

DESCRIPTION FOR THE GENERAL PUBLIC

Pesticides belong to xenobiotics which fate and activity depend on interaction with soil components, including sorption by soil organic matter. This is the most important process which governs the amount of active substance available. These processes are dependent of the chemical properties of particular fractions of soil organic matter, including humin. Till present, this is the least studied fraction of soil organic matter, although it usually constitute over half of their composition. Because of that, deeper recognition and understanding of the mechanisms of pesticides sorption on humin fraction of soil organic matter is crucial for evaluation of their impact on the soil environment.

The aim of the project is to obtain a detailed characteristic of mutual interaction between soil humin fraction and chosen active substances of pesticides.. This will be accompanied by assessment of particular role of humin fraction in the pesticide accumulation in soil. Furthermore, it will be better recognized the nature of bonding between pesticides and humin fraction, and to determining the effect of the chemical and spectroscopic characteristics of humin on the sorption capacity and adsorptive interactions with pesticides. Undertaken investigations give a new insights on the problem and will enable to answer if heterogeneity of humin chemical composition can significantly influence strength of pesticides bounds and influence their resistance in soil, as well as if humin molecular structure may be modified by sorption of pesticides.

The investigation will be conducted by four leading in Poland laboratories dealing with soil organic matter, and will regard spectroscopic characterization of the most important components of humin fraction. Apart of that, the sorption experiment will be undertaken dealing with pesticide active substances (Pendimethalin, Metazachlor, Flufenacet Acetamipiryd, and Alfa-cypermetyrn). Humin fraction will be isolated from mollic horizons of Chernozems and Phaeozems derived from different parent material under different climatic conditions of Poland. The scope of the study will include isolation of humin fraction from the soil material, after extraction of humic and fulvic acids using the method recommended by the IHSS, and the wide characterization of humin fraction with novel spectroscopic methods: nuclear magnetic resonance (^{13}C NMR); electron spin resonance (EPR); Fourier-transform infrared (FT-IR); visible and near-infrared (VIS-NIR); ultraviolet and visible (UV-VIS); delayed luminescence (DL); and high performance liquid chromatography (HPLC) spectroscopy.

Currently published research results relates mainly to general relationships between the total content of organic matter or humic acids and pesticide residue in soils. From that reason, planned investigation provide a new insight into phenomena of pesticide sorption on poorly known humin fraction. This will be a major step forward to a knowledge of pesticides fate in the soil environment. A unique feature of this project is the comprehensive assessment of the properties of humin and effects of their heterogeneity on the transformation, retention and diffusion of pesticides in soil with various characteristics. Furthermore, this will explain how pesticides affect the natural soil organic matter transformations and what role humin plays in the accumulation of pesticides in soil.