DEVELOPMENT OF A FUNGAL INOCULUM FOR BIOSOLUBILIZATION OF EPPAWALA ROCK PHOSPHATES

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Eppawala Rock Phosphate (ERP) is a che[illegible]phosphate-rich source. Due to its low solubility, usages are confined to perennial crops as a phosphorus (P) fertilizer. Phosphate-solubilizing microorganisms (PSM) including fungi, bacteria and actinobacteria have been identified as good agents for increasing the solubility of rock phosphate. Hence this study was conducted to develop fungal inoculum to enhance the biosolubilization of ERP. Three experiments (two cultural broth studies and a leaching tube study) were conducted in laboratory conditions with Completely Randomized Design (CRD) by maintaining three replicates for each treatment. All the data were statistically analyzed using analysis of variance (ANOVA) and means were separated using Tukey's HSD test. Among four fungal isolates two most promising P solubilizers (Fungus isolated from rhizosphere soil - F_{Soil} and fungus isolated from ERP particles - F_{ERP}) were selected by three levels of screening. The efficiency of P solubilization of two selected isolates in Pikovskaya (PVK) and modified PVK liquid media containing ERP was evaluated using two parameters as; solubilized P concentration and media pH due to organic acid production during 24 hours incubation period. Results revealed that the F_{Soil} was efficient in solubilizing P in both PVK and modified PVK media. Significantly the highest ($p<0.05$) organic acid production denoted by the lowest pH of the cultural broth was observed in F_{ERP}. However, it's high assimilatory activity led to immobilize a large portion of solubilized P, possibly inside the microbial biomass. The results of the leaching tube experiment after the three months also confirmed the significantly highest ($p<0.05$) P solubilization by F_{Soil}. At the end of the media optimization study, it was observed that Glucose as carbon source, ammonium sulphate as nitrogen source and neutral pH (pH 7) can maximize the solubilization of P with F_{Soil}. Consenting all three experiments, it can be concluded that fungus isolated from F_{Soil} is most effective to be used as P solubilizing soil inoculant. Thus, further improvements are needed prior to introducing F_{Soil} as a P solubilizing fungal inoculum.

Keywords: Biosolubilization of phosphorous, Eppawala rock phosphate, Organic acids, Phosphate-solubilizing microorganisms