

The Indian Agricultural Research Institute, New Delhi invites applications from MSc and PhD students of IARI for a two weeks **International training workshop on Plant Microbiomes: Theory and Application** sponsored by **NAHEP-Centre for Advanced Agricultural Science and Technology (CAAST)**, Indian Council of Agricultural Research, New Delhi.

Jointly organized by
ICAR-IARI, New Delhi, India,
Netherlands Institute of Ecology, and Leiden University, the Netherlands

WHO CAN PARTICIPATE

MSc and PhD students of IARI are eligible to apply. The number of participants will be limited to **thirty ONLY**

REGISTRATION FEES: No registration fee is to be paid; the programme is fully sponsored by NAHEP-CAAST

HOW TO APPLY: Filled- in-application form in the prescribed format forwarded by the chairperson should reach the **Principal investigator, NAHEP-Centre for Advanced Agricultural Science and Technology (CAAST), ICAR-IARI, New Delhi** on or before **30 November 2022**; the application form can be downloaded from www.iari.res.in

TRAVEL

No travelling allowance will be provided by the organizers as students are expected to make their arrangements to reach the venue at 9:30 am on all working days

FOOD and ACCOMMODATION: Tea and snacks will be served during the programme and expenditure will be met from the training budget. However, no accommodation will be arranged as students are already housed in IARI- hostels

DURATION

Two weeks- December 12-23, 2022

Venue:

Lectures: NRL Auditorium, Discovery Center, ICAR-Indian Agricultural Research Institute, Pusa Campus, New Delhi-110012.

Practicals: Discovery Center, ICAR-Indian Agricultural Research Institute, Pusa Campus, New Delhi-110012.

Organizers

Dr. C. Viswanathan

Joint Director (Research), and Principal Investigator-**NAHEP-Centre for Advanced Agricultural Science and Technology (CAAST)**, ICAR-Indian Agricultural Research Institute, Pusa Campus, New Delhi-110012

Course Director (International)

Prof. Jos Raaijmakers

Director, Microbial Ecology
Netherlands Institute of Ecology
Professor, Leiden University, the Netherlands

Course Director (National)

Dr. A. Kumar

Principal Scientist, Division of Plant Pathology,
ICAR-IARI, Pusa Campus, New Delhi-110012
Email: kumar@iari.res.in, kaundy@yahoo.com,
Phone: 09540829009

Course Coordinator (National)

Dr. B. Ramakrishnan

Division of Microbiology, ICAR-Indian Agricultural Research Institute, Pusa Campus, New Delhi 110 012

Course Coordinators (International)

Dr. Victor J Carrion

Leiden University, the Netherlands
Drs. Guillermo Guerrero Egido
Leiden University, the Netherlands

The programme is jointly coordinated by
Leiden University, the Netherlands; Netherlands Institute of Ecology; Divisions of Plant Pathology and Microbiology at IARI



NETHERLANDS
INSTITUTE
OF ECOLOGY
(NIOO-KNAW)



Lectures and hands-on Practicals by international experts on plant microbiomes



National Agricultural Higher Education Project



International training workshop

Plant Microbiomes: Theory and Application

December 12-23, 2022

Discovery Center
ICAR-IARI, Pusa Campus, New Delhi



NETHERLANDS
INSTITUTE
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Organized by

Center for Advanced Agricultural Science and Technology (CAAST)

Indian Agricultural Research Institute
Pusa Campus, New Delhi- 110012

About NAHEP-CAAST

Centre for Advanced Agricultural Science and Technology (CAAST) is a new initiative and student-centric sub-component of the **World Bank-sponsored National Agricultural Higher Education Project (NAHEP)** granted to IARI to provide a platform for strengthening education and research activities of postgraduate and doctoral students. CAAST theme for IARI is **Genomic assisted crop improvement and resource management** which aims at inculcating genomics literacy and skills among the student of IARI.

ICAR-IARI: The ICAR-IARI, New Delhi has made significant contributions to developing crop protection and production technologies for all major crops in India. The institute has core strength in the area of genomics, and microbiome research as evident from the publication of whole genome and metagenome sequences of agriculturally important microorganisms.

NIOO: The Netherlands Institute of Ecology is one of the largest Dutch National Academy institutes. We focus on three major research themes: biodiversity, climate change, and sustainable use of land & water. In the microbial ecology department, we investigate the mechanisms underlying plant microbiome assembly. The functions of microbiomes we study in detail are i) protection of plants against diseases and insect pests; ii) promotion of plant growth and iii) alteration of plant chemistry. Microbiome assembly is studied for different crop species and their wild relatives grown in their native habitat in the centre of origin. Adopting various 'omics technologies, we have identified consortia of different bacterial genera that play an important role in the protection of plants against diseases. Several of the plant-associated microbial genera are studied at the biochemical, genetic and genomic levels to identify genes and metabolites involved in plant protection. NIOO works closely with numerous stakeholders to translate the fundamental results into practical applications of microorganisms for sustainable food production.

