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Influence of Genotypic Variability on Symbiotic and Agrophysiological Performances of Chickpea Under Mesorhizobium-PSB Inoculation and RP-Fertilization Likely Due to Shipping Rhizosphere Diversity

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Abstract : Chickpea (Cicer arietinum L.) is an important leguminous crop grown worldwide and the second most important food legume in Morocco. In addition, chickpea plays a significant role in humans' dietary consumption; it has a key ecological interest in terms of biological N-fixation (BNF), having the ability to symbiotically secure 20-80% of need. Alongside nitrogen (N), low soil phosphorus (P) availability is one of the major factors limiting chickpea growth and productivity. After nitrogen, P is the most important macronutrient for plant growth and development, as well as the BNF. In the context of improving chickpea symbiotic performance, co-application of beneficial bacterial inoculants (including Mesorhizobium) and Rock P-fertilizer could boost chickpea performance and productivity, owing to increasing P-utilization efficiency and overall nutrient acquisition under P-deficiency conditions. A greenhouse experiment was conducted to evaluate the response of two chickpea varieties (Arifi "A" and Bochra "B") to the co-application of RP-fertilizer alongside Mesorhizobium and phosphate solubilizing bacteria (PSB) consortium under P-deficient soil in Morocco. Our findings demonstrate that co-applying RP50 with bacterial inoculant significantly increased NDW by 85.71% and 109.09% in A and B chickpea varieties, respectively, compared to uninoculated RP-fertilized plants. Nodule Pi and leghemoglobin (LHb) contents also increased in RP-fertilized bacterial inoculant plants. Likewise, shoot and root dry weights of both chickpea varieties increased with bacterial inoculation and RP-fertilization. This is due to enhanced Pi content in the shoot (282.54% and 291.42%) and root (334.30% and 408.32%) in response to RP50-Inc compared to unfertilized uninoculated plants for A and B chickpea varieties, respectively. Rhizosphere available P was also increased by 173.86% and 182.25% in response to RP50-Inc as compared to RP-fertilized uninoculated plants, with a positive correlation between soil available P and root length in inoculated plants of A. and B. chickpea varieties (R= 0.49; 0.6) respectively. Furthermore, Mesorhizobium was among the dominant genera in the rhizosphere bacterial diversity of both chickpea varieties. This can be attributed to its capacity to enhance plant growth traits, with a more pronounced effect observed in B. variety. Our research demonstrates that integrated fertilization with bacterial inoculation effectively improves biological N-fixation and P nutrition, enhancing the agrophysiological performance of Moroccan chickpea varieties, particularly in restricted P-availability conditions.

Keywords : chickpea varieties, bacterial consortium, inoculants, Mesorhizobium, Rock-P fertilizer, phosphorus deficiency, agrophysiological performance
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