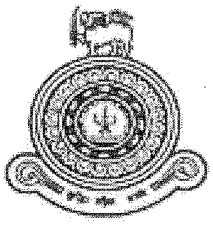

Evaluation of the pesticide distribution between soil and ground water

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Abstract

Pesticides stand out as one of the major development of the 20th century. They are among the most important compounds which are needed to increase the yield in agricultural practices. After the application of the pesticides unnecessarily, they are found to be present as pollutants in the environment. When a pesticide enters soil, some of it will stick to soil particles particularly organic matter through a process called adsorption and some will dissolve and mix with water between soil particles called "soil water".

One of the most useful indices for quantifying pesticide adsorption on soil is the "adsorption coefficient" or "partition coefficient" (K_d). The K_d value is defined as the ratio of the pesticide concentration in the adsorb state (bound to soil particles) to the pesticide concentration in the solution phase (dissolved in the soil water). So the K_d value is differentiated according to the type of pesticide and the type of soil.

In this project, carbofuran was selected as the test pesticide and its distribution was monitored for two different soil types with aqueous media under selected conditions. Soil samples obtained from Wadduwa area were cleaned and homogenized prior to the studies. The physical and chemical parameters of the two tested soil samples were evaluated and known amount of carbofuran was spiked, air dried and homogenized prior to the equilibrations for the determination of the K_d values. The value of K_d for carbofuran were found to be 0.89 (± 0.01) and 0.88 (± 0.01) for blackish and yellowish soils respectively against distilled water. The value of K_d for both soil types was not changed significantly using the natural water (pH = 6.58) as liquid phase under identical experimental conditions.

The value of K_d was lowered to 0.76 (± 0.01) and 0.73 (± 0.01) for blackish soil and yellowish soil respectively in the presence of detergent as an adulterant in the liquid phase. Amount of organic carbon content in both soils were differentiated by adding purified sand portions and the K_d value was found to be lowering with the increase of the sand content in the soil sample. Calcium carbonate is commonly used as an additive substance into the field in agricultural purposes. Therefore, changes of the value of K_d values for carbofuran was studied with the addition of different amounts of calcium carbonate to the soil. The value of K_d was found to be increased by with calcium carbonate in the soil. Different amounts of acetonitrile were added as a modifier for aqueous phase which exhibited a decrease in K_d initially and then the K_d was found to be increased with the acetonitrile levels.

The ability to change the K_d values with the modification of the soil and aqueous media enables to establish the conditions favoring the effective use of pesticide by retaining them in soil without leaching to the water. Similarly, conditions can be established to clean the contaminated agricultural fields by lowering the K_d values.