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Effect of TOC and depth on soil chemical properties and labile carbon pool in the topsoil of drained peatlands*

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Abstract

The differentiation of soil parameters is most frequently studied between soil horizons. However, in drained organic soils, the marsh-forming process changes peat into marsh in the topsoil, the layers of which may behave differently. The aim of the study was to characterize how soil chemical properties and the labile carbon pool respond to the marsh-forming process at three depths: 0-10 cm, 10-20 cm and 20-30 cm, as well as at various TOC levels. Secondly, we attempted to answer the question whether different labile carbon fractions display the same response and can be regarded as indicators of the changes in marsh. In the study, we determined the following soil properties: organic matter, carbon, nitrogen contents, hot and cold water-extractable carbon (HWC and CWC), calcium chloride extractable carbon ($\text{CaCl}_2\text{-C}$), soil sorption properties, and bioavailable forms of Fe, Mn, K, Ca, Mg, Zn, Cu. The results of the study revealed that the determined soil properties were changing along with the depth, and were also dependent on the total organic carbon content. Most of decomposable and mineralizable organic matter occurred in the 10-20 cm or 20-30 cm layers, especially when HWC or $\text{CaCl}_2\text{-C}$ were taken into account. The variability of the results among the studied depths was explained in a PCA analysis by organic matter and carbon content as well as soil sorption properties, Zn content and labile carbon fractions contents, mainly HWC. The study revealed that HWC is an excellent indicator of changes occurring under the marsh-forming process, whereas CWC proved to be ineffective as an indicator.

Keywords: CWC, drainage, HWC, marsh, soil sorption properties

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