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The Effect of Pyrolysis Temperature on the Characteristics of Fodder Beet Biochar

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Abstract

Soils in desert areas are mostly low in organic matter and may fluctuate a lot in terms of acidity. Biochars are one of the materials that can be used to improve and modify some of the soil characteristics. This compound is very resistant to decomposition and remains in the soil for a longer period, reducing agricultural waste and turning it into a soil conditioner. This leads to maintaining carbon in the soil, increasing food security, increasing biodiversity, and reducing forest destruction. In this research, it was attempted to investigate the biochar of fodder beetroot at different temperatures of pyrolysis and its physical and chemical characteristics. The fodder beets were collected after being crushed and air-dried and were pyrolyzed in an electric furnace under limited oxygen conditions in the temperature range of 300-700 degrees Celsius. Then, the properties of the produced biochars were measured and statistical analyses were done using SPSS software. The results of this research showed that with the increase in temperature, the yield of biochars decreased significantly, so that the highest percentage of yield (59%), organic carbon (56.33%), total nitrogen (0.53%), water retention (0.84 g/g) at 300 and 400 °C and the highest amount of ash (76%), acidity (8.21) and electrical conductivity (0.1 ds/cm) were obtained at 700 °C. The percentage of carbon and the efficiency of biochar produced at temperatures of 300 and 400 degrees Celsius were higher than other biochar produced at other temperatures. Biochar produced at 300°C had better characteristics in terms of carbon percentage and acidity efficiency compared to biochar produced at 400°C, although these differences were not statistically significant. However, due to biochar production is more economical in terms of energy consumption, it is recommended to produce biochar at a temperature of 300 degrees Celsius.

Keywords: Biochar, Fodder beet, Pyrolysis temperature

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