

ABSTRACT

Rice is the staple food in Sri Lanka. New improved rice varieties are cultivated for efficient production to meet the increasing demand in Sri Lanka. However, rice yields of new improved varieties heavily depend on synthetic fertilizer, which cause economical, environmental and health hazards. Therefore, identification of alternative fertilization methods is required for sustainable rice production. Use of plant associated beneficial bacteria could be one of the best solutions to overcome these problems. Therefore, the effect of nitrogen fixing bacterium *Bradyrhizobium* (ORS 278) and some locally isolated bacteria in Sri Lankan wild, traditional and improved rice was determined for future use in rice research. *Bradyrhizobium* (ORS 278) enhanced the growth and yield of Sri Lankan rice under *in vitro* and greenhouse conditions. Harvest index, total chlorophyll content and filled grain percentage significantly increased in inoculated plants. Improved rice variety At 308 inoculated with *Bradyrhizobium* could grow on nitrogen free Jensen's medium (*in vitro*) while non-inoculated plants did not survive for 2 weeks. Heterosis of response to *Bradyrhizobium* was evident in responsive parents and F1 plants.

Forty-four bacterial isolates were collected from four species of Sri Lankan wild rice and two weedy legumes of rice fields. All isolates were morphologically characterized and fourteen isolates were partially identified through 16S rRNA genes sequencing. *Bradyrhizobium* (ORS 278) and local isolate *Bacillus megaterium* have shown plant growth promoting activities such as phosphate solubilizing ability, protease producing ability and growth on a nitrogen free medium *in vitro*. These results indicate the importance of *Bradyrhizobium* and other beneficial endophytic Plant Growth Promoting Bacteria (PGPB) for future rice research particularly rice breeding.