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"Solidarity in a competing world — fair use of resources"

Effects of Modified Biochars on the Growth of Maize (*Zea mays* L.)

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Abstract

The application of biochar as a soil amendment is becoming a viable option against depleting soil resources and fertility. Especially in the context of an increasing demand for agricultural land, biochar-based organic fertilisers have the potential to improve soil fertility and production in otherwise unsuitable soils. Recent studies however, indicate that the interaction between biochar applications and certain environmental components such as climate, soil type and fertilisation are highly variable and might not substantially increase crop yield. Thus, modifying biochars to fit certain soil characteristics is the necessary first step in sustainably increasing long-term soil fertility on low-yielding soils. In the present study, the growth of *Zea mays* L. on sandy, marginal substrate was evaluated in a greenhouse experiment. We applied untreated maize cob biochar, biochar washed with ethanol or hydrochloric acid, as well as biochar incubated in digestate, a nutrient-rich by-product of the anaerobic digestion of organic feedstock. These modifications were designed to either remove pollutants and alter the biochars' surface properties or load it with additional nutrients. Maize plants were harvested 21, 28 and 35 days after germination. The results indicated that the biochars had varying effects on soil parameters, shoot and root biomass production, plant growth and plant specific leaf area over the course of the three harvests. Biochar incubated in digestate had the most pronounced positive effect, while biochar washing resulted in negligible variations of the biomass production when compared to the untreated biochar. This study underlines the importance of modifying biochars and serves as a basis for future studies incorporating mixtures of variously treated organic fertilisers in a bid to increase crop yields on marginal soils.

Keywords: Biochar, biogas digestate, crop yield, maize cob, soil amendment

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