



Indian Phytopath News

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From President's Desk

Climate Change: Plant and soil health management

Variety of agri crops are cultivated to fulfill the requirements of an ever-growing population and industries but at the same time, a large number of biotic and abiotic stresses having severe impact on plant and soil health is also witnessed. The intensity of different stresses on plant and soil health are on the rise during the last few years due to climate change and resources constraint. The faculties to combat with them are meagre in agriculture due to non availability of information and less awareness. In such a situation useful microbes and adaptation of new technologies may play a significant role in coming to the rescue of the farmer's communities. Nowadays, a combination of various microbes like *Trichoderma* spp., *Aspergillus* sp., *Bacillus* spp., *Pseudomonas* spp., *Azospirillum brasilense*, *Beauveria bassiana*, *Metarhizium anisopliae*, *Gluconacetobactor* sp. etc. in the form of consortia with useful characteristics help a lot to improve the soil and plant health through bioremediation, targeted mechanism, solubilization of zinc and phosphorus, plant growth promotion mechanism etc. Inclusion of new crops especially medicinal and aromatic and changing crop cultivation techniques in stressed soil help not only to improve the soil health but also is useful in increasing farmers income during this climate change era. Therefore, the final aim and objective of researchers should be to make plant and soil healthier and more productive for future generation and therefore we all should prioritize future research accordingly.



Rakesh Pandey

President

Indian Phytopathological Society

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Editorial

Genome Mining for Bioactive Substances Produced by Fungi

Bacteria, plants, and filamentous fungi are capable of producing many chemically diverse bioactive substances, referred to as natural products or secondary metabolites (SMs). The classical example of production of fungal bioactive compounds is penicillin from *Penicillium rubens*, discovered by Alexander Fleming in 1929, which initiated the "antibiotic revolution" that led to a major paradigm shift in the treatment of patients. SMs as per definition are not essential for growth but may provide selective advantages for the producing organism upon specific environmental challenges. As versatile are SMs functionally, as diverse are the chemical properties of such natural products. Most of them are only produced under defined environmental or developmental conditions implying a complex regulation at the molecular level. Many fungi and their SMs made it into pharmaceutical applications, such as cyclosporin from *Tolypocladium inflatum* which is used as an immunosuppressant, or lovastatin as a treatment for coronary heart diseases produced by *Aspergillus terreus*. Other fields of application for microbial-derived natural products are the food industry e.g., soy



sauce, sake, and miso by *Aspergillus oryzae* or citric acid by *Aspergillus niger*; in agriculture sector as biocontrol agents, for production of growth hormones, and many others. However, only a small fraction of the true chemical diversity of fungi is known so far. There are advanced methods that can be used to explore this chemical repertoires. There are genetic and genomic methods for detection of genes/ biosynthetic gene clusters (BGCs) that harbor the blueprints for the production of secondary metabolites. Ways have to be identified to activate the chromosomal regions by way of chromatin-level regulation of BGCs and potential to use the CRISPR/Cas technology as an activation tool. Depending on the key enzyme(s) involved in the biosynthesis, SMs are categorized to the chemical families such as polyketides, non-ribosomal peptides, terpenes and alkaloids or prenylated tryptophan derivatives. The biosynthetic genes physically linked in fungal genomes and together with genes for regulators and transporters sometimes constitute very large BGCs. Now bioinformatic tools have been developed that predict fungal BGCs based on whole-genome sequence data. These predictions show that so far sequenced fungi harbor between ~15 and 50 BGCs, however, up to more than 80 BGCs have also been predicted in some genomes. Under standard laboratory conditions most of the BGCs are transcriptionally silent, therefore, majority of natural products are not known. Since fungi exhibit a very diversified and specialized chemical repertoire- diversification of BGCs increases with the phylogenetic distance. BGCs are differently affected by evolution compared to the rest of the genome. They are located outside of so-called syntenic blocks, i.e., their position within the genome, and the BGC itself is less conserved than the rest of the genome. Therefore, many BGCs are found to be enriched in sub-telomeric regions which are known to be hotspots for recombination. This has been shown in many fungi e.g., *Sclerotinia sclerotium*, *Magnaporthe oryzae*, *A. umigates*, *Zymoseptoria tritici* etc. Relevant genomic regions and hence the genes situated in these regions (i.e., BGCs) experience regular mutations leading to single nucleotide polymorphisms (SNPs), missense, nonsense, frameshift, or gain/loss of function; and genomic rearrangements as for instance gene duplications, gene or BGC loss, BGC rearrangements, pseudogeneization events and also

