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Impact of Biochar Soil Amendment on Growth and Physiology of Live Oak Saplings

Abstract:

Biochar from gasification of wood waste in Louisiana was used as soil amendment in a randomized completely block design study to quantify the impact of biochar soil treatment on the growth and physiology of live oak saplings. Height, diameter growth, net photosynthesis, respiration, and transpiration of live oak saplings were measured after biochar soil amendment treatment during one growing season. In addition, impact of biochar on the chemical properties of the soil was quantified. The results indicated statistically significant impact on growth and physiology of live oak saplings treated by biochar soil amendment. Some chemical soil properties were significantly impacted by the biochar amendment.

Topics/Keywords:

Biochar, Arboriculture, Fertilization, Soil, Water, Roots; Tree Anatomy, Biology, and Physiology

Introduction:

There are many types of soil amendments used to improve the structure and functions of soil. One that has emerged in the last few years is biochar. Interest in biochar has increased recently as urban foresters, arborists, horticulturalists are looking for sustainable ways to improve soils and decrease their use of chemical fertilizers.

According to the United States Department of Agriculture, Agricultural Research Service (USDA-ARS), biochar is black carbon produced from biomass sources [i.e., wood chips, plant residues, manure or other agricultural waste products] for the purpose of transforming the biomass carbon into a more stable form (carbon sequestration). Black carbon is the name of the range of solid residual products resulting from the chemical and/or thermal conversion of any carbon containing material (e.g., fossil fuels and biomass) (Jones et al., 1997). Biochar does not refer to a singular product with a given set of chemical and physical characteristics. Rather, biochar spans the spectrum of black carbon forms (Spokas, 2010) and it is chemically and physically unique as a function of the feedstock, creation process (pyrolysis unit), cooling, and storage conditions. The main purpose for the creation of biochar is for carbon sequestration.

According to the literature, the key benefits of biochar include reduced soil bulk density, increased nutrient and water retention, and decreased nutrient leaching. With this rise in interest,

new questions come up. How much biochar should be used in soils? How should biochar be applied? What types of biochar fit specific types of soils? How do we know if a particular biochar actually helps a particular soil retain nutrients and water? How do we know what is in the biochar? The answers can vary depending on the purpose of the product as biochar can be used as a product itself or as an ingredient within a blended product. In addition to use as a soil improvement device, biochar can also be used for remediation and/or protection against particular environmental pollution and as an avenue for greenhouse gas (GHG) mitigation.

References:

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