



Effect of Ca:Mg ratio on precipitated P species identified using ^{31}P solid state NMR

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Agronomic efficiency of added P fertilizer is reduced by the precipitation reactions with the exchangeable Ca and Mg in calcareous soils. We hypothesized that the ratio of Ca to Mg on the soil exchange complex will affect the species of P that is precipitated and its solubility in the soil. A laboratory experiment was conducted using a model calcareous soil system which was composed of resin (Amberlite IRP69) and sand coated with CaCO_3 packed into a column. The resin was pre saturated with Ca and Mg in order to achieve five different saturation ratios of Ca:Mg approximately as 100:0, 70:30, 50:50, 30:70 and 0:100. Monoammonium Phosphate was applied to the soil surface to simulate one-dimensional diffusive transport. The column was then incubated for 2 weeks. Chemical analysis for water and acid soluble P, pH, NH_4^+ , Ca and Mg was performed on 2mm sections of the soil to a depth of 10 cm. This paper will present and discuss the distribution of P along the soil column. Unlike similar studies that have speculated on the precipitation of P, this study will identify and quantify the P species that is formed using ^{31}P solid state NMR technique. Such knowledge will be helpful in understanding the effect of Ca and Mg on P availability in calcareous system and the role of each cation on P precipitation.

Key words: P fertilizers, Ca, Mg, model system, solid state NMR