the acquisition of genetic material *via* horizontal gene transfer. *In silico*-prediction of BGCs within the genome gives important information about the chemical potential of a fungus. This is important for deciding if a species is a promising candidate for novel bioactive compounds and also is a prerequisite for linking those compounds to a specific cluster and also for targeted BGC activation. Bioinformatic analyses of high-quality genome sequences and transcriptome datasets are becoming cornerstones to explore the theoretical chemical diversity of SMs in a given species giving insights for laboratory confirmations.

Rashmi Aggarwal
Chief Editor, IPS Newsletter

Research Highlights

Multi-location evaluation of fungicides for managing blast (*Magnaporthe grisea*) disease of forage pearl millet in India

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Blast has emerged as a major threat in recent years to forage pearl millet in India. Field trials for two consecutive years (2019 and 2020) were conducted at four geographically different locations (Ludhiana, Palampur, Jhansi and Bhubaneswar). Carbendazim, tebuconazole + trifloxystrobin, tricyclazole, chitosan and neem oil were tested for their efficacy through seed treatment alone or seed treatment followed by two foliar sprays. Results showed the superiority of tebuconazole + trifloxystrobin as seed treatment (@1g/kg seed) followed by two foliar sprays (@0.4g/ L of water) in reducing the AUDPC as well as rate of infection at Ludhiana, Jhansi and Palampur. Tricyclazole as seed treatment (@ 0.6g/kg seed) followed by two foliar sprays (@0.3g/L of water) was found superior over others in reducing the AUDPC and rate of infection at Bhubaneswar. Through this study, an effective strategy for location specific management of blast disease in forage pearl millet has been formulated.

(<https://doi.org/10.1016/j.cropro.2022.106019>)

Awards/Honours/Promotions

- **Dr. Narender K. Bharat**, Principal Scientist (Plant Pathology) joined as Professor and Head, Department of Seed Science & Technology, Dr. Y.S. Parmar University of Horticulture & Forestry, Nauni, Solan (HP) on 05th August, 2022.
- **Dr. Ramji Singh**, Professor (Plant Pathology), Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, Uttar Pradesh has joined as Dean, College of Post Graduate Studies with effect from 19th September, 2022.
- **Dr. Ritu Mawar**, Principal Scientist (Plant Pathology), ICAR-CAZRI, Jodhpur, Rajasthan has been awarded “Fellow of the Asian PGPR society 2022” during 7th International Asian PGPR Conference for sustainable agriculture held at University Putra from August 23, 2022 to August 26, 2022 in Kuala Lumpur, Malaysia.
- Agricultural Research Station, Vizianagaram has received the “Best Institution (Crop Improvement), AICRP on Small millets” under Poshak Anaaj awards, 2022 among the 33 AICRP centres across the country during the National Nutri-Cereal Convention (NNCC) 4.0 held at HICC, Hyderabad during 23-24th September, 2022 (*Source: Dr. T.S.S.K. Patro*, Principal Scientist & Head, ARS, ANGRAU, Gajularega, Vizianagaram, Andhra Pradesh).
- **Dr. Shamarao Jahagirdar**, Professor (Plant Pathology) & Editor received the prestigious International Fellow Award of Asian PGPR Society - 2022 from Asian PGPR Society for his outstanding contributions in field of PGPR & biological control research over two decades.

