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BINDING AND MOVEMENT OF CYFLUTHRIN IN SOIL COLUMNS CONTAINING CLAY AND ORGANIC MATTER

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ABSTRACT

Use of pesticides has become an integral part of present-day agriculture. However, the effect of pesticides on non-target organisms and their entry into soil-plant-animal system is posing serious concerns. A significant proportion of the plant-applied pesticides ultimately reaches the soil where it may be adsorbed onto the soil colloidal complex, taken up by the plants or contaminates the sub-surface water. Development and standardization of convenient and quick methods for the determination of pesticide residues has thus assumed importance. Presently, different laboratory experiments aimed at studying the binding, movement of cyfluthrin (active ingredient of Baythroid, an insecticide) in soil are reported. For the quantification of cyfluthrin in soil extracts, a spectrophotometric method was standardized that showed methanol to be the best solvent/extractant. A close relationship (r = 0.999) was observed between optical density of methanol extract at 230nm and the amount of cyfluthrin in the solution suggesting a high reliability of spectrophotometric method. In one of the experiments employing ten soils that differed in organic matter and clay contents (0.54-3.72 percent and 8.8-34.5 percent, respectively), binding of cyfluthrin varied between 19.1 and 84.2 percent. Bound cyfluthrin was closely related with the content of both organic matter and clay with a correlation co-efficient of 0.98 and 0.86, respectively. Exogenous addition to soil of organic matter in the form of sugar mill compost (0, 0. 1, 0.2, 0.3, 0.4 and 0. 5 percent) caused a decrease in the extractability of cyfluthrin that was more at higher levels of addition. Consequently, the binding in soil increased by 29.2 - 87.4 percent. In another experiment with six soils packed in 8 inch columns, the binding and movement of cyfluthrin was considerably dependent on soil texture and organic matter content. In a light garden soil with high organic matter content a quick binding and slow movement of cyfluthrin was observed. In most cases significantly lower than expected amounts of methanol extractable cyfluthrin were determined, the values of cyfluthrin actually determined varied were 0 - 51.9 percent of that expected. The recovery of cyfluthrin decreased significantly with increasing depth and virtually no cyfluthrin moved beyond 7.5cm in any of the test soils; a greater proportion of the extractable cyfluthrin was determined in top 2.5 cm portion.