Geophysical Research Abstracts
Vol. 18, EGU2016-7699-1, 2016
EGU General Assembly 2016
© Author(s) 2016. CC Attribution 3.0 License.

A spectroscopic approach to determine the soil organic matter in grasslands

Karin Kauer and Kerttu Tammik

Institute of Agricultural and Environmental Sciences, Estonian University of Life Sciences, Tartu, Estonia (karin.kauer@emu.ee)

The study aims were the chemical characterization of the soil organic matter and to find out whether the effect of the different plant species on the soil organic matter is possible to detect using the FTIR spectrometer. A special experiment was established in 1964 and initiated in Tartu, Estonia to study pedogenesis and its continuous development under grass-herbaceous vegetation on reddish-brown calcareous sandy loam moraine (BC-horizon) which was practically free from soil organic carbon (SOC) (1.28 g kg-1). There were three treatments: (i) without plants; (ii) grasses and white clover (Phleum pratense, Festuca pratensis, Poa Pratensis, Trifolium repens); (iii) hybrid lucerne (Medicago varia).
In 2014 the soil samples were collected from the 0-20 cm depth, air dried and sieved to 1 mm. The content of the SOC was determined by Tjurin method. Also the FTIR spectra were obtained on a Nicolet 550 Magna-IR spectrometer equipped with OMNIC software.
The SOC concentration in soil samples from the upper 20 cm of the profile responded significantly to 50 years of different treatments. Without plants the SOC content increased up to 3.5 g kg-1; in grasses-clover treatment up to 9.1 g kg-1 and in hybrid lucerne treatment up to 10.7 g kg-1.
The FTIR transformation spectra of the soil from different treatment showed the same peak pattern. A sharp and intense band was recorded in the 1030 cm-1 region (polysaccharides and Si-O vibrations of clay minerals). Intense bands were recorded at 1630 cm-1 (C=O vibrations of carboxylates and aromatic vibrations) and 1450 cm-1 (CH and NH bending motions and carbon oxygen bond vibrations). The peaks at the 1630 and 1450 cm-1 were lower in soil without plants and higher in hybrid lucerne treatment. This indicates that the increase of SOC content is related to the increase of proportion of lignin, other aromatics and aliphatic carboxylates which have phenolic and aliphatic structure.