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Boosting the Agrophysiological Performance of Chickpea Crop (Cicer Arietinum L.) Under Low-P Soil Conditions with the Co-application of Bacterial Consortium (Phosphate Solubilizing Bacteria and Rhizobium) and P-Fertilizers (RP and TSP Forms)

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Abstract : Chickpea (Cicer arietinum L.) is an important leguminous crop grown worldwide and plays a significant role in humans' dietary consumption. Alongside nitrogen (N), low phosphorus (P) availability within agricultural soils is one of the major factors limiting chickpea growth and productivity. The combined application of beneficial bacterial inoculants and Rock P-fertilizer could boost chickpea performance and productivity, increasing P-utilization efficiency and minimizing nutrient losses under P-deficiency conditions. A greenhouse experiment was conducted to evaluate the response of chickpeas to two P-fertilizer forms (RP and TSP) under N2-fixer and P-solubilizer consortium inoculation to improve biological N fixation and P nutrition under P-deficient conditions. Under inoculation, chickpea chlorophyll content and chlorophyll fluorescence (RP+I and TSP+I) were increased compared to uninoculated treatments. The RP+I treatment increased both shoot and root dry weights by 48,80% and 72,68%, respectively, compared to the uninoculated RP fertilized control. Indeed, the bacterial consortium contributed to enhancing root morphological traits (e.g., root volume, surface area, and diameter) of all inoculated treatments versus the uninoculated treatments. Furthermore, soil available P and root inorganic P were significantly improved in RP+I by 162,84% and 73,24%, respectively, compared to uninoculated RP control. Our research outcomes suggest that the co-inoculation of chickpeas with N2-fixing, and P-solubilizing bacteria improves biomass yield and nutrient uptake. Eventually, enhancing chickpea agrophysiological performance, especially in restricted P-availability conditions.

Keywords : chickpea, consortium, beneficial bacterial inoculants, phosphorus deficiency, rock p-fertilizer, nutrient uptake
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