Leiden University: The Institute of Biology Leiden (IBL) is an internationally oriented institute for research and education in biology. We are part of the Faculty of Science at Leiden University, Netherlands. Our aim is to perform top quality innovative fundamental and strategic research that will lead to scientific progress, contribute to solutions for societal challenges, and generate industrial opportunities, reflected in our general theme 'Harnessing Biodiversity for Health'. We investigate the enormous functional diversity of microorganisms for biotechnology and their role in the protection of plants against biotic and abiotic stress factors. We develop metabolomic and bioinformatic pipelines to discover novel biosynthetic gene clusters and antimicrobial metabolites.

Background

The cracking of the first microbial genome by Crag Venter in the year 1996 culminated in the birth of the science of genomics. In the last two decades, 'omics science' and genomic data has enabled us to understand diverse plant-associated microbial communities, pathogens of crop plants and their behaviour on plant-associated niches. The exponential growth of genome-related information and the associated "Omics tools" provided an opportunity for the plant microbiologist and pathologist to understand the population genetics of microorganisms, pathogens and their host interactions at the cellular and genome levels.

A total of 476,139 whole genome sequencing projects encompassing most of the plant pathogens and microbes are underway throughout the world that includes 104,918 metagenome projects (<https://gold.jgi.doe.gov/>). To harness the potential of the genome information, we need to create appropriate infrastructure facilities and human resources to face the challenges in the coming decades.

Plant Microbiomes and Genomics: Global food production needs to keep pace with the ever-growing human population of 7 billion which is expected to touch 10 billion by 2050. With shrinking cultivable area and consequent 'agricultural habitat loss' for sustained crop production, one of the approaches for ensuring, sustaining and enhancing agricultural productivity and nutritional security is by reducing the losses due to biotic and abiotic stress factors. Traditionally plant biotic stresses are managed by deploying resistant cultivars and application of chemical molecules. These approaches, though very effective, are not universally adopted in all situations. While crop resistance is not durable, the chemicals are not a sustainable solution as a long-term strategy. Therefore, novel and innovative approaches are, indeed, essential for mitigating crop losses. Plant-associated microorganisms are known to play a vital role in shaping and guiding plant growth, and development and confers defense against biotic and abiotic stresses.

In recent years microbe assisted crop production is gaining momentum as a supplementary strategy in agriculture that is expected to make a major impact on clean agricultural production. However, the vast diversity of microbial communities in plant-associated niches is not exploited properly for want of appropriate technologies.

With this background, the **Centre for Advanced Agricultural Science and Technology (CAAST)** under NAHEP is organizing a 2-weeks **International Workshop cum Training on "Plant Microbiomes: Theory and Application"**

COURSE OUTLINE

The training cum workshop has the following components:

Lectures on principles and practices of microbial metagenomic and metabarcoding techniques: The lectures on advanced genomic tools currently in use for the characterization and identification of microbiomes will be delivered by an expert team led by **Prof. Jos Raaijmakers**. Molecular taxonomic markers used for the authentic identification of microbes and plant pathogens will be covered. Basic knowledge of bioinformatic tools used in structural and functional microbiomes will be imparted.

A theoretical account of biological sample preparation for metagenome sequencing by various sequencing chemistries, nucleic acid isolation, quality checks, library preparation, and microbial genome sequencing and sequence data generation will be delivered by **Drs. Victor Carrion, Guillermo Guerrero Egido of Leiden University, the Netherlands, and national experts at ICAR**. Lectures on data handling, genome assembly, and *in silico* annotation leading to function prediction using advanced bioinformatic tools are scheduled in the programme.

Practicals: Hands-on training on Microbiome DNA/RNA isolation, and quantification; Culturomics (random, targeted isolation); Amplicon analysis - 16S rRNA gene, ITS; Genome assembly & comparative genomics; Metagenome analysis (antiSmash, dbCAN); Morphotyping of bacterial species; Phenotypic fingerprinting of bacteria; Volatilome and metabolome screening; Metabolome extraction, Chemical profiling; assay on microbiome conferred immunocompetence; MAMP triggered immunity assay; transcriptome analysis; qPCR data analysis etc will be covered.

Exposure visits to the state-of-the-art laboratory facilities will be made during the course of training.

Group activities: Student groups will be allotted a set of topics for discussion and moderation. Students are expected to bring their laptop computers. The presentation will be facilitated by Prof. Raaijmakers and the team

Application deadline: 30 November 2022