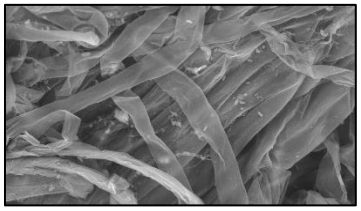

Deciphering the molecular mechanisms underlying the interaction of *Bacillus velezensis* strain B26 with the model plant *Brachypodium distachyon*

Oral Defence by PhD Candidate Meha Sharma

Department of Plant Science

January 25, 2023 @ 1:00pm — Zoom Video Conference

Abstract

Host-associated plant growth-promoting rhizobacteria (PGPR) influence plant health. The metabolites secreted from root exudates are used by PGPR as food and energy source. In the present study, we investigated the role of *Brachypodium distachyon* root exudates and organic acids in recruiting *Bacillus velezensis* strain B26. GC-MS analysis of root exudates of B26 inoculated *B.distachyon* revealed the highest levels of fumaric and succinic acid production than control root exudates. Genes encoding the enzymes malate dehydrogenase (MDH) and citrate synthase (CS) for the production of malate and citrate respectively were significantly upregulated in inoculated roots. These organic acids helped in successful recruitment and colonization of *B. velezensis.* We also screened four *B. distachyon* genotypes with varied flowering stages for their ability to be colonized by *B. velezensis*. All accessions differentially responded to B26 inoculation in terms of phenotypic expression. Phenotypic data showed an increase in the number of awns which led us to investigate expression of *Brachypodium* flowering genes. We characterized the expression patterns of *B. distachyon* flowering genes *FT1*, *FT2*, *VRN1* and *VRN2* in response to *B.velezensis* inoculation and found that strain B26 modulates the transcript abundance of flowering genes. CT-scanning was used to estimate the root volume of inoculated plants, and increased root volume suggested that B26 is responsible for altering the root architecture. Accession Bd21-3 was further analyzed using a transcriptomics approach. Differential gene expression studies were conducted between control and inoculated roots of Bd21-3. We observed that B26 colonization caused differential expression of a diverse set of genes in inoculated roots. Taken together, this study identified the molecular basis of a) plant-PGPR interaction b) biofilm formation c) plant growth promotion d) the priming ability of PGPR.

Meha Sharma holds a bachelor's degree in Biotechnology Honors from Panjab University, India. She then pursued a master's degree in Plant Biotechnology from Punjab Agricultural University, India. After completing her master's, she worked as Senior Research Fellow in Punjab Agricultural University for two years. She is currently a PhD candidate in Department of Plant Science under supervision of Dr. Suha Jabaji. Her research focuses on identifying the molecular mechanisms behind plant-microbe interaction using molecular and bioinformatics tools.