Use of Corn Cob and Rice Husk Biochar as Liming Materials in Acid Soils

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Abstract

Most soils in Ghana are acid with those of the Evergreen Rain Forest belt having Al toxicities. Unavailability, high cost and poor grade of conventional liming materials have led to poor yields of food crops grown on these acid soils. Preliminary works on biochar produced from agricultural waste in Ghana have shown that some types have high concentration of basic cations and contain $CaCO_3$, an active ingredient in conventional lime. Biochar could, therefore, be exploited for use as liming material. However, the biochar type that would be ideal for use as liming material in acid soils of Ghana has received little attention. Two typical acid soils viz., Typic Hapludox and Typic Hapludult were thus amended with corn cob and rice husk charred at 500 and 700 ^oC at a rate of 80 Mg/ha in a screen house experiment to evaluate their respective efficacies as substitutes for conventional agricultural lime. The Ca equivalent of the biochar types from $CaCO_3$, the conventional lime, was amended to the soils to serve as realistic controls. The amended soils, in addition to their un-amended counterparts were all kept at 80% field capacity in a completely randomized design in the screen house to allow for pH equilibration amidst weekly pH and bi-weekly exchangeable Al, Ca and Mg monitoring. Results showed that corn cob charred at 500 ^oC was able to raise pH from 4.2 to 5.2 in Hapludox and from 4.9 to 6.2 (an optimum pH for most food crops) in Hapludult within a six-week incubation period. All the biochar types reduced Al concentration from 0.4 $cmol_c$ /kg to undetectable levels in the Hapludult. The element was reduced from 1.3 $cmol_c$ /kg to 0.45 $cmol_c$ /kg in the rice husk and corn cob charred at 700 ^oC amended Hapludox.