Carbon mineralization and nutrient availability in calcareous sandy soils amended with woody waste biochar

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Abstract:

Many studies have reported the positive effect of biochar on soil carbon sequestration and soil fertility improvement in acidic soils. However, biochar may have different impacts on calcareous sandy soils. A 90-day incubation experiment was conducted to quantify the effects of woody waste biochar (10 g kg⁻¹) on CO₂-C emissions, K₂SO₄-extractable C and macro-(N, P and K) and micro-(Fe, Mn, Zn and Cu) nutrient availability in the presence or absence of poultry manure (5 g kg⁻¹ soil). The following six treatments were applied: (1) conocarpus (Conocarpus erectus L.) waste (CW), (2) conocarpus biochar (BC), (3) poultry manure (PM), (4) PM + CW, (5) PM + BC and (6) untreated soil (CK). Poultry manure increased CO₂-C emissions and K₂SO₄-extractable C, and the highest increases in CO₂-C emission rate and cumulative CO₂-C and K₂SO₄-extractable C were observed for the PM + CW treatment. On the contrary, treatments with BC halted the CO₂-C emission rate, indicating that the contribution of BC to CO₂-C emissions is negligible compared with the soils amended with CW and PM. Furthermore, the combined addition of PM + BC increased available N, P and K compared with the PM or BC treatments. Overall, the incorporation of biochar into calcareous soils might have benefits in carbon sequestration and soil fertility improvement.

Published In:

Chemosphere, 138, 67-73