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## PGPR: Useful tools for improving the *Cicer arietinum* L. (chickpea) crop

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Plant Growth-Promoting Rhizobacteria (PGPR) are the rhizosphere bacteria that can enhance plant growth by a wide variety of mechanisms. The potentiality of PGPR in agriculture is steadily increased as it offers an attractive way to replace the use of chemical fertilizers, pesticides and other supplements. The objective of this study was to find the compatible PGPR strains for chickpea crop, a major pulse crop in Pakistan. For this purpose, we focused on the photosynthesis and proteome analysis of PGPR treated and non-treated plants of chickpea. Three plant growth promoting *Bacillus* strains Sa-65, D-6 and K-39 were used to investigate their effects on growth, photosynthesis and proteome of five chickpea varieties namely Pb-1, Padir-19, CM-2008, K-01019 and 01004. The results showed that variety K-01019 grown under controlled condition was best in growth as compared to other four varieties. It was observed that the application of PGPR strain K-39 significantly increased the fresh and dry biomass of variety Pb-1. Strain D-6 showed better results in term of increased growth in variety CM-2008. The chlorophyll transients showed that there is a slight decrease in the fluorescence of K-39 treated plants of variety Pb-1. In variety Padir-19 the decrease in fluorescence was recorded in plants treated with K-39 and D-6 strains. These results suggested that the strain K-39 and D-6 were found to be more efficient for growth promotion of different varieties of chickpea as compared to strain Sa-65. Furthermore, differential protein bands of approximately 150 and 20 KDa were observed in K-39 treated plants of varieties Pb-1 and CM-2008 which were not present in controls of respective varieties. This study provides useful tool to improve growth of chickpea crop by applying PGPR strains K-39 and D-6.

### Biography

Kausar Hussain Shah is involved in teaching and research at the Institute of Pure and Applied Biology, Bahauddin Zakariya University, Multan, Pakistan. He has obtained his MSc in Botany from IP&AB, BZU Multan, Pakistan; MPhil in Molecular Biology from CEMB, University of the Punjab Lahore, Pakistan and PhD in Plant Biotechnology from IPS, BOKU University Vienna, Austria. His research interests include crop improvement by applying PGPR, Plant biotic/abiotic stress tolerance, plant antimicrobial/anti-cancerous/insecticidal agents such as proteins/peptides, molecular plant-microbe interaction, genetic engineering in plants and molecular-farming.

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