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Plant Growth Promotion and Biocontrol Potential of Salt Tolerant Native Rhizobacteria from Coastal Saline Zone of West Bengal

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Abstract

Salt stress is one of the major problems in crop productivity under coastal saline belt of West Bengal and the salt stress situation is aggravated under post cyclonic *Aila* period. The tidal surge of cyclonic *Aila* caused floods over the entire Coastal region of Bay of Bengal which brought high salinity across the coastal regions of West Bengal and posed a serious threat on agricultural crop production. In the present investigation attempts were made for the enumeration, characterization and application of the most efficient native rhizo-microbial inoculants for accruing benefit to agricultural crop production in the problematic saline soil. In this study, seventy six number of rhizobacteria were isolated from rhizosphere of bani, dhani, horkoch grass, ground nut, onion and sunflower collected from costal belt of West-Bengal. The native rhizobacteria isolated from rhizosphere of different plants were categorized into three groups based on the average salt tolerance. Based on antagonistic activity against *Sclerotinia sclerotiorum,* the forty one native rhizobacterial isolates were classified into three clusters. Cluster I contained 21 isolates (51.22%) which were highly antagonistic. Cluster II contained 12 moderately antagonistic isolates (29.27%) and Cluster III contained 8 isolates (19.51 %) which were low in antagonistic activity. Based on antagonistic activity against *Rhizoctonia solani,* rhizobacterial isolates were broadly classified into two main groups of which Group A contained high antagonistic isolates whereas Group B contained isolates of comparatively lower antagonistic potentiality. The seven halo-tolerant rhizobacterial isolates (C16I, G2, P4, BR21, BR23, C19 and C20) with potent antagonistic activity were selected for field evaluation under Regional Research Station (Coastal Saline Zone), BCKV, Kakdwip, South 24-Parganas, West Bengal. These seven rhizobacterial isolates were identified as *Bacillus* sp on the basis of colony morphology, shape, biochemical and molecular characterization. These bacteria were assessed for the production of indole-3-acetic acid (IAA), ammonia, salicylic acid, siderophore, hydrogen cyanide (HCN) production and chitinase activity. It was observed that the isolates had significant variation in the production of various secondary metabolites. Salicylic acid production was highest for the isolates G2 (5.40) and BR23 (5.20) whereas isolate P4 (3.50) and BR21 (3.20) were the lowest producers. Siderophore and HCN production of rhizobacterial isolates were identified as the contributing factors towards the antagonistic activity against *S. sclerotiorum* and *R. solani,* respectively. The native rhizobacterial isolate BR23 (*Bacillus subtilis)*, C20 (*Bacillus cereus*), C16I (*Bacillus subtilis*) and G2 (*Bacillus velezensis*) exhibited higher plant growth characteristics and yield of cowpea under RRS, Kakdwip costal belt farm.

Key words: Antagonism, biofertilizer, plant growth promoting rhizobacteria (PGPR), salt tolerance, secondary metabolites

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