



**National Agricultural Higher Education Project
(NAHEP) Sponsored**

Short Term Training Programme

**Pathophenotyping and Genome guided
Characterization of Rust fungi Infecting Wheat
and other Cereals**

January 22 - February 01, 2020

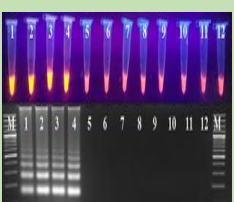
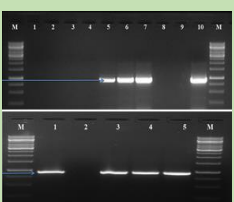
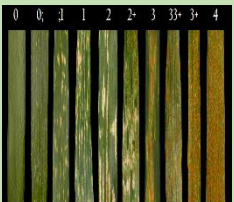
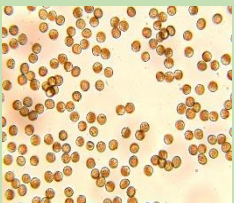
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**Center for Advanced Agricultural Science
and Technology (CAAST)**

**Division of Plant Pathology and Division of Genetics
ICAR-Indian Agricultural Research Institute
New Delhi - 110 012**



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Short Term Training Programme**

on

**Pathophenotyping and Genome guided Characterization of Rust
fungi Infecting Wheat and other Cereals**

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The ICAR-Indian Agricultural Research Institute (IARI), New Delhi, invites applications from M.Sc, M.Tech. and Ph.D. students studying in concerned subject under State Agricultural Universities / Central Agricultural Universities / UGC recognized Private Universities / ICAR Institutes for a 10-days Training Programme on “**Pathophenotyping and Genome Guided Characterization of Rust Fungi Infecting Wheat and other Cereals**” sponsored by National Agricultural Higher Education Project (NAHEP) - Centre for Advanced Agricultural Science & Technology (CAAST), on Genomics Assisted Crop Improvement & Resource Management, ICAR-IARI, New Delhi, scheduled from January 22 - February 01, 2020.

Objective

The main objective of this training programme is to train young students and research scholars on the advance application of phenotyping & genomic tools for characterization with special relevance to gene postulation, host-pathogen interaction, pathogenic variability, molecular diagnostic and pathogenomics. The recent advances on phenotyping and genomics will facilitate students to update their skill on pathogen characterization and management. The proposed training course would, therefore, be an opportunity for students/research scholar on a national level to have active interactions and experiences to refine their skills in the area of phenotyping & genome guided characterization. Hands-on training in this topic will be imparted in addition to lectures by eminent experts so that the participants could apply the same in their research programmes.

Eligibility

M.Sc, M.Tech. and Ph.D. students of State Agricultural Universities / Central Agricultural Universities / UGC recognized Private Universities / ICAR Institutes are eligible to apply. The number of participants will be limited to twenty five (25) ONLY.

How to Apply

Complete application form in the prescribed format forwarded by Head of the Institute or Departmental Authorities should reach the Course Director, NAHEP-Centre for Advanced Agricultural Science & Technology (CAAST) sponsored training, Division of Plant Pathology, ICAR-Indian Agricultural Research Institute, Pusa Campus, New Delhi - 110 012 on or before 30th November 2019; application form can be downloaded from www.iari.res.in or www.nahep-caast.iari.res.in. Selected candidate will be intimated by email on or before 15th December 2019.

Registration Fees

No registration fee is to be paid as the programme is fully sponsored by NAHEP-CAAST.

Duration

10-days (January 22 - February 01, 2020).

Venue

For Lectures: Auditorium, Division of Plant Pathology, ICAR-Indian Agricultural Research Institute, Pusa Campus, New Delhi-110 012.

For Practicals: PG laboratory, Division of Plant Pathology and Division of Genetics, ICAR-Indian Agricultural Research Institute, Pusa Campus, New Delhi-110012.

Travel & Accommodation

The participants will be provided to and fro fare restricted to III Tier AC Train fare or any state road transport services as per the ICAR guidelines. Participants should produce a certificate that they have not been given TA/DA by their host institute (Head of the Department / Institute). Food and accommodation will be arranged at the ICAR-IARI campus only for the participants and expenditure will be met from the training budget

About NAHEP-CAAST

Centre for Advanced Agricultural Science & Technology (CAAST) is a new initiative and student centric sub-component of World Bank sponsored National Agricultural Higher Education Project (NAHEP) granted to ICAR-IARI to provide a platform for strengthening educational and research activities of post-graduate and doctoral students. CAAST theme for IARI is Genomic Assisted Crop Improvement & Resource Management that specifically aims at inculcating genomics literacy and skills among the students of SAUs / CAUs / UGC recognized Private Universities / ICAR Institutes.

About the Training Programme

Rust fungi are pathogens of major importance to agriculture, and dominant factor limiting yield potential in wheat and other cereals globally. These obligate parasites are highly specialized and unveil significant variation in the pathogen population. The economic losses due to rusts have been reported up to Rs. 60 million annually and estimated losses of Rs. 392 million in India. Furthermore, in the last decade new rust races have emerged that are adapted to warmer temperatures, have expanded virulence profiles, and are more aggressive than previously characterized races leading to wide scale epidemics. Targeted breeding for resistance, based on information from fungal surveys, early diagnosis and pathotype analysis, have been effective. Nevertheless, breakdown of resistance occurs frequently and continued efforts are needed to understand how these fungi overcome resistance and to determine the range of available resistance genes. This requires new, innovative, data-driven, pathophenotyping, diagnostic and genomics tools. Reliable molecular diagnosis and early detection methods are still one of the main and most effective actions to develop control strategies for rust pathogen. The development of genomic resources for these fungi and their

comparison has released a torrent of new ideas and approaches to use this information to assist pathologists and agriculture in general. Recently, considerable progress has been made to develop tools with high specificity and low detection limits for use in the detection of these plant pathogens. Advances in sequencing technologies and bioinformatics pipelines have permitted the development of new in-field pathogenomics methods which have been tested and validated for rust. The sequencing of gene transcripts and the analysis of proteins from haustoria has yielded candidate virulence factors among which could be defense-triggering avirulence genes. Genome-wide computational analyses, including genetic mapping and transcript analyses by RNA sequencing of many fungal isolates, will predict many more candidates. This will allow the screening of wheat germplasm for novel resistance genes for breeding. Comparative analyses have also revealed fungal virulence genes, providing fungal targets for disease control in host-produced RNAi approaches. Recently, our group has been instrumental in successfully demonstrating the genomics-assisted molecular diagnosis, characterization and genome sequencing. In the proposed training, these success stories will be demonstrated with the main objective to provide a practical presentation on phenotyping and genotyping in rust pathogens.

Course Outline

The CAAST training has the following components:

A. Lectures on principles and practices of basic & advanced phenotyping, genotyping and molecular tools & techniques used in Wheat Rust Pathology and Plant Pathology:

The lectures will be delivered in the forenoon of the day during the training period.

B. Demonstration of the advanced research facilities: Visit to facilities like TEM, SEM, Confocal Microscope, Genome sequencers, Bioinformatic data center, Phytotron and Phenomics facility etc.

C. Group activities for case studies: Student groups will be given a set of rust pathogens to characterize using phenotyping & genomic tools.

D. Interactive discussion presentation and Quiz: Each student is expected to make a short presentation of their present work and future work plan on pathophenotyping and genomics programme of their choice organism. Presentation will be facilitated by coordinators during evening hours on all days during the programme. Students are also encouraged to bring their own biological material to work with.

Dr. Vaibhav K. Singh

Course Director

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