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# Indian Phytopath News

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## From President's Desk

### Main streaming biopesticides for management of plant diseases - Opportunities and limitations

While the country continues to battle COVID-19, plant diseases and pests continue to pose threat to food production and farmers livelihood. New pests and diseases continue to surface on plants affecting production. Two new diseases *viz*., Apple necrotic mosaic virus in Jammu and Kashmir and Tiranga, a complex virus disease in tomato in Maharashtra caused a huge loss in quality and quantity of produce during April and May 2020, respectively. The vectors transmitting these invasive and emerging viral, and other endemic diseases are predominantly controlled by chemical pesticides. Twenty seven pesticides (including 8 fungicides, 12 insecticides, 7 herbicides) proposed for ban by Government in May 2020, constitutes almost 25 percent of the total generic pesticide market in India. The pesticides along with their constituent 134 formulations are registered to control diseases and other pests on 74 important field and horticultural crops. Timing of the notification however, has shaken the industry, farmers and plant protection scientists equally, given the uncertainty due to COVID-19 crisis and also due to onset of the *Kharif* crop season, when protection of crop from diseases and pest, is considered crucial to ensure crop security. Series of discussions, deliberations and suggestions are engaged into by Industry, academia and scientific associations for a science led decision, instead of imposing irrational blanket ban endangering food security and raising cost of cultivation. Keeping aside the Govt decision on ban of these generic pesticides, scientists have to continue to work for farmers in protecting crop losses due to diseases and sustaining their livelihood.

At a time when every now and then one or the other concerns keep arising in agricultural front from using chemical pesticides for crop protection, scientists and policy makers, need to engage and work to make biopesticides a dependable tool for disease management. Biopesticides use despite being known for their potential to control crop losses and reduce negative environmental externalities are yet to take off in India. During last more than 5 decades the area under bio intensive IPM remained below 3 percent with biopesticides constituting only around 3 per cent of pesticide market in the country. Present volume of around 27,000 tons of licensed production of registered biopesticides is a miniscule quantity for a large arable area of 142 million hectare in India.

Scientists, Industry and policy makers have to work coherently to remove challenges limiting widespread use of biopesticides. Several factors seems to slow down the pace of development of market for biopesticides, including: 1) lack of farmer awareness; 2) slow pace of action unlike chemical pesticides; 3) lack of faith and confidence in its use for management; 4) poor quality and self-life constraints; 5) spurious and counterfeit biopesticides often laced with chemical pesticides; 6) reliability in controlling invasive diseases; 7) proven efficacy against above ground pathogens and curative action; 8) the cost of registration and; 9) lack of fiscal incentives for promotion and use of biocontrol agents. All these barriers need to be addressed on a priority basis for better penetration of biopesticides in the conventional chemical controlled market. Nevertheless, biopesticides cannot qualify as alternative to chemical pesticides but can serve as an important component of disease management.

**P.K. Chakrabarty**

## IN THIS ISSUE

# Editorial

## Digital Plant Pathology: Opportunities and applications for food and nutritional security in COVID-19 period

Massive technological developments and opportunities in information and communication technologies (ICT) has transformed lives of the people. This ICT in agriculture play significant role in transforming farmers' lives, playing key role in knowledge exchange, targeted recommendations and giving access to markets to sell farmers produce. India is one of the world's largest contributors of agricultural produce and half of Indian population is dependent on agriculture and most of them are small holders. In order to strengthen them, ICT holds a promise. ICT bridges the gap between the farmers and know how to successful farming processes in general and crop protection in particular. Computer vision techniques have proven to play an important role in agriculture, remote sensing, etc. The use of digital image processing methods for simulating the visual capability of the human being has proven to be a dynamic feature in smart or precision agriculture. This concept has provided with the automatic preventing and monitoring of diseases in plants, cultivation, disease management, water management etc. to increase the crop productivity and quality. Many benefits of ICT have been emphasized as easy access to expert opinions minimizes crop losses due to diseases and these technologies are also up scalable. Although, environmental uncertainties make Information Technology use in agriculture difficult but effective tools for plant disease diagnosis and management could be optimized and validated for their implementation. Disease rating and plant protection need new and innovative techniques to address forthcoming challenges and trends in agricultural production that require more precision than ever before. Hyperspectral sensors and imaging techniques, intrinsically tied to efficient data analysis approaches have shown an enormous potential to provide new insights into plant-pathogen interactions and for the detection of plant diseases. Even then there is gap between the current capabilities of image-based methods for automatic plant disease identification and the real-farmers need. Plant Pathologists diagnose plant diseases by considering all information available for plant, pathogen and environment so that the final diagnosis is very much accurate. In COVID-19 pandemic situation, certainly there will be increasing adoption of the use of photographs and digital images for plant health diagnosis. Under present circumstances, we cannot ignore use of digital images for managing plant diseases for the benefit of farmers as well as for sustaining food security. But we have to be cautious as inaccurate diagnosis can have negative economic impact on the grower, pesticide misuse, added health risks to farm workers and the public, and a down grading of the skills and professionalism of plant disease diagnosticians.

