

ABSTRACT

The fate of five selected pesticides in a tropical environment

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Pesticides are used extensively in Jamaica, however, studies on the effectiveness and persistence of alachlor, diquat, paraquat, methomyl, and oxamyl in soil and water are limited. The aim of this study is to evaluate the persistence of these pesticides and their metabolites in soil and water using hydrolysis, photolysis, volatilization, leaching, surface run-off and biodegradation.

Data on the rate of degradation are extremely important as they permit prediction of pesticide residual levels that are most likely to persist in soil and water. The rate and products of degradation of these pesticides under tropical conditions in soil and water were investigated.

The degradation and soil sorption characteristics of the five selected pesticides were assessed by conducting laboratory based experiments that simulated conditions existing in Jamaica, and by extension the wider Caribbean. The potential for these pesticides, particularly diquat and paraquat, to be transported by surface runoff from sugar cane fields to pollute the nearby rivers (Rio Minho and Milk Rivers in Clarendon) was also assessed. The methods of analyses employed were Gas Chromatography with Mass Spectrometry and Liquid Chromatography with diode array detector.

Photolysis was the most effective tool for degrading the selected pesticides and so

it can be used as a remediation tool. Hydrolysis, however, is not very effective in degrading the selected pesticides. With respect to adsorption and leaching, diquat and paraquat were adsorbed strongly to the soil and hence reduces the threat of rapid environmental pollution. Volatilization occurred in the following order: Alachlor > Methomyl > oxamyl > paraquat > diquat. Biodegradation was effective in degrading alachlor, methomyl, and oxamyl but had little effect on paraquat and diquat. Biodegradation can also be used as a remediation tool. Based on the field studies/surface run-off conducted, none of the selected pesticides was detected in the nearby Rio Minho and Milk River.

The data generated can be used by the Pesticide Control Authority of Jamaica (PCA) when making decisions with regards to the banning of the selected pesticides or its use as a tool for deciding on the quantities of the selected pesticides for importation and distribution. Finally, an effective and efficient method for paraquat was developed from this research.

Keywords: Raymond Roy Reid, alachlor, diquat, paraquat, methomyl, oxamyl, Rio Minho and Milk River.