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Characterisation of biochar from maize residues produced in a self-purging pyrolysis reactor

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Abstract

Response surface methodology was used to optimise pyrolysis conditions to produce biochar from maize residues (cobs, husks, leaves and stalks). The aim was to obtain biochar with good potential as an additive for composting. Mathematical models were developed to explain the experimental responses of volatile matter content (VM), ash content (AC), pH and electrical conductivity (EC) to the operating parameters such as temperature, heating rate and holding time. The temperature had the most significant influence on biochar properties. AC, pH and EC significantly increased ($p < 0.05$) with increasing temperature, while the VM decreased. The holding time showed less effect on the responses, while the heating rate had insubstantial effect. Under the optimal conditions, the husk and leaf biochar had higher AC (11.42 and 26.55%), pH (10.96 and 11.51), and EC (12.37 and 6.79 mS/cm), but lower VM (7.38 and 8.39%) than those of cob and stalk biochar.

Keywords: Biochar; Characteristics; Composting; Maize residues; Self-purging pyrolysis

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