

SOIL BIOLOGICAL PROCESSES IN SOD-PODZOLIC SANDY LOAM SOIL WITH BIOCHAR

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The effect of wooden biochar, introduced into sod-podzolic sandy loam soil at the rate of 1% of the soil weight, both separately and in combination with mineral fertilizer, on the dynamics of the soil biological processes of the nitrogen-carbon cycle was evaluated in an 80-day laboratory experiment. The experiment scheme included 4 treatments in 9 replicates: (1) control; (2) biochar at a rate of 1% by weight of the soil; (3) mineral fertilizer at the rate of 90 kg of nitrogen per hectare; (4) a mixture of biochar and mineral fertilizer. Incubation was carried out in 1-liter plastic containers under constant temperature ($\pm 28^{\circ}\text{C}$) and soil moisture (23%). The content of microbial biomass carbon (C_{mic}), the concentration of ammonium and nitrate nitrogen, as well as the emission of carbon dioxide (CO₂) and nitrous oxide (N₂O) were studied using standard physiological, chromatographic and chemical methods. It was established that the introduction of biochar significantly ($P < 0.05$) increased the amount of microbial biomass carbon, and the energy consumption for the formation of a microbial biomass unit was significantly lower ($P < 0.05$) than in soils without biochar. Biochar did not have a significant effect on the dynamics of the exchangeable ammonium concentration in the soil, but increased the nitrate content 1.2–2 times after one month of incubation, and also contributed to a 20–36% reduction in N₂O emissions from the soil. The use of biochar in the experiment had a positive effect on soil biological processes, leading to a decrease in greenhouse gas emissions and loss of mineral nutrients, which allows to recommend biochar as an ameliorant for soil quality management.

Keywords: wooden biochar, ameliorant, mineral nitrogen, microbial biomass carbon, greenhouse gas emissions.