IPS Zonal Symposia 2022-23

IPS Northern Zone Symposium

Indian Phytopathological Society (North Zone) in association with Division of Plant Pathology, SKUAST-Kashmir organized two day Zonal Meeting and National Symposium on “Impact of Climate Change on Emerging Plant Diseases” October 28-29, 2022 at Division of Plant Pathology, FoH, SKUAST-Kashmir, Shalimar, Srinagar, Jammu and Kashmir.

IPS Central Zone Symposium

IPS Central Zone Symposium and National Conference on “Phytopathology for sustainable disease management and food security” was jointly organized by Acharya N.G. Ranga Agricultural University, Lam, Guntur, Andhra Pradesh during October 31 - November 2, 2022 at Regional Agricultural Research Station (ANGRAU), Tirupati, Andhra Pradesh.

IPS Western Zone Symposium

A conference on “Current trends in plant disease detection, diagnosis and management” was jointly organized by Department of Plant Pathology, N.M. College of Agriculture, NAU, Navsari, Gujarat and Indian Phytopathological Society (Western Zone) on November 16-17, 2022.

IPS North-Eastern Zone Symposium

Indian Phytopathological Society (North-Eastern) organized two symposium on “Reframing Futuristic Plant Health Safeguards” was jointly organized by Department of Plant Pathology & Regional Agricultural Research Station, Titabar (AAU, Assam) on November 24-25, 2022 during November 24-25, 2022

Symposia/Workshop: Organized

- **International Workshop on “Complementing Current Techniques with Next Generation Technologies for Crop Health Improvement: The Department of Plant Protection, Aligarh Muslim University, India in collaboration with the Department of Plant Pathology, North Dakota State University, USA organized one week International Workshop on “Complementing Current Techniques with Next Generation Technologies for Crop Health Improvement”, under *Global Initiative of Academic Networks Program*, Ministry of Education, Government of India, during 14-19 November, 2022.**, under the coordinatorship of **Prof. Mujeeb Rahman Khan**, Department of Plant Protection, AMU.
- **Academia-Industry International Collaborative Research Projects with AMU and Russell-IPM, UK:** A collaborative research project on evaluation for

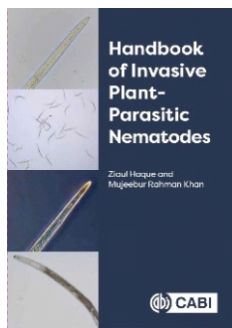
effectiveness of formulations based on pheromones and biocontrol agents to control pest and disease problem in Paddy has been started under the supervision of **Prof. Mujeebur Rahman Khan (PI) and Dr. Ziaul Haque (Co-PI)** at the Department of Plant Protection, Aligarh Muslim University with the sponsorship of Russell-IPM, UK.

- **International Year of Millets-2023:** As per the directives of the Ministry of Education, New Delhi, with regard to carry out month-wise activities to celebrate the International Year of Millets-2023 (IYM), a lecture for creating awareness regarding significance of millets was organized by the Department of Plant Protection, Faculty of Agriculture Sciences, Aligarh Muslim University on 29 July, 2022. The lecture, "Millets, Benefits of Farming and its Consumption" (in Hindi) was delivered by **Prof. Mujeebur Rahman Khan**, Chairman, Department of Plant Protection, AMU, Aligarh, Uttar Pradesh.

Books Published

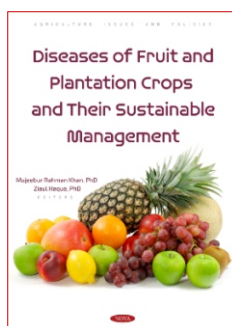
Handbook of Invasive Plant-Parasitic Nematodes

Editors: Ziaul Haque and Mujeebur Rahman Khan
Published by: CABI
Published: 2021
Page Count: 544
ISBN: 978-1789247367



Diseases of Fruit and Plantation crop and Their Sustainable Management

Editors: M.R. Khan and Z. Haque
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