

Changes in forest soil organic matter quality affected by windstorm and wildfire.

Autorzy

Gabriela Barančíková

Maria Jerzykiewicz

Erika Gömöryová

Erika Tobiašová

Tadeáš Litavec

Rok wydania

2018

Czasopismo

Journal of Soils and
Sediments

Numer woluminu

18

Strony

2738-2747

DOI

10.1007/s11368-018-1942-2

Kolekcja

Naukowa

Język

Angielski

Typ publikacji

Artykuł

Streszczenie

Purpose Windthrows and fires are major natural disturbances in forest ecosystems, which can affect organic matter in the surface and the mineral layer of forest soil. The main aim of this study was to evaluate the changes occurring in the structure and properties of humic acid (HA) in the lands where windthrows and wildfires occurred.

Materials and methods: In November 2004, the forest in the area of 12,000 ha in the Tatra National Park, Slovakia, was seriously damaged by northern wind gusts exceeding 200 km/h. In July 2005, a wildfire broke out in a 220 ha of wind-damaged area. The HAs have been isolated from four research plots: (a) the area where the fallen trees were removed (EXT); (b) an area after windstorm covered by wood from struck trees (NEX), left for spontaneous succession; (c) an area after extracted timber, damaged by the surface wildfire (FIR); and (d) a reference intact spruce forest area (REF). Changes in the chemical structure of the HAs isolated from the research plots were determined on the basis of elemental analysis and UV-Vis, EPR, IR, and ¹³C NMR spectroscopy.

Results and discussion: All used analytical methods showed a decrease in the humification degree of the humic acids extracted from the soils where the spruce forest has been affected by a wildfire and a windthrow. In the case of the control sample HA (REF), the calculated atomic H/C and O/C ratios and the degree of aromaticity (α) calculated from the ¹³C NMR spectra were higher, indicating higher aromaticity of HA from the REF area. The more complex and developed structure of REF HA was confirmed by the higher value of E1% 6 and the lower E4/E6 ratio obtained using UV-Vis spectroscopy. Also, the higher gparameters determined from the EPR spectra of the stable radicals present in HA confirmed the lower aromaticity on the plots that have been subjected to the calamities. The ¹³C NMR spectra and the elemental analysis show that the structure of the HA extracted from the NEX plot

is the closest to the REF.

Conclusions: The results of the systematic research showed significant changes in the structure of HA taken from spruce forest soils that were subjected to windstorms and fires. An enrichment of the HAs in aliphatic carbon and so a lower humification degree of the organic matter in the areas calamity-affected were observed. The results clearly indicate that the HAs extracted from the disturbed plots of the spruce forest are not as stable as those extracted taken from the control plot.

Słowa kluczowe

humic acids, Spectroscopic methods, Tatra National Park, Wildfire, Windthrow

Adres publiczny

<http://dx.doi.org/10.1007/s11368-018-1942-2>

Strona internetowa wydawcy

<http://link.springer.com>