Impact of biochar and lime amendments on physico-chemical parameters and uptake of heavy metals in soils contaminated with municipal and industrial waste water

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ABSTRACT

The physical, chemical, and biological properties of soils are influenced by industrial effluents, which provide serious concerns to soil health. The present study investigate into the effect of lime and biochar amendments to increase soil fertility and lower pollution levels in areas that have been contaminated by municipal & industrial effluents. A pot culture experiment was conducted in a greenhouse using a completely randomized design (CRD) with three replications for each treatment. Treatments applied with varying levels of biochar (1.25 t ha^{-1}, 5 t ha^{-1}, 7.5 t ha^{-1}), and lime (1.25 t ha^{-1}, 2.5 t ha^{-1}, 5 t ha^{-1}) including with and without 100% RDF. Amaranthus and fodder sorghum were grown as test crops. Soil samples were analyzed for pH, electrical conductivity (EC), nutrient content, and heavy metal concentrations, in addition, plant growth parameters, dry matter yield (DMY), and nutrient uptake were also assessed. Results indicated that both biochar and lime significantly enhanced the soil quality by increasing pH and nutrient availability by reducing heavy metal bioavailability. Biochar and lime treatments led to higher nutrient uptake (N, P, K) by amaranthus and fodder sorghum, contributing to improved plant growth and dry matter yield. The study highlights the benefits of biochar and lime in improving soil fertility and reducing heavy metal uptake by plants, demonstrating their potential as sustainable soil remediation strategies. These findings suggest that biochar and lime amendments can effectively restore the productivity of soils polluted with municipal and industrial effluents, for sustaining the agricultural production of contaminated soils.

Key words: *Amaranthus, Biochar, Effluents, Fodder Sorghum, Heavy metal, Lime and Pollution.*