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Characterization of osmotolerant rhizobacteria for plant growth promoting activities *in vitro* and during plant-microbe association under osmotic stress

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Osmotic stress has a detrimental effect on growth and plant growth promoting activities (PGP) of rhizobacteria. Thus, before exploring the potential of a rhizobacterium as bioinoculant for drought prone areas, it is essential to understand the effect of osmotic stress on their PGP traits. Here, we characterized two osmotolerant bacteria *Bacillus* sp. and *Bacillus cereus* for their PGP activities with *Brassica* sp. under osmotic stress conditions. Osmotic stress did not appear to have any deleterious effect on their growth. Lower level of osmotic stress (20% PEG 6000) in fact improved their growth. Both the rhizobacterial strains possessed multiple PGP activities. Lower level of osmotic stress had beneficial effect on most of the PGP activities, while higher level of osmotic stress (40% PEG 6000) had a detrimental effect on ACC deaminase activity and GA production. Variable effect of osmotic stress on the different PGP activities of the osmotolerant rhizobacteria during plant-microbe association was observed. Lower level of osmotic stress enhanced IAA and exopolysaccharide production while GA production was reduced. Further increase in osmotic stress had a detrimental effect on IAA production, while exopolysaccharide production was enhanced. However, ethylene production by the inoculated plants was reduced under stressed conditions. Inoculation with the osmotolerant rhizobacterial strains enhanced seed germination and seedling fresh weight in mustard under osmotic stress conditions. Thus, these osmotolerant *Bacillus* sp. and *Bacillus cereus* strains have potential as bioinoculants for mitigation of water deficit stress in plants in drought affected regions.

Keywords: Abiotic stress, *Bacillus*, Bioinoculants, *Brassica*, Drought, Mustard, PGP activities