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**Quantification of Different Phosphate Fractions in Soils
Treated Separately with Triple Super Phosphate, Eppawela
Rock Phosphate and Imported Rock Phosphate in the Low
Country Intermediate Zone of Sri Lanka**

By
D.M.S.Duminda (B.Sc. in Agric. Spc, Hons)
Department of Chemistry
University of Kelaniya
Kelaniya
Sri Lanka

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ABSTRACT

The present study is aimed at investigation of both short term and long term effects of increasing different soil P fractions following application of two rock phosphates, viz., Imported rock phosphate (IRP) and Eppawela rock phosphate (ERP) in comparison to Triple super phosphate (TSP), which contains 100% soluble P, to lateritic soils in the Intermediate Zone of Sri Lanka. Long term effect was studied by analyzing the soils of an on-going field experiment, which situated on Andigama series soil at Ratmalagara Estate of the Coconut Research Institute. Short-term availability of different phosphate fractions was determined by a pot experiment that was carried out for six months using Ruzi grass (*Brachiaria ruziziensis* L.) as the indicator plant.

The field experiment consisted of biannual P treatments with TSP, IRP and ERP at three levels, viz., 50, 100 and 200 g P_2O_5 equivalents/palm/year that were laid out on a randomized block design with three replicates. Soil samples for the present study were taken after 11 years from the commencement of the experiment. Composite soil samples from the site were used for P fractionation analysis, which were prepared by mixing the soil depth-wise, 0-25 cm and 25-50 cm respectively, and treatment-wise, taken from 90 cm distance from three palms per each plot.

The pot experiment, in which Ruzi grass (*Brachiaria ruziziensis* L.) was grown on the same soil taken from the field experiment site, consisted of P treatments at levels of 15, 30, 60 mg P_2O_5 equivalents/ 100g soil separately applied with TSP, ERP and IRP as P sources. A set of fallow pots was also established with all the treatments but without grass to study the effect in the absence of grass. The treatments, levels of fertilizer applications and number of replicates of the pot experiment were selected to simulate the fertilizer application rate of the field experiment. The soil moisture content of all the pots was maintained at 60% field capacity. Phosphorus content of the grass and total dry matter yield were determined at bimonthly interval for six months. Soils of both field and pot experiments were analyzed for concentration of different phosphorus fractions, viz., Saloid bound phosphorus (Sa-P), Aluminium bound phosphorus (Al-P), Iron

bound phosphorus (Fe-P), Occluded phosphorus (Occ-P) and Calcium bound phosphorus (Ca-P) using modified fractionation procedure of Petersen and Corey (1957).

Results of short-term pot experiment showed that Ruzi grass utilized more Sa-P and Al-P than other P fractions, viz. Occ-P, Fe-P and Ca-P. The P uptake by Ruzi grass was low in both rock phosphate treatments and did not show a significant increase with the increase of the application rate. In contrast, TSP treatments showed linear increase of Sa-P and Al-P and of P uptake by Ruzi grass with the increase of application rate. The overall results of the pot experiment showed that whilst both rock phosphates were inferior to TSP and IRP was slightly better than ERP on short term as the former marginally increased P uptake of Ruzi grass as well as Sa-P fraction of the soil in six months compared to the control. ERP was found not beneficial in this respect.

Results of P fractionation of soil at 0 – 25 cm depth of the field experiment showed that efficiency of the three P fertilizer sources in increasing both Sa-P and Al-P fractions in the soil, which are useful for plants, was in the order of TSP >> IRP > ERP. Also both Sa-P and Al-P linearly increased with increase of TSP application rate but that effect was not seen in the case of both IRP and ERP. The major effect of TSP application was to increase P fractions in the order of Sa-P > Al-P > Occ-P > Fe-P > Ca-P. Conversely, major effect of IRP and ERP was to increase unavailable or slowly available P fractions in the order of Ca-P >> Fe-P > Occ-P. P fractionation of 25 – 50 cm depth also showed a similar trend in P fractions of the respective treatments. It indicated considerable movement of different P fractions has taken place over the 11 year period, probably as P compounds rather than dissolution followed by transport.

The overall results of both experiments showed that both IRP and ERP were inferior to TSP. However, IRP showed some beneficial effect both on short term and long term as it significantly increased Sa-P and Al-P in the soil. ERP was not effective in increasing readily available P fractions in the soil but it increased slowly available Ca-P in the soil.

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