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Aerobic metabolism and adsorption of pyrethroid insecticide metofluthrin in soil

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Abstract:

Metofluthrin [2,3,5,6-tetrafluoro-4-(methoxymethyl)benzyl (1*R*,3*R*)-2,2-dimethyl-3-((1*EZ*)-prop-1-enyl)cyclopropanecarboxylate] was rapidly degraded in two aerobic US soils with first-order half-lives of 2.3–3.5 days primarily *via* ester cleavage to give the corresponding acid and alcohol without any epimerization and geometrical isomerization. The rapid oxidation proceeded either at the prop-1-enyl group of the acid moiety to form the diacid derivative or the benzyl carbon to finally give the terephthalic acid derivative. These metabolites were finally mineralized to carbon dioxide with partial formation of bound residues. The soil adsorption coefficients (K_{oc}) of the *Z* isomer, the main component of metofluthrin, in three German soils were determined to be 3553–6124 (ml/g o.c.) by the batch equilibrium method. The screening groundwater simulation model SCI-GROW using the metabolic half-lives and K_{oc} values clearly indicates that metofluthrin is most unlikely to contaminate groundwater even in the unrealistic worst case.

Keywords:

metofluthrin, soil metabolism, soil adsorption

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