

Phosphorus Reserves in a Tropical Ultisol under Vegetable Cultivation and Tropical Forests

D.M.M.R. Dissanayake¹, C.P. Attanayake^{1*},
U.W.A. Vitharana¹ and D.D.A.E. Hemamali²

¹*Department of Soil Science, Faculty of Agriculture*
²*Postgraduate Institute of Science*
University of Peradeniya, Peradeniya 20400, Sri Lanka
**chammiatt@pdn.ac.lk*

Land use causes a considerable impact on the composition of Phosphorus reserves in Soil. Understanding on forms and abundance of soil P is essential to make them available for crop production. This study was conducted to determine soil P fractions in a vegetable grown land in comparison to a natural forest in Nuwaraeliya, Sri Lanka. Both soils belonged to Ultisols soil order. Based on a primary data set, 28 sampling points were selected by conditioned Latin hypercube sampling method. Phosphorus fractions of topsoil (0-30 cm) and subsoil (30-60 cm) were determined using Hedley sequential P fractionation procedure. Readily available P, loosely and tightly bound P to Fe, Al and Ca bound P were extracted using distilled water, 0.5 M NaHCO₃, 0.1 M NaOH and 0.1 M HCl, respectively. Total and inorganic P in extractants were determined and the difference was taken as organic P. Finally residual P was determined. The total P concentration was significantly higher in vegetable soil (2423 mg/kg) than forest soil (345 mg/kg). In both land uses, total P concentration in the subsoil was more than 55% of that in the topsoil, indicating a significant P reserve in subsoil. Organic P fraction was 43% (of the total P) in forest soil whereas inorganic P fraction was 49% in vegetable soil. There was no significant difference in residual P fraction in both land uses. Readily available P and the P fraction loosely bound to Al or Fe were 17% and 25% in vegetable and forest soils, respectively. Majority of P in both land uses were in NaOH extractable form (50 - 43%) either in organic or inorganic form that tightly bound to Al or Fe components, plant cannot access. This study revealed that intensive vegetable cultivation has altered total soil P by increasing the unavailable pool. Thus, technologies need to be developed to utilize this fraction effectively.

Keywords: Phosphorus fractions, Phosphorus availability, Forest soil, Vegetable grown soil

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