Abstract

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Title: STUDIES ON THE EFFECT OF RESIDUE OF SOME PESTICIDES ON PHYSICOCHEMICAL PROPERTIES OF SOIL

Laboratory batch experiments were designed to study the adsorption of three granular nematicides belonged to different groups of molecules: Organophosphorus (cadusafos and fenamiphos) and Carbamate (oxamyl) on two different types of soil with different characteristics (clay and sandy soils) collected from two regions around the Nile Delta in Egypt. The adsorption process is fast reaching equilibrium in 60 min. The adsorption equilibrium time of 24h was selected to carry out the adsorption experiments. The amount adsorbed decreases with increase of soil mass. The experimental data have been modeled using Linear, Freundlich, Temkin and Dubinin–Radushkevich models. The experimental results were well fitted to linear partition model and Freundlich non linear model. The adsorption of cadusafos, fenamiphos and oxamyl on the two types of soil obeys Freundlich isotherm over the entire studied range of adsorption concentration, and results in a value of 1/n parameter near unity, which implies the probable and acceptable proposal of the linear model. The partition coefficient (K_d, L/g) values obtained from linear model for cadusafos, fenamiphos and oxamyl on sandy soil were 4.20, 3.81, 0.868, and clay soil were 2.74, 0.973, and 0.729, respectively which is higher in sandy soil than that on clay soil in spite of the higher organic matter in the latter. The energy of adsorption (kJ/mol) calculated from Dubinin–Radushkevich equation was on clay: 4.36, 5.19 and 2.29 and on sandy 5.29, 5.30, and 3.27 kJ/mol for cadusafos, fenamiphos and oxamyl, respectively indicating a physical nature of adsorption. These values agree with the partition model suggested by the linear model. This kind of weak interaction, together with pH-independence in the examined range 3-11 implies that for the studied soils the organic content (that is higher in the clay soil) is not a major parameter in the adsorption of three pesticides. The higher uptake of three pesticides in sand soil denotes that three pesticides may be mobile with a potential to leach and pollutes ground water and surface water. The kinetics of adsorption was well fitted by the

pseudo-second order equation. The linear plots of intraparticles diffusion model for the adsorption of cadusafos, fenamiphos and oxamyl on two soils did not pass through the origin. This indicates that the intraparticles diffusion was not the only rate controlling mechanism. Thermodynamics parameters for the adsorption process were calculated and the results suggest that the adsorption is endothermic and spontaneous accompanied by increase in entropy.

Field experiments were carried out at Dakahleya and El-Beheira Governorates to study the persistence of cadusafos, fenamiphos and oxamyl in clay and sandy soils at different time intervals and in potato tubers at harvest time at the rate of 30, 20 and 20 Kg / feddan, respectively under the Egyptian field conditions. The residue half-life values (RL_{50}) for cadusafos, fenamiphos and oxamyl were calculated mathematically depending on the first order kinetics and the obtained values for clay soil 13.61, 6.98 and 8.09, and sandy soil were 10.19, 3.98 and 7.02 days, respectively. According to the determined half-life values of the three tested pesticides in both soils, it is clear that fenamiphos exhibited the lower half-life value in the two studied soil. Such compound is the least persistent substance in soil, hence causes a minimum soil impact compared to the other tested compounds, which exhibited slightly higher persistence and thus may cause higher soil effect. It is to be noted that the values (in case of three molecules) in sand soil is lower than in clay due to easier leaching in the former. The detected residues of cadusafos, fenamiphos and oxamyl in potato tubers collected from sandy soil were lower than the detected amount in samples collected from clay soil. These differences may be due to the higher uptake of sandy soil that adsorbed a significant amount of the applied pesticides. The residual level of cadusafos, fenamiphos and oxamyl in potato tubers were below the Maximum Residues Limits (MRL). Accordingly, potato tubers can be safely marketed and consumed by human.

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