**Rashmi Aggarwal**

*Chief Editor, IPS Newsletter*

# Research Highlights

## New protocol for virulence analysis among wheat powdery mildew (*Blumeria graminis* f.sp. *tritici*) population using host differentials

P. Nallathambi[1]*, C. Uma Maheswari[1], Santosh G. Watpade[3], P.L. Kashyap[2], S. Kumar, B. Aarthy[1], R. Pirya[1], A. Sharma[2] and R. Kumar[3]

*[1]ICAR-Indian Agriculture Research Institute, Regional Station, Wellington-643231, TN; [2]ICAR-Indian Institute of Wheat and Barley Research, Karnal, Haryana; [3]ICAR-Indian Agriculture Research Institute, Regional Station, Shimla-171004, HP*

*Correspondence: scientist_thambi@yahoo.co.in

Powdery mildew is becoming major disease of wheat. Host resistance is the best option to manage this emerging fungal pathogen. In order to constitute host differentials, 36 iso-genic lines (Acc. Nos. EC944673 to EC944708) of *T. aestivum* were imported through ICAR-NBPGR (IQNo.32/2018, IP No.437/2017) from CIMMYT, Mexico. Three set of differentials with 10 genotypes in each set were identified and tentatively designated as B, G and T based on hierarchy level of infection frequencies and other parameters. BGT denotes as B-*Blumeria*, G-*graminis* and T-*tritici* which is exclusively pathogenic on *Triticum* spp. B-set comprises wheat cultivars (WL 711, HI 1500, HS 507, HD 4672, TL 2908, TL 2967 and IWP 72) and few germplasm lines (Chancellor, Lehmi, Loros); G-set involves isogenic lines with 'R' genes (*Pm*1, *Pm*2, *Pm*3b, *Pm*3c, *Pm*3d, *Pm*3e, *Pm*4, *Pm*4a, *Pm*5 and *Pm*6) and T-set with single or combinations of Pm genes (*Pm*7, *Pm*8, *Pm*12, *Pm*17, *Pm*25,

**Rapid culturing of *B. graminis* f.sp. *tritici* on wheat seedlings (WL 711)**

*Pm*2+*Pm*6, *Pm*2+6+, *Pm*2+Mild, *Pm*1+2+3 and SQARROSA). Virulence pattern was indentified in response to artificial inoculations and symptom expression of Bgt population purified from southern hills (SHZ), north western plain zone (NWPZ) and northern hill zone (NHZ). Strength of infection potential of particular isolates was identified as decanary (numerical) values prefixed with first letter of scientific name of test pathogen (BGT). These differentials are useful to find out virulence efficacy (%) of pathogen and % gene efficacy of differentials rapidly under controlled conditions and new culturing method. Few lines (cv. IWP 72 and NILs with Pm6, Pm2+Pm6, Pm2+6+ and Pm1+2+9) are consistent in expression of variable infection intensity. They demonstrated as distinct differentials when inoculated with 150 Bgt isolates individually, which could be used to find emerging races and pathotypes of wheat powdery mildew pathogen in India.

## Deciphered genome sequence of Indian race 4 of *Xanthomonas oryzae* pv. *oryzae*, the bacterial blight pathogen of rice

*Kalyan K. Mondal, Geeta Verma, Aditya Kulshreshtha, Yuvika Rajrana, Chandra Mani, Madhvi Soni, KishoreKumar Reddy, Thungri Ghoshal, Amrutha Lakshmi, Kalaivanan N.S.

