

## **Characterization of salt-tolerant plant growth-promoting rhizobacteria and the effect on growth and yield of saline-affected rice**

### **ABSTRACT**

In this study, we characterized, identified, and determined the effect of salt-tolerant PGPR isolated from coastal saline areas on rice growth and yield. A total of 44 bacterial strains were isolated, and 5 were found to be tolerant at high salt concentration. These isolates were further characterized for salinity tolerance and beneficial traits through a series of quantitative tests. Biochemical characterization showed that bacterial survivability decreases gradually with the increase of salt concentration. One of the strains, UPMRB9, produced the highest amount of exopolysaccharides when exposed to 1.5M of NaCl. Moreover, UPMRB9 absorbed the highest amount of sodium from the 1.5M of NaCl-amended media. The highest floc yield and biofilm were produced by UPMRE6 and UPMRB9 respectively, at 1M of NaCl concentration. The SEM observation confirmed the EPS production of UPMRB9 and UPMRE6 at 1.5M of NaCl concentration. These two isolates were identified as *Bacillus tequilensis* and *Bacillus aryabhattai* based on the 16S rRNA gene sequence. The functional group characterization of EPS showed the presence of hydroxyl, carboxyl, and amino groups. This corresponded to the presence of carbohydrates and proteins in the EPS and glucose was identified as the major type of carbohydrate. The functional groups of EPS can help to bind and chelate Na<sup>+</sup> in the soil and thereby reduces the plant's exposure to the ion under saline conditions. The plant inoculation study revealed significant beneficial effects of bacterial inoculation on photosynthesis, transpiration, and stomatal conductance of the plant which leads to a higher yield. The *Bacillus tequilensis* and *Bacillus aryabhattai* strains showed good potential as PGPR for salinity mitigation practice for coastal rice cultivation.