

The Significance of Herbicide–Humin Interactions in Sustainable Agroecosystems

Autorzy

Maria Jerzykiewicz
Irmina Ćwieląg-Piasecka
Jerzy Weber
Aleksandra Ukalska-Jaruga
Elżbieta Jamroz
Andrzej Kocowicz
Magdalena Dębicka
Jakub Bekier
Lilla Mielnik
Romualda Bejger
Magdalena Banach-Szott
Agnieszka Grabusiewicz

Rok wydania

2025

Czasopismo

Sustainability

Numer woluminu

17

Strony

3449/1-3449/18

DOI

10.3390/su17083449

Kolekcja

Naukowa

Streszczenie

Humin, as the most stable fraction in soil organic matter, determines possibility of sustainable environmental development by influencing, among other things, the binding and migration of different chemicals in soil. The aim of this paper was to determine changes in the properties of humins after interaction with three selected active substances of herbicides differing in structure and chemical properties (pendimethalin, metazachlor, and flufenacet) and two different commercial products. In accordance with OECD 106 guidelines, humins isolated from eight different soils were saturated with herbicide compounds under study. As humin is a non-hydrolyzable organic carbon fraction, solid state research techniques (elemental analysis, NMR, FTIR, EPR, and UV-Vis) were applied. The results clearly showed that the interaction between humin and herbicides increases the concentration of oxygen-containing groups and the internal oxidation (ω) in humin. For all investigated humins, a reduction in radical concentration was observed. Radicals in humins were not completely quenched; a certain concentration of radicals with unchanged structure always remained in the samples. Other spectroscopic analyses showed no significant changes in the structure of pesticide-saturated and non-saturated humins. This suggests that sorption of the studied compounds occurs on the humins only as a result of the interaction of physical forces on the surface of the studied organic matter fraction. Thus, interaction with the studied herbicides occurs as a surface phenomenon, and the inner core remains protected by the condensed structure and/or strong binding to the clay minerals.

Słowa kluczowe

EPR, ^{13}C CP MAS NMR, FTIR, radicals

Język

Angielski

Typ publikacji

Artykuł

Licencja otwartego dostępu

CC-BY

Licencja na prawach której można swobodnie kopiować, rozprowadzać, zmieniać i remiksować objęty prawem autorskim utwór (Utwór-przedmiot prawa autorskiego) pod warunkiem podania imienia i nazwiska autora utworu pierwotnego oraz źródła pochodzenia utworu.

Pełny tekst licencji:

<https://creativecommons.org/licenses/by/3.0/pl/legalcode>

Adres publiczny

<http://dx.doi.org/10.3390/su17083449>

Strona internetowa wydawcy

<http://www.mdpi.com/journal/metals>

Plik został wygenerowany dnia 2026-10-11 05:38:58

Adres w repozytorium <https://old.chem.uni.wroc.pl/pl/repozytorium/PXUzwDC>.