AdSORPTION OF PESTICIDES APPLIED ALONE OR IN MIXTURES ON AN AGRICULTURAL VERTIC DARK SOIL
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Applications of herbicide mixtures to enhance the effects are now a common practice in agriculture. It allows the range of weeds treated to be broadened and to limit the agronomic dose applied for each herbicide. Nevertheless the presence of multi-contaminants in the soil can affect the behaviour of individual components and only a few studies have dealt with this phenomenon. The objective of our study was to explore the sorption processes of herbicides belonging to various chemical families, alone or in mixtures, on bulk soil and fine fraction of a Vertic dark soil from a sedimentary valley (central France). Indeed sorption is a key process governing the fate of herbicides.

Cocktail for maize crops

Sampling of an agricultural soil from an experimental field located in the Limagne plane (Auvergne, France) at four points and 2 depths

pH = 8.2

Total Carbon: 5.4%

Total Carbon after H2O treatment: 3.5%

Organic matter strongly linked to clay minerals:

Kaolinite 30%

Magnetite 30%

Smectite 30%

Mica 30%

High combustion temperature (TGA): 320°C

Stable, insoluble organic matter

The herbicides studied are selective for maize crops and are generally used in mixtures to get better herbicidal results.

Soil properties

- Clay soil
- Soil granulometry
- Clay minerals

Adsorption of nicosulfuron, metolachlor and mesotrione on soil and fine fraction

Adsorption isotherms

Physical adsorption

Kd is the highest for tembotrione among triketone family members (tembotrione, mesotrione and sulcotrione)

Kd of fine fraction > Kd on soil

Mixtures reduce the Kd of tembotrione

Conclusions:
The present results show that the fate of pesticides is strongly dependent on their chemical structure and corresponding physico-chemical properties as well as on the environmental conditions and soil characteristics.

We have also evidenced the effect of pesticide mixture on individual pesticide adsorption behaviour. The equilibrium between soil and water compartments observed for all the pesticides studied shows a great mobility that can lead to leaching of pesticides when the water is renewed in soil.

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