ABSTRACT

Biochar as a soil amendment in the Barbados turf grass industry

Aprajita Kulshrestha

Biochar (charcoal) is produced by pyrolysis of different types of feedstock, under anaerobic conditions. Biochar is added to soils to improve soil physical, chemical and biological properties with beneficial effects on soil water and nutrient retention with implications for reducing fertilizer imports and irrigation water use. Unlike compost, biochar's benefits can last for hundreds of years as it does not easily decompose in soil. It can also help to recycle organic waste and sequester carbon in the soil. Three experiments were conducted in this study using biochar as a soil amendment on turfgrass (Zoysia japonica 'El Toro') in pots. Turf grass was selected as the test species for this study as it is often grown in sandy (free draining) soils, which can benefit from the biochar enhancing effects on nutrient and water retention. In the first experiment, locally produced (from Garden clippings feedstock) and imported (Lambert Horticulture, Canada) biochar were applied at three concentrations (6%, 12% and 18%, v/v) and 0% (control) at each of three application times prior to planting. Biochar (produced from wood of Leucaena leucocephala trees as feedstock) was applied to the soil at two concentrations (6% and 12%) with three particle sizes (<2.5mm, 2.5-6mm, 6-10mm) in experiment 2. In the third experiment, the effects of a surfactant (Yucca root extract) and a bio-stimulant (AEM, Activated Effective Microorganisms) on the response to biochar (Leucaena leucocephala feedstock) were investigated. As biochar aging in the soil increased (1-4 months), the highest turf chlorophyll index was obtained at lower biochar concentrations for the local biochar but not for the imported biochar. Turf chlorophyll index was increased by biochar (10-12%) except for the large (6-10mm) particle size biochar. There were no significant effects of biochar on turf grass height or ground cover, but a tendency for the dry mass of turf clippings to increase with biochar application was observed. Biochar also increased the number of grass spikes produced by the turfgrass. No significant interactions of biochar with the surfactant (or the biostimulant) were observed, suggesting that hydrophobicity was not a major issue for the biochar used in this study. Soil-settling compaction was reduced by biochar especially for the fine-sized (<2.5mm) particles. No significant effects of biochar on soil moisture content was observed. Soil respiration was reduced by the medium-sized biochar particles at 12 months after biochar incorporation. The current study was limited to potted plants since once incorporated in soil under field conditions, biochar cannot be easily removed. Local biochar of fine particle size (<2.5mm) at 10% -12% (v/v) concentration is recommended for further field studies.

Keywords: Biochar; Biochar Aging; Feed stocks; Biochar Concentration; Particle Size; Surfactant; Biostimulant; Turf grass; Soil Characteristics; Plant Growth.