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"Bridging the gap between increasing knowledge and decreasing resources"

Salinity Effects on Soil Microbial Properties and Nutrient Fluxes in a Rice Paddy Soil During Short Term Aerobic Incubation

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Abstract

As a consequence of climate change, a rising sea-water level results in increased saltwater intrusion and soil salinity problems in Bangladesh. The affected agricultural soils are characterised by temporarily high concentrations of soluble salts, low organic matter and reduced plant growth. However, addition of organic matter (such as rice straw) is expected to ease the effect of salinity on soil microorganisms therefore positively influencing nutrient cycling. Therefore, a short term laboratory incubation experiment was conducted to evaluate the benefit of rice straw addition to saline Bangladeshi soils from paddy rice fields on the microbial community and associated nutrient and matter dynamics. Soil samples were collected from two locations in Batiaghata (B) and Dumuria (D) in the coastal area of Bangladesh. Both soils were then incubated with rice straw (0, 25 and 50 % of the straw yield) and three levels of salinity (0, 15 and 50 mg NaCl g^{-1} soil) for 28 days at 25°C. Soil respiration was measured during incubation. At the end of the experiment microbial properties (microbial biomass C, ergosterol), extractable carbon and inorganic nitrogen was determined. In both soils, increasing soil salinity decreased soil respiration, microbial biomass C and ergosterol content, which were generally on a very low level. On the other hand, addition of rice straw increased microbial properties and resulted in nitrogen immobilisation. Thus, by improving the soil organic matter content, rice straw addition can ease the negative effects of soil salinity on soil microbial communities allowing them to maintain some of their ecological functions, such as immobilisation and mineralisation processes. To improve soil fertility, addition of organic matter is crucial. Returning parts of the rice straw to the soil might contribute to this goal. However, rice straw is a valuable source used e.g. as feed or burning material, making the return to the field a less economic viable option.

Keywords: Ergosterol content, microbial biomass C, mineralisation, nitrification, soil respiration

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