Reducing soil Phosphorus Fixation to improve yield of Maize on a Tropical Acid Soil using compost and Biochar Derived from Agro-Industrial Wastes

Abstract

Phosphorus is an essential element required to maintain profitable crop production. Most soils of the tropics, such as Ultisols, are acidic and fix phosphorus because of their characteristically high contents of aluminium and iron. Compost and biochar could be used to mitigate phosphorus fixation by reducing the phosphorus sorption sites. This study aimed to: (i) improve soil phosphorus availability, nutrient uptake, and yield of maize using biochar and pineapple leaf residue compost; and (ii) determine if the use of biochar and compost could exert a residual effect on phosphorus nutrition in the second cycle of the field trial. Field trials were carried out using a Zea mays L. hybrid as the test crop. At harvest, the plants were harvested, partitioned into leaves and stems, and analyzed. Soil samples were also collected and analyzed. Ears were harvested to determine the yield from each treatment. The results suggest that the soil total phosphorus and available phosphorus recovered from the treatments with the organic amendments were higher compared with the non-organic amendments. The availability of soil nutrients (nitrogen, potassium, calcium, magnesium, and sodium) in the soils and yield of maize were higher in the treatments with the organic amendments in the first and second field trials. These results further confirm that amending chemical fertilizers with organic amendments have a larger residual effect than chemical fertilizers only. Amending chemical fertilizers with organic amendments can be used to ameliorate phosphorus fixation of acid soils to improve maize production on acid soils.