

The effects of some humic substances and vermicompost on phosphorus transformation rate and forms in a calcareous soil

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Abstract

The role of some humic substances (HS) on phosphorus (P) bioavailability and fractions was investigated in a greenhouse study using a calcareous soil from Eastern, Iran. Soils were treated with two levels (2 and 4%) of Humic Acid (HA), Fulvic acid (FA), Vermicompost (Verm) and their mixtures including FA+HA and FA+HA+Verm, and incubated for 24, 360, 720 and 1080 h. The Olsen-P was determined in amended and non-amended soils after incubation time. The P release was modeled by Parabolic, Power and Elovich equations to determine the transformation rates. Since the maximum P release was found in vermicompost treated soil, P was sequentially extracted with H₂O, NaHCO₃, NaOH and HCl at 24 and 1080h after incubation. The highest released P was measured in vermicompost treatment and decreased as follows: HA+FA+Verm>HA+FA>HA>FA>CO. The decrease of P release data was best described by Parabolic equation ($r^2=0.83-0.93$, SE=0.51-2.91). Higher transformation indices of vermicompost amended soil than other treatments showed more efficiency of vermicompost to release of phosphorus in soil. H₂O-P, NaHCO₃-P and NaOH-P increased after vermicompost application and converted to HCl-P fraction so that at the end of the experiment, calcium phosphates comprised 69 and 43% of inorganic P (Pi) at 2 and 4% vermicompost treatments, respectively. Results of the study showed that humic substances could increase P extractability and availability in soil.

Keywords: Phosphorus fractionation, kinetic models, P release