Effects of clinoptilolite zeolite on phosphorus dynamics and yield of Zea Mays L. cultivated on an acid soil

ABSTRACT

Efficient management of P fertilizers ensures good yield of crops and adequate food supply. In the acid soil of the tropics, soluble P is fixed by Al and Fe. Exploitation of the high CEC and pH of Clinoptilolite zeolite (CZ) could mitigate low soil pH and P fixation in acid soils. This study was undertaken to determine the effects of amending a weathered acid soil with CZ on: (i) soil P availability and other related soil chemical properties, and (ii) nutrient concentration, nutrient uptake, above-ground biomass, agronomic efficiency, and yield of Zea mays L. on a tropical acidic soil. Triple superphosphate (TSP), Egypt Rock phosphate (ERP), and Christmas Island Rock phosphate (CIRP) were used as P sources. The treatments evaluated were: (i) soil alone, (ii) 100% recommended fertilizer rate (NPK), and (iii) 75% fertilizer rate + Clinoptilolite zeolite. Selected soil chemical properties and P availability were determined before and after field trials. Zea mays L. above-ground biomass, nutrient concentration, nutrient uptake, agronomic efficiency, and fresh cob yield were also determined. Results revealed that the effects of treatments with and without CZ treatments on soil pH, P fractions, soil acidity, dry matter production, yield of maize, nutrient uptake, and agronomic efficiency were similar. Hence, suggesting CZ inclusion in the fertilization program of Zea mays L is beneficial in terms of reducing excessive or unbalanced use of chemical fertilizers due to reduction of fertilizers usage by 25%.