Changes in Soil Humin Macromolecular Structure Resulting from Long-Term Catch Cropping

Autorzy

Jerzy Weber

Elżbieta Jamroz

Lilla Mielnik

Riccardo Spaccini

Andrzej Kocowicz

Irmina Ćwieląg-Piasecka

Maria Jerzykiewicz

Danuta Parylak

Magdalena Dębicka

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The aim of this study was to assess the effect of long-term catch crop application on the structural properties of humin, which is considered the most recalcitrant fraction of soil organic matter. Soil samples from a 30-year field experiment on triticale cultivated with and without catch crops were analysed to determine the total organic carbon content and fractional composition of humic substances. Meanwhile, humin isolated from bulk soil was analysed to determine its elemental composition and spectroscopic properties measured with UV-Vis, fluorescence, and ^{13}C-CPMAS-NMR. It was found that catch crop farming enhanced the formation of highly reactive humus substances, like low-molecular-weight fractions and humic acids, while decreasing the humin fraction. The higher H/C and O/C atomic ratios of humin and the UV-Vis, fluorescence, and ^{13}C-CPMAS-NMR results confirmed a higher share of oxygen-containing functional groups in humin isolated from the soil with catch crop rotation, also corroborating its greater aliphatic nature. Under the conditions of our field experiment, the results indicated that organic residues from catch crops quickly undergo the decay process and are transformed mainly into highly reactive humus substances, which can potentially improve soil health, while mineral fertilisation alone without catch crops favours the stabilisation and sequestration of carbon.

Słowa kluczowe

long-term field experiment, fluorescence, UV-Vis, NMR, EPR, humic substances