

Effect of salt-tolerant bacterial inoculations on rice seedlings differing in salt-tolerance under saline soil conditions

ABSTRACT

Salt-tolerant plant growth-promoting rhizobacteria (PGPR) could be an alternative to alleviate salinity problems in rice plants grown in the coastal areas. This study was conducted to isolate and characterize salt-tolerant PGPR and observe their effects on the physiological and biochemical properties of rice plants grown under non-saline and saline glasshouse conditions. Three strains were selected based on their salt-tolerance and plant growth-promoting properties under in vitro saline conditions. These strains were identified as *Bacillus tequilensis* (UPMRB9), *Bacillus aryabhattai* (UPMRE6), and *Providencia stuartii* (UPMRG1) using a 16S rRNA technique. The selected strains were inoculated to three different rice varieties, namely BRRI dhan67 (salt-tolerant), Putra-1 (moderate salt-tolerant), and MR297 (salt-susceptible) under glasshouse conditions. Results showed that the MR297 rice variety inoculated with UPMRB9 produced the highest total chlorophyll content, with an increment of 28%, and lowest electrolyte leakage of 92%. The Putra-1 rice variety also showed a 156% total dry matter increase with the inoculation of this bacterial strain. The highest increase of relative water content and reduction of Na/K ratio were found upon inoculation of UPMRE6 and UPMRB9, respectively. The biggest significant effects of these bacterial inoculations were on relative water content, electrolyte leakage, and the Na/K ratio of the BRRI dhan67 rice variety under saline conditions, suggesting a synergistic effect on the mechanisms of plant salt-tolerance. This study has shown that the application of locally-isolated salt-tolerant PGPR strains could be an effective long-term and sustainable solution for rice cultivation in the coastal areas, which are affected by global climate change.

Keyword: PGPR; Salt-tolerant; Rice; Salinity; Dry matter