Title: Influence of phosphate-solubilizing bacteria on phosphorus content and growth of cotton in presence of phosphorus fertilizer

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Abstract

The usage of phosphate-solubilizing bacteria (PSB) as bioinoculants increases the availability of phosphorus (P) in soil and promotes sustainable agriculture. In this study, we evaluated the influence of PSB on both phosphorus content and growth on cotton. Four strains isolated from Caribbean region of Colombia were used: RG58A, RG56A, SP20, and B02. We assessed *in vitro* inorganic phosphate solubilization using tricalcium and iron phosphate, and phosphoric rock as a sole source of phosphorus, as well as phosphatase activity and indolic compounds synthesis. Cotton response in terms of biomass and P content to bacterial inoculation were measured under greenhouse conditions after three months of sowing. All experiments were carried out in a soil amended with 10% single superphosphate. We observed that all evaluated strains were able to *in vitro* solubilize all inorganic sources of P, produce acid and alkaline phosphatases, and also auxins. Interestingly, the strain SP20 (8207 µg $PO_4^{-3}mL^{-1}$ from $Ca_3(PO_4)_2$), B02 (7.62 phosphatase units at acid pH), and RG56A (19.490 IAA mg mL^{-1}) displayed the highest rates of phosphate solubilization, phosphatase activity, and indole production, respectively. Greenhouse experiments showed that SP20 increased both biomass and phosphorus accumulation in plant tissue by 24.5% and 23%, respectively. These results suggest that phosphorus solubilization *in vitro* not necessarily associates to plant growth promotion; hence, plant growth promotion might be also attributed to other plant growth-promoting traits. We conclude, therefore, that plant inoculation with the P-solubilizing bacteria increases the efficiency of superphosphate fertilizer use, where SP20 displayed the best results.

Keywords: Phosphate-solubilizing bacteria, bioinoculants, cotton, phosphorous uptake.

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