*Plant Bacteriology Lab, Division of Plant Pathology, ICAR-Indian Agricultural Research Institute, Pusa Campus, New Delhi 110012*

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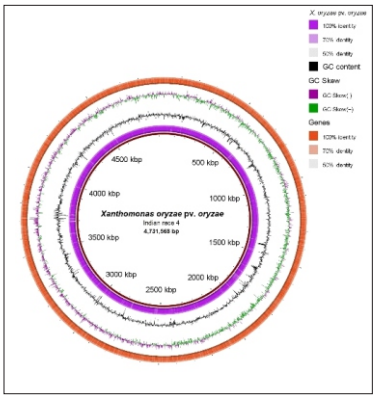



*Xanthomonas oryzae* pv. *oryzae* (Xoo), the causal bacterium of bacterial blight (BB) is a major threat to the rice production globally. Recently the whole genome sequence of Indian race 4, a virulent member from North Indian Xoo population was deciphered using PacBio sequencing method. The final genome assembly composed of 4,731,568 bp and has a total of 63.8% GC content. There were 4505 genes, 4299 CDS with 3542 protein coding genes. Among the total 206 RNA encoding genes, 6 genes encode for ribosomal RNAs, 57 encode for transfer RNAs and 143 were identified as noncoding RNAs. Race 4 has been extensively used during phenotyping for resistance breeding programme. Thus, the genome information would certainly help researchers to understand the Xoo-rice interaction and would help in exploring new management strategy for BB. The whole-genome shotgun project was deposited in the GenBank database under accession number CP046148 and documented in MPMI (https://doi.org/10.1094/MPMI-12-19-0335-A).

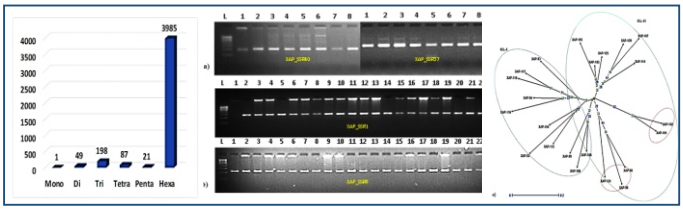
## Genome-wide mining of SSR markers specific to Bacterial blight of pomegranate (*Xanthomonas axonopodis* pv. *punicae*)

Prakash G. Patil*, N. V. Singhand and Jyotsana Sharma

*Biotechnology and Plant Pathology, ICAR-National Research Centre on Pomegranate (NRCP), Solapur 413255, India*

Correspondence: patilbt@gmail.com

Genome-wide characterization of 4,341 SSRs specific to Xap genome (strain LMG 859, 4.94 Mb) was analysed. The frequency distribution for repeat types revealed abundance of hexa (91.8%), followed by tri (4.6 %), tetra (2.00%), di (1.13%) and penta (0.48%) nucleotide repeats. Designed a total of 2746 SSRs primers that are covering entire Xap genome. Of these, 70 primers were validated through PCR on eight Xap isolates revealing amplification rate of 85.71%. Finally, a subset of 20 XAP-SSR primers were used to investigate molecular diversity among 22 Xap isolates collected during 2013-2017 from six states of India. As a result, total 40 alleles were detected with an average of 2 alleles/locus. Higher genetic diversity was observed among Xap isolates as evident through Jaccards dissimilarity values ranging from 0.14 to 0.75. Phylogenetic and PCoA clustering divided entire isolates into two distinct groups. The cluster I contained 11 isolates from six different states, which strongly supported earlier report on prevalence of ST3 type Xap isolates across India. Cluster II contained 11 isolates from Maharashtra, XAP-101 and XAP-102 (Akkalkot) were found most divergent strains. This study has generated genomic resource which will help in understanding population dynamics, epidemiological and quarantine of pathogen.




