ABSTRACT

Plant growth promotion by rhizobacteria is a known phenomenon, but in the present study we tried to find important strains which have revolutionary effect on plant growth. Plant growth-promoting rhizobacteria (PGPR) are potential agents for the biological control of plant pathogens. We searched for those PGPR strains that are associated with oil seed and medicinal plants to investigate the mechanisms that are involved in plant growth-promotion. The application of PGPR is seen as being very attractive method since it would promote plant growth with potential biofertilizer, biocontrol and bioremediation activities without using agrochemicals. But many times the PGP activities are lost in the presence of pesticides.

Herein, we isolate rhizobacterial strains with plant growth promoting activities. We isolated DMR 1c from field grown Brassica campestris (mustard); TSR 7c, TSR 10a and TSR 23a from Sesamum indicum L. (Sesame); LRS 6a from Linum usitatissimum (Flax); DVR 20f from Catharanthus roseus (Periwinkle); and PCR 25d from Centella asiatica (Brahmi) rhizosphere. The strains were characterized for different PGP traits such as phosphate solublization, IAA production, nitrogen fixation, ammonia production and biocontrol activities such as siderophore production and antifungal activity. All strains (DMR 1c, TSR 7c, TSR 10a, TSR 23a, LRS 6a, DVR 20f and PCR 25d) were checked for antifungal activity against Alternaria sp., Fusarium sp., Pythium sp., Rhizoctonia sp. and Rosellinia sp. in dual culture plate assay. Mustard isolate DMR 1c, sesame isolates TSR 7c and TSR 23a, Madagascar periwinkle isolate DVR 20f, and brahmi isolate PCR 20f being strong PGPR’s were identified with 16S rRNA gene sequencing. These were found to belong Burkholderia sp. Sesame isolate TSR 10a was identified as Acinetobacter sp. with 16S rRNA gene sequencing. In vitro seed bacterization with three DMR 1c, TSR 7c and TSR 23a PGPR Burkholderia spp. improved root and shoot growth of maize plant.

This study was also navigated to examine the effects of different pesticides on the activities of isolated PGP Burkholderia spp. As compared to the previous reports our strains showed better resistance to pesticides for their PGP activities. Pesticides at the 1 mg/l dose had minor reducing effect while the doses 10 mg/l and 100 mg/l dose significantly reduced the PGP activities worldwide. Chlorpyrifos is one of the most widely used insecticides in agriculture. We also determined the chlorpyrifos degradation ability of DMR 1c, TSR 7c, DVR 20f and TSR 23a rhizobacterial isolates. Levels of chlorpyrifos in minimal salt medium (MSM) were analyzed spectrophotometrically. We found that PGP strains were able to degrade 87–95 % of chlorpyrifos
within 72 h. Interestingly, pretreatment of seeds with *Burkholderia* spp. strongly inhibited the deleterious effects of chlorpyrifos on the maize seed germination and overall growth of seedlings. These findings suggest that the isolated *Burkholderia* spp. strains are promising candidates for biofertilizer, biocontrol and bioremediation even in the presence of pesticides.

**Keywords:** Rhizosphere, *Burkholderia*, Plant pathology, Biocontrol, Bioremediation, Pesticide