5 Effect of Soil Depth on Carbofuran and Aldicarb Degradation

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Preferred pathways, especially in heavy clay soils with high shrink-swell potential, are suspected to be a primary route for the movement and accumulation of pollutants deep within the profile and close to the groundwater table (White et al., 1986).

Conservation tillage systems rely heavily or exclusively on chemical weed and insect control. Although these systems have proven effective in reducing soil erosion and thus the amount of sediments in runoff, soils under some conservation tillage systems, such as no-tillage, are more susceptible to the development of deep cracks that potentially can enhance downward movement of chemicals.

The fate of pesticides transported to the lower soil profile is unclear. Most of the experiments to establish “apparent half-life” of pesticides have been done with the biologically active surface layer. It is well known, however, that microbial counts for deeper parts of the soil profile are usually $10^2$ to $10^3$ times smaller than for the upper 0 to 10 cm layer. Locke and Harper (1991) attributed depth differences in metribuzin degradation to reductions in microbial activity with increasing soil depth.

Due to reduced biological activity, the persistence of pesticides in the lower soil profile could be much longer than is usually taken into account, and the probability of groundwater contamination greatly increased. A project is in progress with an overall goal to test the hypothesis that measurable contaminant transport via preferred pathways in some Missouri soils is possible. As part of the project, a laboratory experiment has been conducted to estimate the mineralization rates of two widely used pesticides within a soil profile. Carbofuran (2,3-dihydro-2,2-dimethyl-7-benzofuranyl methylcarbamate) and aldicarb [2-methyl-2-(methylthio) propionaldehyde O-methylcarbamoyloxime], are broad-spectrum, soil-applied systemic pesticides for control of mites, nematodes, and insects. The two chemicals are distinct...