**Development, validation and molecular diversity analysis among 22 Xap isolates using twenty XAP-SSRprimers.**

## Whole genome sequence of *Tilletia indica* inciting Karnal bunt of wheat

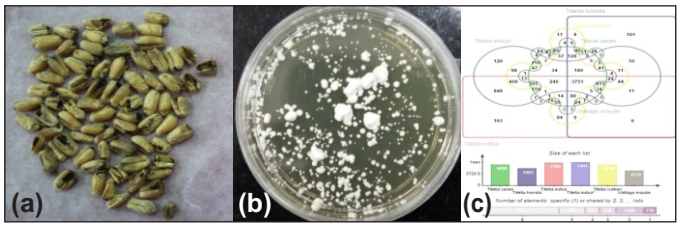
Malkhan Singh Gurjar and Rashmi Aggarwal

*Division of Plant Pathology, ICAR-Indian Agricultural Research Institute, New Delhi-110012*

Correspondence: malkhan_iari@yahoo.com

*Tilletia indica* (Karnal bunt of wheat) is an internationally quarantined fungal pathogen and reemerging disease in NWPZ of India. The whole genome of *T. indica* was sequenced and pathogenicity-related genes were identified. Genome assembly size of *T. indica* of 33.7 MB was generated using Illumina and Pac

Bio platforms. A total of 1737 scaffolds were obtained with N50 of 58,667 bp. A total number of 10,113 genes were predicted with an average gene size of 1945 bp out of which functionally annotated genes were 7262. Total 5772 simple sequence repeats were identified in the genome assembly. The comparative genome analysis suggested 3751 proteins of T. indica had orthologs in five fungi, whereas 126 proteins were unique to *T. indica*. The secretome analysis showed the presence of 1014 secretory proteins. Some putative candidate pathogenicity-related genes were identified in the genome. The whole genome sequence will provide a window to understand the pathogenesis mechanism, fungal life cycle, survival of teliospores, and novel strategies for management of Karnal bunt disease of wheat. The sequence was deposited at DDBJ/ENA/GenBank under the accession number MBSW00000000 (https://doi.org/10.1007/s13205-019-1743-3).




**(a) Karnal bunt disease, (b) Culture of *T. indica* and (c) comparative genome analysis**

# Awards/Honours

- **APS-IPS award for Plant Health 2020** will be organized on digital platoform. The American Phytopathological Society (APS) has APS-IPS Student Travel Award this year. Instead of selecting a single student for the award, all three candidates, namely, Mr. Darshan K, Mr. Kavi Sidarthan V, and Mr. Praveen Boda have been offered Meeting Registration + APS membership ($186 per student) this year. Congratulations to all the selected candidates.
- **Dr. K. Sesha Kiran,** Assistant Professor (Plant Pathology), Dr.Y.S.R.Horticultural University, (A.P) has been selected for the prestigious INSA Visiting Scientist Award for 2020-21, sponsored by the Indian National Science Academy, New Delhi.


# Symposium/Training/Workshop

## Organized

- **Mid-term EC meeting : 23rd May 2020**

  Mid-Term Executive Council Meeting was held on digital platform on May 23, 2020. The proceedings of the meeting is available on IPS website.

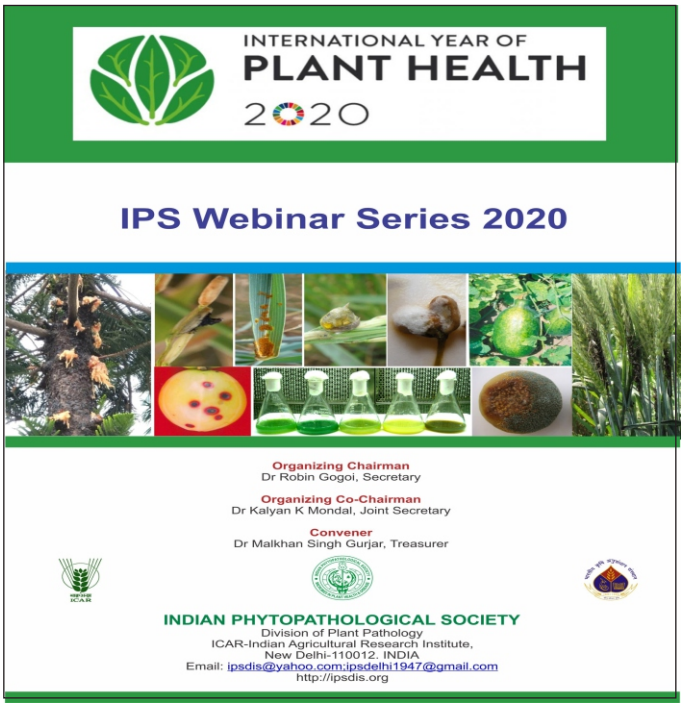
- **IPS addressed emergent issues on banning of pesticides**

  An emergency virtual meeting was conducted on 4th June 2020 involving EC members of IPS HQ, eminent scientists from Entomology, Agricultural Chemicals Division, IARI, New Delhi and 4 other ICAR institutions to discuss the issues of the banning of 27 pesticides by CIB&RC, Govt. of India.

