Evaluation of *Pseudomonas stutzeri* and *Bacillus subtilis* Strains for Plant Growth Promotion Potential on *Capsicum annuum* L.

Amjid Khan[1,*], Rashid Abbas Khan[2], Tauqeer Ahmed Qadri[3]
[1]Department of Botany, University of Mianwali, Mianwali-42200, Pakistan
[2]Department of Botany, University of Education, Lahore, Pakistan
[3]Department of Biosciences, University of Wah, Wah Cantt, Pakistan
*Email: amjidniazi8@gmail.com

ABSTRACT

INTRODUCTION

Capsicum annuum L. commonly known as chilli and sweet pepper belongs to family Solanaceae and it is one of the most cultivated species of its genus *Capsicum*. It is being used as an important component of the human diet throughout the world as it is an excellent source of many antioxidant particles like quercetin, polyphenols and ascorbic acid (Fartianni *et al*., 2020). These are the major source of spices, many nutritional and biochemical compounds and mineral elements (Albsebaeai *et al*., 2020). The fruit of chilli is most consumed vegetable throughout world as it is mainly characterized by many minerals contend and vitamins. Besides this chilli contains a significant level of health promoting substance like carotenoids, flavonoids and polyphenols. Chilli is a significant source of income for many farmers in agro-industrial area (Palma *et al*., 2020).

Plant growth promoting rhizobacteria also known as PGPR are basically a beneficial microorganism which can be used as biofertilizers as PGPR enhances plant growth and yield (Azeem *et al*., 2021). These are the microorganisms which enhances the plant growth by various mechanisms in different environments (Madhavan, 2020). PGPR are the best alternative of chemical fertilizer as they enhance the productivity of agriculture. They Improves the plant growth by many physiological, molecular and biochemical pathways. PGPR stimulates growth of many plants by phosphorus solubilizing, nitrogen fixation, producing phytohormones like auxins gibberellins and vitamins (Sonbarse *et al*., 2020). PGPR bacteria which enhances the plant growth in different environments belongs to species of Pseudomonas, Klebsiella, Rhizobium, Alcaligens, Enterobacter, Azospirillum, Arthrobacter, Flavobacterium and Serratia (Kumari *et al*., 2020).

OBJECTIVES

The present research study was conducted to assess the PGPR role in the growth promotion of *Capsicum annuum* L.

METHODOLOGY

The PGPR of genus *Pseudomonas stutzeri* and *Bacillus subtilis* were used to inoculate the seeds of chilli prior to sowing at vegetative stage the physiological and biochemical activities of chilli plant were checked. The proline content of leaves was measured by the protocol of Bates *et al*., (1973). Chlorophyll and carotenoids content were determined using the protocol of Arnon, (1949). The phenolics content of leaves was measured by the protocol of Singleton *et al*., (1999). The flavonoids content of leaves was measured by the protocol of Zhishen *et al*., (1999).

RESULTS

Both the PGPR significantly increase the physiological and biochemical activities of the leaves of chilli plant as compared to untreated control (Figure **1**). The maximum increase in chlorophyll a, chlorophyll b, phenolics content of leaves when plant inoculated with *Pseudomonas stutzeri* which were 28%, 282% and 48% respectively and carotenoids, protein, proline and flavonoids 85.47%, 37.26%, 170% and 29% respectively when plant inoculated with *Bacillus subtilis* as compared to untreated control.

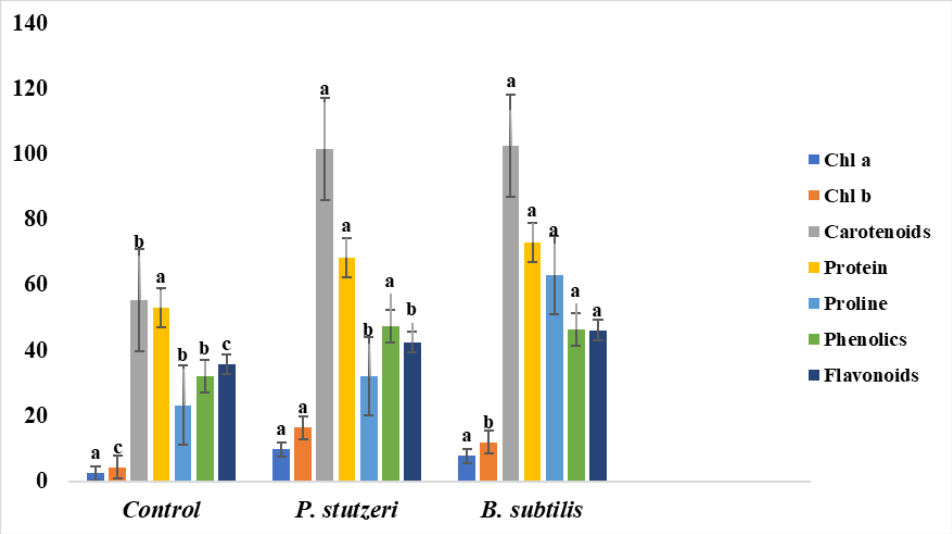

Figure 1. Effects of PGPR on chlorophyll a, chlorophyll b, carotenoids, protein, proline, phenolics and flavonoids activity of leaves at early vegetative stage. Values are mean of 3 replicates. Values followed by different letters are significantly different according to ANOVA, $P \leq 0.05$, Tukey's honest significant difference.

CONCLUSION

It is concluded from the recent study that the chilli is the source of spices and both the PGPR proved most effective in improving growth, physiological and biochemical activities of chilli plants.

Keywords: *Bacillus subtilis*, Flavonoids, *Pseudomonas stutzeri*, Phenolics, Proline, Protein.

ACKNOWLEDGEMENT

The authors are thankful to Mr. Mohsin Khan to analyze the data statistically.

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