



Medium-term effects of corn biochar addition on soil biota activities and functions in a temperate soil cropped to corn

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ARTICLE INFO

Article history:

Received 22 October 2013

Received in revised form

19 November 2013

Accepted 29 January 2014

Available online 11 February 2014

Keywords:

Biochar

Microorganisms

Soil fauna

Litter

Decomposition

Mineralization

ABSTRACT

Biochar addition to soil has been generally associated with crop yield increases observed in some soils, and increased nutrient availability is one of the mechanisms proposed. Any impact of biochar on soil organisms can potentially translate to changes in nutrient availability and crop productivity, possibly explaining some of the beneficial and detrimental yield effects reported in literature. Therefore, the main aim of this study was to assess the medium-term impact of biochar addition on microbial and faunal activities in a temperate soil cropped to corn and the consequences for their main functions, litter decomposition and mineralization. Biochar was added to a corn field at rates of 0, 3, 12, 30 tons ha⁻¹ three years prior to this study, in comparison to an annual application of 1 t ha⁻¹.

Biochar application increased microbial abundance, which nearly doubled at the highest addition rate, while mesofauna activity, and litter decomposition facilitated by mesofauna were not increased significantly but were positively influenced by biochar addition when these responses were modeled, and in the last case directly and positively associated to the higher microbial abundance. In addition, in short-term laboratory experiments after the addition of litter, biochar presence increased NO₂ + NO₃ mineralization, and decreased that of SO₄ and Cl. However, those nutrient effects were not shown to be of concern at the field scale, where only some significant increases in SOC, pH, Cl and PO₄ were observed.

Therefore, no negative impacts in the soil biota activities and functions assessed were observed for the tested alkaline biochar after three years of the application, although this trend needs to be verified for other soil and biochar types.