  The concerns and likely impact of the ban on pesticides were discussed by the Indian Phytopathological Society members. Based on a scientific deliberation, a request for careful review of the Draft Notification "Banning of Insecticides Order 2020" with relevant stake holders was sent on June 11, 2020 to DAC&FW, Krishi Bhawan, New Delhi The details of the meeting are available on IPS website.

## Attended

- **Dr. Malkhan S. Gurjar** attended International training on "E-agriculture for climate resilience in Rice-Based Agri-food Systems" at IRRI South Asia Regional Centre (ISARC), Varanasi, India during 4-6 March, 2020.
- A talk on "Role of plant protection in Agriculture" was delivered by **Rakesh Kumar Goel**, Vice President Sumitomo Chemicals in the Zoom Webinar organized by Dr S K Gupta, Shoolini University on 17th June, 2020 at 2.00 pm.



# Upcoming seminar/symposia /conferences/Webinars:

**IPS Webinar Series 2020-21**

- **SOUTHERN ZONE: 14.07.2020**

  **Lecture 1 :** 10.00-11.00 AM: **Dr. R. Velazhahan**, Associate Professor, Department of Plant Sciences, College of Agricultural and Marine Sciences, Sultan Qaboos University, Muscat, Sultanate of Oman

  **Topic:** Innovative strategies to reduce aflatoxin contamination in foods

  **Lecture 2 :** 11.30-12.30 PM: **Dr R Selvarajan,** Principal scientist (Plant virology), ICAR-NRCB, Trichy

  **Topic:** Recent developments in plant pathogen detection, discovery and diagnostics for deploying effective managements against emerging diseases

- **CENTRAL ZONE: Date: 17.07.2020**

  **Lecture 1 :** 10.00-11.00 AM: **Dr. Mamta Sharma**, Theme Leader, Integrated Crop Management, Asia Program at ICRISAT, Hyderabad

  **Topic:** Climat change impact on occurrence and spread of diseases in crop plants and their management

  **Lecture 2 :** 11.30-12.30 PM: **Dr. Pratibha Sharma**, ICAR-Emeritus Scientist, Department of Plant Pathology, Sri Karan Narendra Agriculture University, Jobner, Jaipur, Rajasthan

  **Topic:** Impact of climate change on efficiency of biocontrol of plant diseases

- **EASTERN ZONE: Date: 21.07.2020**

  **Lecture 1 :** (10.00-11 AM) : **Dr. Kutubuddin Ali Molla**, Scientist, Biotechnology, ICAR-NRRI, Cuttack, Odisha

  **Topic:** CRISPR/Cas tools in plant disease management

  **Lecture 2 :** 11.30-12.30 PM: **Prof. Apurba Kumar Chowdhury,** Professor and Head, Department of Plant Pathology, UBKV Coochbehar, West Bengal, India

  **Topic:** How prepared are we for wheat diseases in eastern Gangetic plains?

- **NORTH EASTERN ZONE: Date: 24.07.2020**

  **Lecture 1 :** 10.00-11.00 AM: **Prof. Ashok Bhattacharyya**, Vice-Chancellor, AAU, Jorhat, Assam

  **Topic:** Agroterrorism-the global menace

  **Lecture 2 :** 11.30-12.30 PM: **Prof. L. Daiho**, Head, Dept. of Plant Pathology, SASRD, Nagaland University, Medziphema campus, Nagaland

  **Topic:** Heat treatment as an important component of Integrated Disease Management

- **WESTERN ZONE: 28.07.2020**

  **Lecture 1 :** 10.00-11.00 AM: **Dr C D Mayee**, Ex Chairman, ASRB; Ex Director, CICR; Ex-VC VNMKV, Parbhani

  **Topic:** Disruptive technologies in agriculture having impact on crop disease research and development

  **Lecture 2 :** 11.30-12.30 PM :**Dr. Dilip K. Ghosh**, Principal Scientist (Plant Pathology-Virology), ICAR - Central Citrus Research Institute, Amravati Road, Nagpur, M.S., India

  **Topic:** Recent trends in developing molecular diagnostics of virus and virus-like pathogens of citrus

- **NORTHERN ZONE: 31.07.2020**

  **Lecture 1 :** 10.00-11.00 AM: **Dr. P.N. Sharma**, Professor, Department of Plant Pathology, College of Agriculture, CSKHPKV, Palampur, H.P.

