Synergistic potential of plant growth promoting bacteria and arbuscular mycorrhizal fungi to improve wheat yield and biofortification and characterization of multiple abiotic stress tolerant bacteria

Ramakrishna Wusirika, Radheshyam Yadav and **Parikshita Rathore**
Central University of Punjab, India

The extensive application of inorganic chemical fertilizers on low-yielding agricultural fields is a severe concern. Microbial consortia comprised of native plant growth promoting bacteria (PGPB) and arbuscular mycorrhizal fungi (AMF) could be a potential solution for site-specific sustainable agricultural-management practices, leading to enhanced plant growth and grain yield. Abiotic stresses such as drought, salt and heat cause reduction of plant growth and loss of crop yield worldwide. The use of biofertilizers is the simplest and cheapest method to stimulate plant growth as well as provide protection against abiotic stress. In the present study, the best performing PGPB and AMF for biofortification and improved grain yield and soil health were identified after two-year field trials. Two bacterial isolates belonging to Bacillus species in combination with AMF showed the best results in macro and micronutrients content in grains and root tissue and yield-related parameters compared to the untreated control. Further, consistent improvement in thousand grain weight, biomass, grain iron, and soil organic carbon was observed. Proteomic, metabolomic and protein-metabolite interactions analyses of wheat inoculated with PGPB and AMF provided insights into the role of specific proteins and metabolites. Bacteria with plant growth promoting (PGP) traits and tolerance to multiple abiotic stresses were identified from soil samples and their co-occurrence was studied. Phosphate solubilizing bacteria (PSB) were the most abundant in all types of soils compared to other traits, Cu metal tolerant bacteria (CTB), salt-tolerant bacteria (STB) and antibiotic-resistant bacteria (ARB). Two bacterial isolates with PGP and abiotic stress tolerant traits are being characterized at the molecular level to understand the underlying mechanisms involved in multiple abiotic stress tolerance.

Speaker Biography

Ramakrishna Wusirika has completed his Ph.D. from University of Pune/ National Chemical Laboratory, India. He was a post-doctoral fellow at Purdue University, USA and a faculty member at Michigan Technological University, USA. Currently, he is Professor in Biochemistry department and Dean, Academics at Central University of Punjab, India. He is working on plant growth promoting bacteria and their applications to enhance crop productivity and biofortification as well as the biochemical and molecular mechanisms involved in the process. He has over 75 publications that have been cited over 5270 times, and his publication H-index is 35 and has been serving as an editorial board member and associate editor of reputed journals.

e: rk.wusirika@cup.edu.in

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