

ENHANCEMENT OF PHOSPHORUS REMOVAL FROM WASTEWATER USING CLAY MIX MEDIA

S.R.G.T. Ariyaratna, D.M.S.H. Dissanayaka and A.G.D. Sandamini

*Department of Agricultural Engineering and Soil Science, Faculty of
Agriculture, Rajarata University of Sri Lanka, Anuradhapura, Sri Lanka.*

Murunkan Clay (MC) is a cost-effective and eco-friendly adsorbent to remove phosphorous (P) in greywater in constructed wetlands. Previous studies suggested that the maximum amount of clay needed to adsorb the P is lower than 20%. Therefore, this study focused on finding the most effective clay percentage by testing four different media made by mixing clay: sand in the ratios of 2:98, 6:94, 10:90 and 15:85. Grumusol soil (USDA taxonomy: Pellusterts) from Murunkan area was collected, and the soil was air-dried, crushed and sieved through a 2mm sieve and mixed with sand in given ratios. A set of leaching column experiments with a height of 30cm (polyvinyl chloride pipes) and a diameter of 6cm filled with sieved sand and Murunkan clay mixtures were conducted to characterise P movement in Murunkan clay. Phosphorus was added to the soil column using KH_2PO_4 at 50, 100 and 200 kg ha^{-1} , followed by irrigation. Leachates were collected, and PO_4^{3-} concentrations were measured. Furthermore, the physico-chemical properties of Murunkan soils of pH (soil/distilled H_2O : 1: 2.5), Cation Exchange Capacity (CEC), Electrical Conductivity (EC), Total Dissolved Solids (TDS), available P, organic carbon and particle density were analyzed using standard analytical methods. The data were analyzed using MS Excel and analysis of variance. The Cumulative Phosphate Phosphorus Concentration in leachate of 10:90 and 15:85 was lower than other two mixed media with fertilizer dosages that revealed P adsorption is highest in 10:90 and 15:85 clay: sand mixture ratios, and there was no any significant difference ($p > 0.05$) in P removal between the two soil mixtures. The results emphasized the high potential of the investigated Grumusols to remove P from wastewater. Further studies are recommended for selecting the most effective soil mixture to be used in the constructed wetlands.

Keywords: Adsorption, Grumusol, Leaching experiment, Murunkan, Phosphorus removal