  **Topic:** Pathogen population structure- A dictator controlling host resistance durability

  **Lecture 2 :** 11.30-12.30 PM : **Dr Sanjeev Sharma**, Head, Division of Plant Protection, CPRI, Shimla, H.P.

  **Topic:** Emerging diseases of potato and their management

- **DELHI ZONE: Date: 07.08.2020**

  **Lecture 1 :** 10.00-11.00 AM: **Dr. H.B. Singh**, Director, Somvanshi Research Foundation, Lucknow; Formerly Prof & Head, Department of Mycology, Plant Pathology, B.H.U., Varanasi, U.P.

  **Topic:** Current scenario of biopesticides in India, regulatory requirements and commercialization

  **Lecture 2 :** 11.30-12.30 PM: **Dr. P. Chowdappa**, Former Director, Central Plantation Crops Research Institute, Kasaragod-671124, Kerala

  **Topic:** Phytophthora: A major threat to horticultural industry

- **Stakeholders Dialogue** on **"Current Challenges and Way Forward for Pesticides Management"** is being organized by the Trust for Advancement of Agricultural Sciences (TAAS), The Society of Pesticide Science (SPS), Indian Phytopathological Society (IPS) and the Entomological Society of India, New Delhi as a virtual event on 24th July, 2020.

- **APS -Plant Health 2020 Online**

  Plant Health 2020 Online, a fully virtual event is being organized by American Phytopathological Society (APS) on the theme "Scientific Credibility: Changing the Climate" during 10-14 August, 2020. The details are available on https://www.apsnet.org/meetings/annual/planthealth2020/about/Pages/default.aspx

# Constitution of new Editorial Board (2020-22) for the journal Indian Phytopathology



## Miscellaneous

**Dr Ashwani Kumar Basandrai**, Dean, College of Agriculture & Basic Sciences, CSKHPKV, Palampur - 176 062 (HP), India superannuated on 31st May, 2020.

# Plant Protection Medley

## Policy issues, major decision, new product registration

**1.** Twenty seven pesticides were proposed for ban through a Govt. Notification S.O. 1512(E) dated 14h May 2020. The list includes 8 fungicides, 12 insecticides and 7 herbicides that are generic in nature and registered for use on 74 horticultural and field crops. The notice is put up in public domain for 90 days from the date of publication for any objections/suggestions for consideration of DAC&FW.

**2.** In view of antibiotic resistance in target phytopathogenic bacteria as well as in human bacterial pathogens, recently the registration committee recommends to phase out the use of Streptomycin + tetracycline by the end of 2022 till then it will be used only on crops strictly as per the label claim, where no alternatives are available (Source: http://ppqs.gov.in/divisions/cib-rc/news-update).

**3. The following biopesticides were registered:**

| S.No | Name of molecule | Company Name |
|---|---|---|
| 1 | *Trichoderma harzianum* 1.0% WP under section 9(3) (Strain designation : IIHR, Th-2, Accession No. ITCC – 6888) | M/s Khedut Beej Nigam |
| 2 | *Trichoderma harzianum* 1.0%WP under section 9(3) (Strain designation : IIHR, Th-2, Accession No. ITCC –6888) | M/s Manshya Enviro Biotech Pvt. Ltd. |
| 3 | *Trichoderma harzianum* 1.0% WP undersection 9(3) (Strain designation : IIHR, Th-2, Accession No. ITCC – 6888) | M/s Dewborn Agro Chemicals |
| 4 | *Trichoderma harzianum* 1.0% WP undersection 9(3) (Strain designation : IIHR, Th-2, Accession No. ITCC – 6888) | M/s Uttam Chemicals Industries |
| 5 | *Trichoderma viride* 1.50% WP under section9(3) (Strain designation : IIHR, Tv-5, Accession No. ITCC No. 6889) | M/s Uttam Chemicals Industries |
| 6 | *Trichoderma viride* 1.50% WP under section 9(3) (Strain designation : IIHR, Tv-5, Accession No. ITCC No. 6889) | M/s Siddaganga Oil and Bio Pesticides LLP |

