

Minimizing phosphorus sorption and leaching in a tropical acid soil using Egypt rock phosphate with organic amendments

ABSTRACT

The study examined changes in soil phosphorus sorption and desorption, pH buffering capacity, and phosphorus leaching upon application of organic amendments (chicken litter biochar and pineapple leaf residues compost). The phosphorus sorption data were fitted to the Langmuir equation. Results revealed that at phosphorus concentrations of $<10 \text{ mg L}^{-1}$, sorbed phosphorus was significantly increased under treatments with organic amendments whereas more phosphorus was desorbed with increasing phosphorus application rates (10 to 20 mg L^{-1}). The decrease in phosphorus sorption was due to precipitation of exchangeable aluminum and extractable iron at the highly negatively charged humic substances functional group surfaces of the organic amendments. High pH buffering capacities were reported in the treatments with organic amendments compared with the treatment that used soil only. The cumulative loss of phosphorus in the treatments with organic amendments at 60 d of leaching was higher than that of the treatment without organic amendments. This effect was due to the low sorption and binding energy of biochar and pineapple leaf residues compost. Amendment of Egypt rock phosphate with biochar and pineapple leaf residues compost imposed high pH buffering capacity and improved phosphorus availability, but did not significantly reduce phosphorus leaching in the acid soil used in this study.

Keyword: Biochar; Pineapple leaf residues compost; pH buffering capacity; Phosphorus sorption and desorption; Phosphorus leaching