B-66 Changes of biomass carbon and nitrogen in soil after incorporation of rice straw

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Eventhough, the microbial biomass in soil is a relatively small fraction, it plays a crucial role in various nutrient transformation processes which control the overall nutrient cycling in the soil-plant system. Decaying microbial biomass is a major contributor to the labile pool of plant nutrients such as C, N, P and S. The quality and quantity of microbial biomass in a given soil may be affected by various environmental factors such as available oxygen and decomposable organic matter contents in soil.

The main objective of this experiment is to study the effects of organic matter addition (rice straw) on microbial biomass development in a soil maintained under arable and flooded conditions. Reddish Brown Earth (RBE) soil collected from Maha Illuppallama was used in this study. Soil was amended with finely ground rice straw at the rate of 1% w/w basis. One set of samples was maintained aerobically and another set of samples was maintained in flooded condition to give anaerobic conditions. Soil samples were incubated at room temperature with 3 replicates and sampling was done on the 1st day, 2nd, 4th and 8th weeks after incubation. Microbial biomass Carbon (C) and Nitrogen (N) in soil samples were determined by using fumigation extraction method. CO_2 evolution was also measured after absorption to NaOH solution.

Application of rice straw markedly increased soil biomass C over the control soil irrespective of the aerobic and anaerobic conditions. Aerobic and anaerobic conditons didn't affect biomass C significantly. The increase of biomass C in straw amended soil can be attributed to the supply of carbon source to the microbial biomass. Biomass nitrogen also behaved in a similar manner. However, only aerobically maintained, rice straw amended soil samples showed a significant increase of biomass N. This means perhaps, in aerobic condition the quality of biomass (in terms of nitrogen) has changed over the anaerobic treatment. It may be due to the low C:N ratio biomass component present in aerobic condition.

Further, microbial activity was measured by CO_2 evolution. In this study, microbial activity increased substantially in rice straw amended soil in both aerobic and anaerobic conditions. However, the increase of microbial activity was more prominent in the rice straw amended soil which was maintained aerobically.

It can be concluded that the addition of organic matter such as rice straw substantially increases the microbial biomass content and activity in soil.