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“Development on the margin”

Agronomic Effects of Biochar and Polyphenols as Compost Additives to Irrigated *Raphanus sativus* in Oman

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Abstract

Under irrigated dryland conditions maintaining soil organic matter and closing nutrient cycles is particularly important for sustainable cropping. In organic farming compost has been used successfully to supply nutrients to crops and to support efficient nutrient cycling through microbial biomass. However, under (sub-)tropical conditions, the efficacy of compost amendments maybe offset by high decomposition rates. To alleviate this problem biochar added as a soil conditioner and / or polyphenols from locally available plant materials could be used as mineralisation inhibitors to enhance plant growth and crop yield. The main objective of this study therefore was to investigate the effects of biochar and polyphenols as additives to composts on the chemical properties of soil, on plant growth and root yield of radish (*Raphanus sativus* L.). These additives were applied singly and mixed (50% each) to compost at two different processing stages; (i) before the composting process and (ii) after processing by mixing additives with mature compost before application to the soil. Both additives were tested in a pot experiment with five replicates whereby the amended compost treatments were compared to an unamended compost and an equivalent application of mineral fertilisers at a level of 135 kg N ha⁻¹.

Total plant dry matter production was highest (5 t ha⁻¹) for the combined application of biochar and polyphenols applied before the composting process and lowest (3.4 t ha⁻¹) for compost treated with only polyphenols (3%) before the composting process. The mixed combination of biochar and polyphenols applied at 1.5% w/w to compost led to highest root yields (2.2 t ha⁻¹) compared to the unamended compost (1.3 t ha⁻¹) and mineral fertiliser application (1.2 t ha⁻¹). In comparison to the mineral fertiliser application the dry matter root / shoot ratio (1:2.6) was significantly higher for compost with biochar (1:1.4) and for biochar and polyphenol addition after composting (1:1.2). The combination of charcoal and polyphenols addition thus seems to have potential to improve the growth and yield of radish.

Keywords: Biochar, compost, Oman, organic agriculture, polyphenols