Linuron Sorption-Desorption in Field Moist Soil

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Introduction

Pesticide sorption coefficients (K_d) have been determined most commonly using batch slurry, column or centrifugation techniques. These techniques suffer from a number of drawbacks. For instance,they require soils withwater contents above field-capacity, so that soil and soil solution can be separated before analysis. The experiments are usually carried out on air-dried soils that are rewetted for the experiment. The extractionprocedure, i.e shaking and centrifugation, usually alters the physical and chemical characteristics of the soil, resulting in changes in properties of the binding sites during the experiment. Therefore, development of techniques where sorption-desorption can be characterized in field-moist soils is of profound importance.

The selectivity of supercritical fluid extraction (SFE) has recently been used to extract atrazine [1] and sulfonylurea herbicides [2] from the soil solution without also extracting residues bound to the soil particles. This has allowed characterization of sorption-desorption of these herbicides in field-moist soil. The objective of this study was to investigate the technique further and determine linuron sorption in field-moist soils.

Material and Methods

SFE sorption experiments of soil samples treated with ^{14}C labeled linuron were conducted using an ISCO SFE System 2200 (Lincoln, NE). Experiments were performed using low

density (i.e. 0.25 g/mL) supercritical carbon dioxide to remove linuron from the water phase only, thus allowing calculation of sorption coefficients at low water contents.

Results and Discussion

Linuron K_d on clay soil at 12 % moisture content (SFE temperature = 50°C) was about 15 mL/g (Figure 1) compared to 20 mL/g on a sandy soil under the same conditions. The higher K_d values for the sandy soil is attributed to a higher organic carbon content in the sandy soil. The effect of temperature and moisture content on linuron sorption behavior in field-moist soils will be discussed.

It should be possible to extend this SFE method further to include other pesticides and organic compounds such as persistent halogenated compounds.

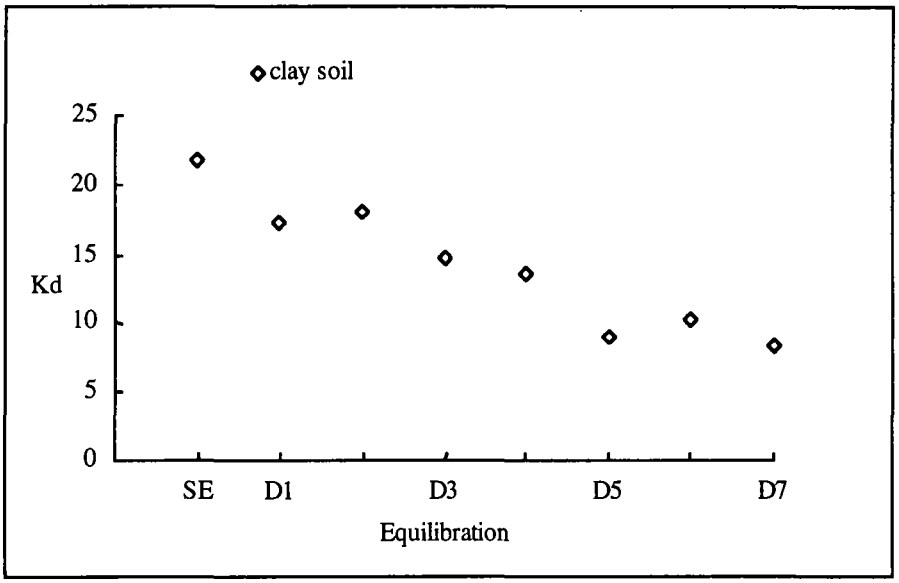

Figure 1. Sorption coefficient (Kd) values resulting from sorption equilibration (SE) and desorption equilibrations (D1 through D7) for Lanna clay soil at 12 % soil moisture content.

References

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2. Berglöf, T., Koskinen, W. C., Norberg, K. and Kylin, H. *J. Agric. Food Chem.*, submitted.