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Can Biofilm-Enriched Eppawala Rock Phosphate Replace the Use of Triple Super Phosphate in Rice Cultivation?

Jayaneththi J.P.H.U.[1*], Seneviratne G [2], Madawala H.M.S.P.[3], Amarasekara M.G.T.S.[1]

[1]Faculty of Agriculture, Rajarata University of Sri Lanka, Sri Lanka.
[2]National Institute of Fundamental Studies, Hanthana, Kandy, Sri Lanka.
[3]Faculty of Science, University of Peradeniya, Sri Lanka.
**harshaniupulika@gmail.com*

Abstract

Eppawala Rock Phosphates (ERP) has a greater potential to be used as an alternate for Triple Super Phosphate (TSP) if phosphorous (P) biosolubility is increased. A certain biofilm (BF3) has been identified as the most efficient P biosolubiliser for ERP. Thus, this study was designed to test the potential of replacing TSP from biofilm-enriched ERP in rice cultivation. Two experiments were conducted; soil leaching tube and pot experiments under controlled conditions. A modified chemical fertiliser (CF_M) mixture was developed by replacing TSP from ERP, in the existing chemical fertiliser (CF_E) mixture for rice recommended by the Department of Agriculture (DOA). Eleven treatments were used with all possible combinations of CF_E and CF_M at rates of 50% or 100% alone or together with the BF3. Soil alone was used as the control. Treatment of 50% CF_M+BF3 was denoted as biofilm-enriched ERP. The experiments were conducted in a completely randomized design (CRD) with three replicates. Data were statistically analyzed using analysis of variance (ANOVA) followed by mean separation using Turkey's HSD test. Solubilised P was recovered by leaching in every two weeks for three months. Available soil P, total plant P and grain yields were evaluated at the end of the pot experiment. Biofilm enriched ERP showed no added advantage over the CF_E, with lower cumulative solubilized P in leachates. At the end of the pot experiment; biofilm-enriched ERP showed significantly ($p<0.05$) higher P retention in soil and significantly ($p<0.05$) lower grain yield comparison to the CF_E. However, biofilm-enriched ERP showed no any significant ($p>0.05$) difference in total plant P. The overall results conclude that the biofilm-enriched ERP performed poorly in comparison to the DOA recommended TSP dosages. Thus, further studies are required to enhance the performance of biofilm-enriched ERP to use as an alternate for TSP in rice cultivation.

***Keywords*:** Biofilm, Eppawala Rock phosphate, Rice cultivation, Triple super phosphate