Effectiveness of *Aspergillus japonicus* in improving soil phosphate availability in cinnamon plantations

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Use of phosphate solubilizing microorganisms is an inexpensive strategy that can confer solubility of insoluble phosphates (P). *Aspergillus japonicus,* an effective native phosphate solubilizer identified by whole genome sequencing in a previous study was used to investigate the effectiveness of improving soil P in cinnamon (*Cinnamomum verum* Presl syn. *Cinnamomum zeylanicum* Blume) cultivations. A field experiment was conducted at Ekarella Estae, Opanayake, Sri Lanka. Randomized Complete Block Design (RCBD) with nine treatments and three blocks was employed. A total of 27 plots were accommodated with six plants/plot. The treatments were: Inoculum (I)+Carrier material (CM) [T1]; I+CM+Eppawala rock phosphate (ERP) Recommendation [T2]; I+CM+50% of ERP Recommendation [T3]; CM [T4]; CM+ERP Recommendation [T5]; CM+50% of ERP Recommendation [T6]; No ERP [T7]; ERP Recommendation [T8] and 50% of ERP Recommendation [T9]. Muriate of potash and urea were added to all the treatments. Pits (30 cm x 30 cm x 30 cm) were filled with compost and a mixture of ERP and 50 g of inoculum (spore density- 6.5×10^8 g^{-1}) was applied. Then, four-month old seedlings were planted, four per pit. After six months, NPK fertilizers were applied as per the recommendations of the Department of Export Agriculture followed by a second inoculum application (50 g) after 2 months of NPK application. Soil sampling was done quarterly for a year and analyzed for available P by Bray method. The data were statistically analyzed by using SAS package. A significant difference was noted ($p<0.05$) between the three blocks at first and second sampling but not in the third and fourth samplings. Even though not significantly different ($p>0.05$), all inoculated treatments showed higher mean available P contents throughout the sampling period compared to the recommendation. At first sampling T3, T1 and T2 treatments had soil available P contents of 12.17±2.96, 11.44±3.94 and 8.28±3.45 mg Kg^{-1} soil, respectively while the recommendation (T8) showed only 5.82±1.19 mg Kg^{-1} soil. At second sampling the T3, T2 and T1 had 9.04±1.57, 8.52±0.84 and 7.85±0.64 mg Kg^{-1} soil while T8 showed only 7.56±0.92 mg Kg^{-1} soil. This trend was evident with third and fourth samplings. Interestingly, inoculum alone gave a higher soil P content than ERP alone treatment. Accordingly, it is evident that application of *A. japonicus* can improve the soil available P status of cinnamon plantations.

Keywords: *Aspergillus japonicus*, biofertilizer, cinnamon, soil available phosphates
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