

Title: Degradation of Atrazine, Alachlor, Metolachlor in Soils and Aquifer Materials (Study No. 47)

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Objectives: To examine the degradation and transport of alachlor, metolachlor and atrazine in soils including volatilization, sorption, plant uptake and degradation in mass balance.

- Background/Need:** Discoveries of pesticides in groundwater have led to extensive research and monitoring efforts, as well as examination of health advisories and water quality standards. The environmental fate and toxicological effects of the herbicides alachlor, metolachlor and atrazine are under close scrutiny by the State of Wisconsin and federal agencies.
- Methods:** Atrazine, alachlor and metolachlor were applied to Plainfield sand and Plano silt loam in greenhouse columns. Grass was grown on the columns to enable evapotranspiration. Water samples were drawn from the soil at three depths and leachate from the bottom of each column was sampled at regular intervals. Herbicide residues were extracted from the soil columns with ethyl acetate.
- Results/Conclusions:** Herbicides moved through the soil columns in decreasing order as follows: alachlor, metolachlor and atrazine. More than twice as much alachlor as metolachlor leached to the bottom of the Plainfield sand columns while five times as much alachlor as metolachlor leached in the Plano soil columns. The herbicides and their degradation products were trapped in the interlayers of expanding clay minerals in the Plano silt loam. The highest concentration of the three herbicides were found in the upper layers with decreasing concentrations further down the soil columns. Metabolites of alachlor and metolachlor leached to the bottom of the columns, though atrazine was not detectable that far down. The mobility of alachlor was slower and degraded faster in Plano silt loam than Plainfield sand.
- Recommendations/Implications:** Investigators recommend further laboratory studies which can be applied to field situations. The specific roles of volatilization, leaching, erosion and runoff need to be better defined. More toxic pesticides, as well as their metabolites, need to be figured into the potential to contaminate groundwater. While research has extensively focused on higher levels of contaminants, investigation is suggested of lower concentrations of herbicides.
- Availability of Report:** This report is available for viewing and loan at:
- The Water Resources Center
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- Related Publications:** Chesters, Gordon, Simsiman, Geronimo V., Levy, Jonathon, Alhajjar, Bashir J., Fathulla, Riyadh N. and Harkin, John M. 1989. Environmental Fate of Alachlor and Metolachlor. Water Resources Center, University of Wisconsin-Madison, Madison, Wisconsin, 99 pp.
- Key Words:** Alachlor, atrazine, metolachlor, pesticides
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