

## THE INFLUENCE OF BIOCHAR ON SOIL CHARACTERISTICS IN A TEMPERATE AGROECOSYSTEM

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While biochar as a soil amendment is not a novel concept, the addition of biochar to temperate agricultural soils represents a relatively new territory. The objectives of this study were to evaluate soil characteristics in a conventional temperate agricultural production system amended with biochar under a maize (*Zea mays*) crop in southern Ontario, Canada. The treatments include: poultry manure (6 t/ha) and nitrogen fertilizer (135 kg/ha) (MN); manure (3t/ha) and biochar (3t/ha) (MB); and manure (3 t/ha), fertilizer (urea) (135 kg/ha) and biochar (3 t/ha) (MNB). Results show that after the first year addition of biochar, soil moisture (0-10 cm) was significantly lower ( $P<0.05$ ) in the MB treatment (10.6%) compared to the MNB (11.5%) and MN (13.2%) treatments. Soil  $\text{NO}_3^-$  (0-10 cm) was significantly different ( $P<0.05$ ) among treatments with the lowest concentration in the MB (2.72 mg N/kg) treatment followed by the MNB (4.03 mg N/kg) and MN (4.50 mg N/kg) treatments. Soil  $\text{NH}_4^+$  (0-10 cm) was significantly lower ( $P<0.05$ ) in the MB treatment (0.37 mg N/kg) followed by the MNB (0.45 mg N/kg) and MN (0.59 mg N/kg) treatments. Soil bulk density (0-30 cm) was not significantly different among treatments ( $P<0.05$ ) but was significantly greater ( $P<0.05$ ) after manure and biochar were added compared to baseline data obtained prior to the initiation of the experiment. Soil pH (0-30 cm) did not differ significantly ( $P<0.05$ ) among treatments and was not significantly different ( $P<0.05$ ) compared to baseline data. The number of macroinvertebrates observed in a 25 cm x 25 cm x 25 cm soil monolith in the spring, summer and fall varied greatly among treatments and seasons. Over the entire field season, the biochar amended MB treatment had a greater total number of macroinvertebrates (51) compared to the MNB (32) and MN (28) treatments. In the spring, the greatest number of macroinvertebrates was observed in the MB (37) treatment followed by the MNB (15) and MN treatments (12). In the summer, the greatest number of organisms was observed in the MN (8) followed by the MB (6) and MNB (3) treatments, whereas in the autumn the MNB (14) treatment had the greatest number of macroinvertebrates followed by MB (8) and MN (8) treatments. Crop metrics including maize above- and below-ground biomass and grain yield were not significantly different among treatments. Results from this study showed that the addition of biochar did not negatively affect soil chemical and biological characteristics when compared to conventional agroecosystem management practices.