Proteomic study on growth promotion of PGPR inoculated aerobic rice (Oryza sativa L.) cultivar MR219-9

ABSTRACT

The plant growth promoting rhizobacteria (PGPR) perform substantial growth enhancement of aerobic rice. Study was conducted at Universiti Putra Malaysia using 2-dimensional polyacrylamide gel electrophoresis (2-D PAGE) strategy to identify mechanisms for rice plant growth promotion by PGPR inoculation. In this study, diverse expressed proteins were determined by mass spectrometry (MS). Aerobic rice seedling (MR219-9) was grown in the soil and PGPR strains of Stenotrophomonas maltophilla and Bacillus spp. were inoculated separately and or as combined bacterial consortium. Leaf sheath and other plant parts were collected after 45 d of transplanting for the analysis of proteins. A total of 153 spots were found and from which 12 proteins were identified. All proteins were varied in MS analysis and exposed the differential expression. The identified proteins were tolerant to abiotic stresses (13.2%), disease resistance (10%), oxidation reduction process (10%), photosynthesis (16.62 μmol CO2 m–2 s–1), involved in the protein synthesis (23.28%), metabolism (13.6%) and related to internal plant physiological functions (13.29%). Beside protein identification, phenotypic characters, such as plant height and photosynthetic activity were measured. The highest plant height and length of root, tiller numbers and nutrients uptake were observed in PGPR inoculated treatments. PGPR inoculation increased leaf chlorophyll contents and net photosynthesis rate of inoculated aerobic rice. Hence, using plant proteomic approach it is proved that various designated proteins are responsible for the plant growth promotion of PGPR inoculated aerobic rice cultivar MR219-9.

Keyword: 2-D PAGE; Bacterial consortium; Rice leaf sheath; Plant growth promotion; Proteomics