Research Institute, Karnal, Haryana from 3rd - 6th February, 2015 (iii) 25th Asia Pacific Weed Science Conference at Hyderabad from 13th-16th October, 2015 at Professor Jayashankar Telangana State Agricultural University, Hyderabad.
- Vigilance awareness week observed from 26th to 31st October, 2015. Dr. Anil Dixit, Chief Vigilance Officer administered the oath on the theme of preventive vigilance tool of good governance to the staff during the occasion.

- Swachh Bharat Abhiyan, Foundation Day and Farmers' Day were organised on 7th October 2015.

Relieving and Joining of New OSD

- Dr. T.P. Rajendran, Officer on Special Duty handed over the charge to Dr. K.R.Kranthi, Director, ICAR-CICR, Nagpur and he was relieved on 29/07/2015.

Joining

- Dr. Jagdish Kumar, Joint Director, School of Crop Health Biology Research joined on 28/12/2015.
- Dr. S. K. Jain, Principal Scientist (Plant Pathology), joined on 01/07/2015 on transfer from ICAR-Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora, (Uttarakhand).
- Dr. K.C. Sharma joined on 19/08/2015 as Senior Scientist (Agrl. Entomology).
- Dr. P. Moventhan, Scientist (Agricultural Extension), joined on 05/08/2015 on transfer from ICAR-National Research Centre on Meat, (Hyderabad).

Promotion

- Shri V. D. Bhiwapurkar, promoted to Sr. Administrative Officer on 04/08/2015.

DIGNITARIES VISIT

- Dr. D.K. Marothia, Member, Planning Commission visited ICAR-NIBSM during June, 2015.
- Dr. J. S. Sandhu, Deputy Director General (Crop Sciences) Indian Council of Agricultural Research, New Delhi visited ICAR-National Institute of Biotic Stress Management, Raipur, Chhattisgarh on 24th October, 2015 along with Dr. S.K. Patil, Vice Chancellor, Indira Gandhi Agricultural University (IGKV), Raipur, Chhattisgarh. He visited the Baronda farm where the new institute is getting established. He also visited the newly established lab facilities, paddy fields and experimental units. He interacted with NIBSM scientists and discussed the ongoing research activities. Dr. S.K. Patil appreciated the research initiatives taken by scientists at NIBSM and expressed his interest to take collaborative research efforts to solve the national level farming issues.



Dr. J.S. Sandhu, DDG (CS) and Dr. S.K. Patil, Vice Chancellor, IGKV visited ICAR-NIBSM's experimental field, infrastructures and interacted with scientists

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