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Sensitivity of soil organic matter indicators to long-term (<50 yrs.) application of mineral nitrogen in Cambisol in Serbia

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ABSTRACT

The goal of production of higher grain yield is predominantly achieved by higher doses of synthesised and mineral fertilizers. Intensive and long-term addition of mineral nitrogen, often adversely affect soil properties and ultimately the adequate ecological functioning of the soil and its sustainability. Labile organic matter fractions are most sensitive soil parameter. Their functional balance is controlled by soil microorganisms. They influence the ecological stability and biological productivity of ecosystems by participating in the biochemical transformation of mineral fertilizers and the synthesis of biologically active substances and nitrogen fixation. On the experimental station set 60 years ago by the Institute of Soil Science in Belgrade, Serbia, the effect of increasing doses of nitrogen fertilizer on biological indices of Cambisol on a bipolar crop rotation (wheat/corn) was studied. Soil basal respiration (BR), potentially mineralizable C and N (PMN and PMC), microbial biomass C and N (MBC and MBN) and light-fraction OM (LFN and LFC) on Cambisol were determined in five treatments with increasing doses of N fertilizer. The parameters studied were significantly affected by the long-term application of mineral fertilizer compared with both the control and the adjacent native soil. The highest amounts of nitrogen (N150) did not significantly differ from N120 and N90 for most of the parameters studied. Potentially mineralizable C represented the largest labile carbon pool, while microbial biomass N was the largest labile nitrogen pool. The mineralization rates for C and N were oppositely distributed over the seasons. The sensitivity index correlated with the amount of light-fraction OM. The results give a deeper insight into the behaviour and distribution of different pools of labile SOM in the agro-landscapes and can serve as a reliable basis for further research focused on zero soil degradation.

Key words:

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