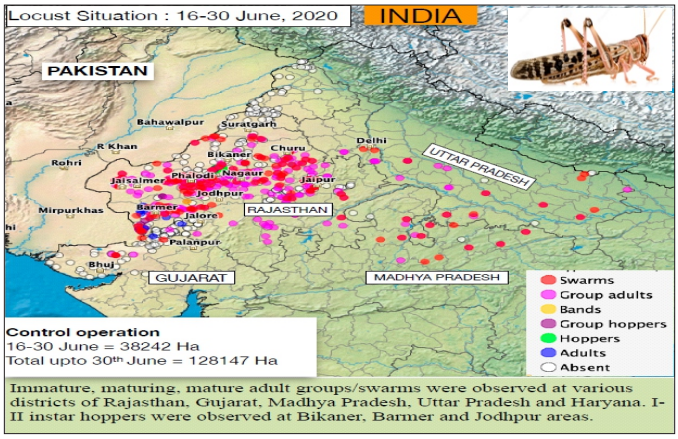
**4. The recent endorsement (label expansion) was made for the following products:**

| Industry | Product | Crop | Diseases | MRL |
|---|---|---|---|---|
| GSP Crop Science Pvt. Ltd. | Azoxystrobin 11% + Tebuconazole 18.3% SC | Rice | Sheath blight | Azoxystrobin-0.3<br>Tebuconazole-0.05 |
| | | Onion | Purple blotch | Azoxystrobin 0.05<br>Tebuconazole-0.01 |
| | | Wheat | Yellow rust | Azoxystrobin-0.2<br>Tebuconazole-0.05 |
| | | Tomato | Early blight | Azoxystrobin-1.0<br>Tebuconazole- 2.0 |
| | | Potato | Early and Late blight | Azoxystrobin-7.0<br>Tebuconazole-0.01 |
| | | Grape | Powdery and Downy mildew | Azoxystrobin-0.5<br>Tebuconazole-0.01 |
| | | Apple | Scab, Powdery mildew & Premature leaf fall | Azoxystrobin-0.2<br>Tebuconazole-1.0 |

(Source: http://ppqs.gov.in/divisions/cib-rc/news-update).

# Invasive/Emerging Pests/New Reports

**Locust alarm:** During the 2nd fortnight of June 2020 swarms population comprising of immature, maturing and mature adult groups were observed at various districts of Rajasthan, Gujarat, Madhya Pradesh, Uttar Pradesh and Haryana. I-II instar hoppers were also reported in Bikaner, Barmer and Jodhpur areas. Out of 782 numbers of spots, control operations were undertaken at 327 spots covering 38242 hectare area.




(**Source:** http://ppqs.gov.in/divisions/locust-control-research)

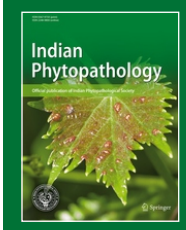
## First report of the association of Apple necrotic mosaic virus (ApNMV) with apple mosaic disease from India

Sajad Un Nabi, Virendra K. Baranwal, Manoj K. Yadav & Govind P. Rao

*Division of Plant Pathology, Advanced Center of Plant Virology, ICAR-IARI, New Delhi*

Apple mosaic disease was recorded (7.14–90% incidence) in apple orchards of Jammu and Kashmir with maximum incidence in cultivar, Golden Delicious. Besides mosaic the symptoms include chlorosis, necrosis and ring spots. The association of ApNMV was confirmed by RT-PCR and subsequent sequencing of coat protein gene in samples that were found DAS-ELISA negative for Apple mosaic virus (ApMV). Sequence analysis of 680 bp from coat protein of positive samples showed 89–91% identity with ApNMV. Indian isolates shared 89–99% identity with ApNMV isolates from China while sharing only 61.6% and 52.8% with PNRSV and ApMV, respectively.

(Source: DOI: 10.1007/s13205-020-2117-6)

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# Editorial Board - Newsletter



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