EGU General Assembly 2020

SESSION: SSS.5.7

INTERACTION OF SOIL HUMIN FRACTION WITH PESTICIDES - A REVIEW

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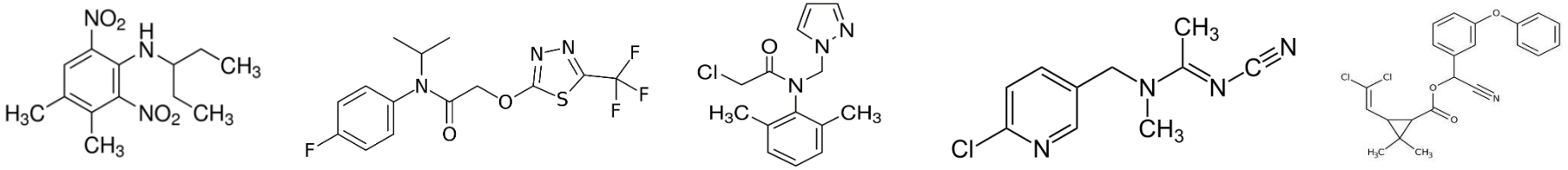
HR EXCELLENCE IN RESEARCH

Background

The use of pesticides significantly influence the efficiency of agriculture/horticulture productions, but at the same time, their extensive and widespread use, raises serious concerns regarding the release of this harmful substances into the environment due to their specific properties.

Properties of pesticides



- organic compounds that are meant to control pests, fungi and weeds, so they are widely used in agriculture and horticulture,
- includes all of the following: herbicide, insecticides (which may include insect growth regulators, termiticides, etc.) nematicide, molluscicide, piscicide, avicide, rodenticide, bactericide, insect repellent, animal repellent, antimicrobial, and fungicide,
- classified by various agencies as dangerous compounds subject to control in the environment (*Environmental Protection Agency - US EPA, International Agency for Research on Cancer - IARC, European Food Safety Authority – EFSA, European Commission – EC, and other)*
- most of them exhibit highly harmful effects on living organisms – carcinogenic, mutagenic and teratogenic properties.

Background

Diversified pesticides application in the environment cause that most of them finally undergoes deposition into the soil.

Sources and sinks of pesticides

Pesticides application in the environment

> 80%

Pesticides deposition in soil







Sources of pesticides:

- crop protection products
- horticultural plant protection products
- veterinary medicines
- effluents: rinsing and washings spillage

Soil properties affected pesticides accumulation:

- pH
- moisture
- grain size distribution

- **soil organic matter**

Background

The fate of pesticides in soil depends on many factors related mainly to the physico-chemical properties of these compounds as well as content and quality of organic matter.

Humin as the predominant fraction of organic matter, may significantly determine the behavior and transformations of pesticides in soil.

Aim of the study

The aim of this review was to present the state of the art of humin-pesticides mutual interactions.

Pesticide accumulation in soil

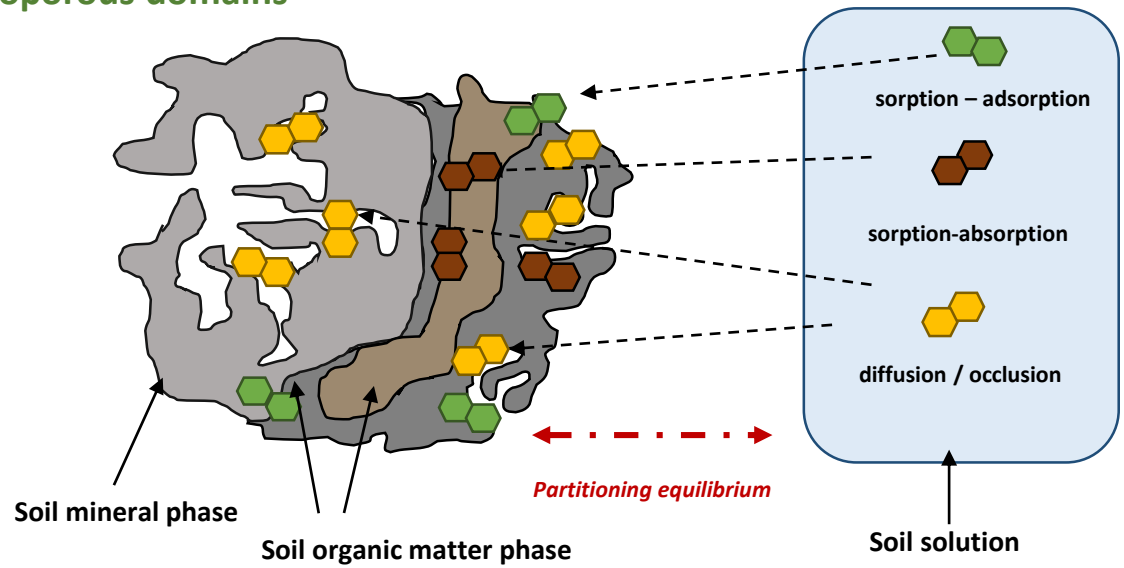
SOIL ORGANIC MATTER

HUMINS as a reactive fraction which significantly influence pesticide retention in soil

- humin surface is covered with various polar and non-polar functionalities, which may efficiently interact with pesticides by van der Waals forces, hydrophobic attraction, hydrogen bonding, charge transfer or ligand exchange processes
- flexible microporous domains

PESTICIDES BEHAVIOR

- degradation
- partitioning equilibrium
- occlusion in three dimenional structure
- sorption processes (functional group interactions)
- aging - formation of bound residue



Summary

Humins due to its specific physicochemical properties can significantly affect the sorption and persistence of pesticides in soils. Nevertheless, literature data on this area are very limited, so further research should be carried out.

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Thank you for the attention!

The studies were supported from the National Science Centre project no. 2018/31/B/ST10/00677
"Chemical and spectroscopic properties of soil humin fraction in relation to their mutual interaction with pesticides"