

Biochar and compost influence the phosphorus availability, nutrients uptake, and growth of maize (*Zea mays* L.) in tropical acid soil

ABSTRACT

Most soils in the tropics are acidic, highly weathered, less fertile, and fix phosphorus. Organic amendments such as compost and biochar can be used to increase the nutrients availability in these soils. Thus, the objectives of this study were to (i) improve soil phosphorus availability using biochar and compost produced using chicken litter and pineapple leaves as feedstock, respectively and (ii) determine if the use of biochar, and compost could improve nitrogen, phosphorus, potassium, calcium, and magnesium uptake and dry matter production of *Zea mays* L. cultivated in tropical acid soil. An incubation study was carried out for 90 days. The treatments evaluated were soil only (T0), 300 g soil + 8.24 g ERP (T1), 300 g soil + 8.24 g ERP + 28.8 g biochar (T2), 300 g soil + 8.24 g ERP + 14.4 g compost (T3), and 300 g soil + 8.24 g ERP + 14.4 g compost + 28.8 g biochar (T4). Pot experiment was carried out using maize hybrid F1 as test crop. The treatments evaluated were 7 kg soil only (unfertilized condition) (T0), 7 kg soil + recommended NPK (5 g urea + 8.24 g ERP + 2.58 g MOP (T1), 7 kg soil + 5 g Urea + 8.24 g ERP + 2.58 g MOP + 769 g biochar (T2), 7 kg soil + 5 g Urea + 8.24 g ERP + 2.58 g MOP + 385 g compost (T3), and 7 kg soil + 5 g Urea + 8.24 g ERP + 2.58 g MOP + 385 g compost + 769 g biochar (T4). The organic amendments increased availability of nitrogen, potassium, calcium, and magnesium in the soil. They also increased soil pH to near neutral such that the soil's exchangeable aluminium and extractable iron which fix soil phosphorus were significantly reduced. As a result, phosphorus availability (total phosphorus, available phosphorus, inorganic phosphorus fractions, and organic phosphorus) in the soil was increased. The organic amendments also improved *Zea mays* L. nutrient uptake and dry matter production. The findings of this study suggest that the organic amendments can be used to ameliorate phosphorus fixation of acid soils to improve crop production on these soils.

Keyword: Phosphorus fixation; Chicken litter biochar; Pineapple leaves compost; Nutrient uptake; Dry matter production