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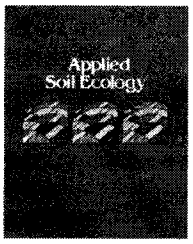


# Application of fresh and composted organic wastes modifies structure, size and activity of soil microbial community under semiarid climate

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ABSTRACT

Although the application of organic amendments is considered a suitable tool for improving soil fertility, few studies have been conducted in semiarid climates to evaluate the joint effect of such practice on the structure and function of the soil's microbial community. The aim of this work therefore was to make a comparative study of the effect of organic materials of differing degrees of stabilization (a sewage sludge and a compost made from the same) on the size, activity and structure of the microbial community in a semiarid soil. In samples taken in spring, summer and autumn over a 2-year period we analysed parameters that indicate the size of the microbial community [microbial biomass C (MBC)], its general activity (ATP and respiration) and specific activity related to the N, P and C cycles in the soil (urease, phosphatase and β-glucosidase, respectively). Two years after the organic amendment, the structure of the microbial community was studied by analysing phospholipid fatty acids (PLFAs). At the end of the experiment, the MBC of the compost and sludge-treated soils was 489 and 463 mg $C_{mic}$ $kg^{-1}$, respectively, while the MBC of the control soils was 247 mg $C_{mic}$ $kg^{-1}$. Over the 2-year period, the higher β-glucosidase, urease and alkaline phosphatase activities of compost and sludge-treated soils reflected higher substrate availability in these plots compared to the control plots. Indeed, plant abundance increased by about 25% with organic amendments. Whereas the bacterial to fungal ratio of signature PLFAs did not change, the ratio of monounsaturated/saturated and the ratio of $Gram^+$/$Gram^-$ of the different treatments indicated that a different bacterial community developed 2 years after amendment with compost and sludge. Thus, factor analysis via PLFAs showed a change in microbial community structure in amended soils versus control soil. It can be concluded that microbial biomass and activity of degraded semiarid soils can be improved by the addition of organic materials of differing degrees of stabilization (compost and sewage sludge). Compost-amended soils showed the highest carbon contents, while in general no differences in activity or microbial biomass where found between compost or sludge treatments. Although phytotoxic substances in sewage sludge might negatively affect plant development, the similar density of plant cover developed in sludge and compost-treated soils suggests that any phytotoxic substances had been degraded.



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