

## Screening of Plant Growth Promoting Rhizobacteria in the Rhizo- and Endosphere of Sunflower (*Helianthus anus*) and Their Role in Enhancing Growth and Yield Attributing Traits and Colonization Studies

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**Abstract :** Plant growth-promoting rhizobacteria (PGPR) are free-living soil bacteria that aggressively colonize the rhizosphere/plant roots, and enhance the growth and yield of plants when applied to seed or crops. Root associated (endophytic and rhizospheric) PGPR were isolated from Sunflower (*Helianthus anus*) grown in soils collected from 16 different sites of sub division Dhirkot, Poonch, Azad Jammu & Kashmir, Pakistan. A total of 150 bacterial isolates were isolated, purified, screened in vitro for their plant growth promoting (PGP) characteristics. 11 most effective isolates were selected on the basis of biochemical assays (nitrogen fixation, phosphate solubilization, growth hormone production, biocontrol assay, and carbon substrates utilization assay through gas chromatography (GCMS), spectrophotometry, high performance liquid chromatography HPLC, fungal and bacterial dual plate assay and BIOLOG GN2/GP2 microplate assay respectively) and were tested on the crop under controlled and field conditions. From the inoculation assay, the most promising 4 strains (on the basis of increased root/shoot weight, root/shoot length, seed oil content, and seed yield) were than selected for colonization studies through confocal laser scanning and transmission electron microscope. 16Sr RNA gene analysis showed that these bacterial isolates belong to *Pseudomonas*, *Enterobacter*, *Azospirillum*, and *Citobacter* genera. This study is the clear evident that such isolates have the potential for application as inoculants adapted to poor soils and local crops to minimize the chemical fertilizers harmful for soil and environment

**Keywords :** PGPR, nitrogen fixation, phosphate solubilization, colonization

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