

N₂O-emissions from soil with different biochar amendments

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Abstract

Biochar, produced during the pyrolysis of biomass, is considered to be highly recalcitrant against decomposition, and therefore contributes to the sequestration of C into the soil. However the effect of biochar on the emission of the greenhouse gas nitrous oxide (N₂O) is not well known. N₂O is a much more powerful greenhouse gas (with a CO₂-equivalent of 298) and is the main source of stratospheric nitric oxide which damages the stratospheric ozone layer. Controlling the N₂O emissions from soils is thus an important challenge in tackling the greenhouse effect and consequently climate change. N₂O is produced as a by-product of the denitrification process of NO₃⁻ to N₂ into soils, in a lesser extent N₂O can also be produced during nitrification processes (of NH₄⁺ to NO₃⁻). Nevertheless N₂O emissions are considered to be more driven by reduction than by oxidation soil processes, therefore aeration of the soil contributes to the reduction of N₂O. Since biochar amendment has been shown to increase soil porosity, it is assumed to contribute to the reduction of N₂O-emissions. However, biochar amendments also influence soil properties such as the microbial community structure, pH and the nutrient use efficiency, and therefore the effect of biochar amendments on N₂O-emissions is probably very complex and not clear. In addition pyrolysis of different feedstocks results in biochars with different effects on soil properties.

A laboratory experiment was conducted in order to determine the effect of different biochar-type amendments on the N₂O-emissions. Six soil treatments were established, in this way the effect of fresh organic matter (OM) and two types of biochar (BC₁ en BC₂) on the N₂O-emission from the soil was studied against a control treatment. In every treatment KNO₃ was applied to the soil in order to supply the microbial community with a source of N.

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