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Effects of Biochar Prepared from Agricultural Residue on Water Retention Indices in Different Suctions

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Abstract

The aim of the present study is to investigate the impact of biochar prepared from agricultural residues as a modifier of soil physical properties, including aggregate stability, water retention, porosity, and air and water capacity indices on sugarcane agro-industries in Khuzestan province, Iran. To this end, in each of the three agro-industries of Amirkabir, Haft Tapeh, and Karun, a factorial experiment in a completely randomised design with the factors; soil texture at three levels, and biochar type at three levels (sugar cane bagasse, wheat straw, and sugar cane leaves) was conducted with three replicates. Subsequently, soil pH, soil electrical conductivity, mean weight diameter of soil aggregates, and soil moisture curve in suctions with pF of 0, 0.4, 1, 1.8, 2, 2.52, and 4.17 were measured. The results showed that by increasing biochar, mean weight diameter of soil aggregates decreased significantly in Amirkabir and Haft Tapeh agro-industries. However, increasing biochar did not affect mean weight diameter of soil aggregates in Karun agro-industry. Furthermore, adding biochar to soil improved soil electrical conductivity and pH. However, its effects on soil salinity and pH in each agro-industry varied according to the type of biochar. Adding different amounts of biochar to soil increased soil moisture in all suctions, but wheat biochar increased soil moisture significantly. Biochar had different effects on other soil physical properties such as porosity, air capacity, plant available water, and relative field capacity. The results showed that biochar increases soil moisture and decreases plant available water, relative field capacity, porosity, and air capacity. In general, sugarcane biochar, compared to wheat biochar, results in lower soil moisture and higher plant available water.

Keywords: Biochar, porosity, sugarcane agro-industries, water retention