PHOSPHORUS REMOVAL USING VERTICAL FLOW CONSTRUCTED WETLAND WITH MURUNKEN CLAY AMENDED SOIL MEDIA

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Intensive cultivation associated with high fertilizer usage and irrigation has caused health problems and eutrophication in water bodies. Excess nutrients, particularly the phosphorus (P) in water bodies is a major factor leading algal bloom. This study was conducted to assess the potential of Murunken clay soil as an amendment to adsorb P and to reduce its concentration in leachate. Leaching experiments were conducted in Soil and Water Science Laboratory, Faculty of Agriculture, Rajarata University of Sri Lanka, by using soil columns to characterize P movement in Murunken clay. Leaching columns with the height of 30 cm (polyvinyl chloride pipes) and diameter of 9 cm were filled with sieved sand and Murunken clay at the ratio of 9:1, 8:2 and 7:3. Phosphorus was added to the soil column as KH_2PO_4 at the rate of 50, 100 and 200 kg /ha followed by irrigation at the rates of 6, 12 and 18 mm with each fertilization. Leachates were collected and PO_4^{3-} concentrations were measured using standard methods. Breakthrough curves were developed in each scenario. Statistical analysis was done using analysis of variance with three factor factorial design ($p<0.05$). Results revealed that the peak phosphate flux and the attenuation varied with irrigation rate, fertilizer application and sand mix Murunken clay ratio. The lowest loss of about 1% was observed in 6 mm irrigation and 100 kg/ ha fertilizer in 7:3 sand mix clay filled column. In contrast, 44 % of loss was observed at 18 mm irrigation with 200 kg/ha fertilizer in 9:1 sand mix clay filled column. This clearly confirmed the diminished P leaching with increasing amount of clay content in the column. A significant interaction ($p<0.05$) was observed between fertilizer application and irrigation on phosphate leaching. Hence it can be concluded that the addition of Murunken clay soil can be more effective in reducing the removal of P from agricultural fields.

Keywords: Algal bloom, Amendment, Breakthrough Curves, Eutrophication, Irrigation, Phosphorus