

**Title:** Effect of Soil Type on Atrazine and Alachlor Movement Through Unsaturated Zone (Study No. 54)

**Investigators:** Principal Investigator

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**Period of Contract:** October 5, 1988 to June 30, 1989

**Objectives:** To compare movement of atrazine and alachlor through soil columns representing the Central Sands and Lower Wisconsin River Valley (LWRV) regions and to examine the influence of an experimental polymer additive on herbicide movement.

**Background/Need:** This study resulted from groundwater monitoring adjacent to agricultural fields in the Central Sands and Lower Wisconsin River Valley, conducted by the Department of Agriculture, Trade and Consumer Protection. The monitoring showed conflicting detections of herbicides despite similar cropping techniques and seemingly similar soil types.

**Methods:** Soil was extracted from two different locations: Sparta sand near Arena in the Lower Wisconsin River Valley and Plainfield sand from the Hancock Research Station in the Central Sands region. Columns were placed in a greenhouse and instrumented to simulate field temperature and moisture regimes. Corn was planted in each column; irrigation was simulated following a pattern used by growers in the LWRV and evapotranspiration was determined by weighing the columns daily and recording water applications and drainage. The same amounts of atrazine and alachlor were applied to all columns. Two of the Sparta columns received a polymer at the time of herbicide application. Bromide was applied to all columns to trace water movement. Leachate was collected daily and analyzed for atrazine and alachlor. Each soil column was sectioned and analyzed for herbicides at the completion of the experiment, which covered a 110-day period between December of 1988 and March of 1989.

**Results:**

A substantial difference occurred in movement of the herbicides when comparing the two soil types. Over 45% of the applied atrazine leached through the 40 cm column of Sparta sand, while the Plainfield sand lost only 3%. The 80 cm columns showed the Sparta and Plainfield losing 36% and 0.4% of the applied atrazine, respectively. Alachlor showed similar trends between soil types, though concentrations were significantly less. The greatest loss of alachlor was less than 2% from the Sparta 40 cm column.

The addition of the polymer to the herbicide showed a reduction in concentration and amount of herbicides leached through 40 cm columns. In 110 days, the polymer columns lost 31% of the applied atrazine, compared to the 45% leached from Sparta soil not receiving the polymer. In analyzing the soil remaining in the columns at the end of the experiment, data show that the columns which received the polymer contained significantly more of the herbicides at the surface of the soil compared to those receiving regular application.

**Conclusions:**

Investigators concluded that both atrazine and alachlor are more mobile in Sparta soil from the Lower Wisconsin River Valley than in Plainfield sand of the Central Sands. The use of an experimental polymer in the atrazine application solution partially reduced atrazine movement through the soil profile.

**Availability of Report:**

Copies of this report for this study can be obtained from:

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1525 Observatory Drive  
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This report is available for viewing and loan at:

The Water Resources Center  
1975 Willow Drive  
Madison, WI 53706  
(608) 262-3069  
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**Key Words:**

Alachlor, atrazine, Central Sands, Lower Wisconsin River Valley, pesticide, unsaturated zone

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