

LEACHING OF HERBICIDES IN SOILS

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INTRODUCTION

In intensively farmed areas, such as the warm and humid climate area in the Lower Mississippi Valley, large quantities of fertilizers and pesticides were used in crop production. Baton Rouge, Louisiana, was an excellent site to conduct a groundwater pollution experiment. Results from the warm, humid climate and clay soils with high watertables could be put into practice readily throughout the Lower Mississippi Valley and perhaps extended into other areas of the Southeastern United States.

Trifluralin, metolachlor and metribuzin were the selective herbicides for the preemergence control of annual grasses and broadleaf weeds in soybean, corn, cotton, and peanut production in Louisiana (Humbrug, 1989). The U.S. Environmental Protection Agency (E.P.A.) advisory levels of trifluralin, metolachlor and metribuzin for drinking water were 2.0 ng/mL, 10 ng/mL and 175ng/mL, respectively (Goodrich et al., 1991).

The objectives of this study are to identify leaching properties of trifluralin, metolachlor and metribuzin in fields, to evaluate water quality of the near surface aquifers with E.P.A. advisory level for drinking water.

MATERIALS AND METHODS

The research farm was located at the Louisiana Agricultural Experiment Station's Ben Hur Farms on the Mississippi River alluvial flood plain with a 0.1% slope about 6 km south of Baton Rouge, Louisiana. The soil was classified as a Commerce clay loam (Camp, 1976).

To quantify the near surface aquifers pollution (Isensee et al., 1990), two monitoring wells were installed in the center of each field to depths of 1 m and 2 m. The 1 m well was placed in the C soil horizon. The 2 m well was placed to

determine the concentration of herbicides percolating into the C soil horizon.

Plots A (3.72 ha), B (3.56 ha) and C (3.76 ha) were surface drain and had subsurface drain tubing installed one meter below the soil surface. Plot I (3.36 ha) had only surface drainage.

Plots are arranged to give 1683 g/ha of trifluralin, 2759 g/ha of metolachlor and 609 g/ha of metribuzin.

RESULTS AND DISCUSSION

The half lives of trifluralin, metolochlor and metribuzin in the top 15 cm of soil are 54.7 days, 35.8 days and 29.8 days, respectively.

A portion of trifluralin, metolachlor and metribuzin within the 0 - 15 cm depth was 94.7%, 86.6% and 75.4% for the amount of the 0-60 cm depth on about 30 days after applying, respectively.

The concentrations of trifluralin were in the range of 0.058 ng/mL to 0.026 ng/mL in well water of 1 m, and in the range of 0.039 ng/mL to 0.007 ng/mL in well water of 2 m on 62 days after applying, respectively. The concentrations of metolachlor in well water of 1 m and 2m deep were 82.32 ng/mL - 3.62 ng/mL and 8.44 ng/mL - 15.53 ng/mL, respectively. The concentration of metribuzin was 27.75 ng/mL - 0.70 ng/mL in 1m well and 1.71 ng/mL - 3.83 ng/mL in 2 m well.

Trifluralin was strongly adsorbed into soil, and showed negligible leaching. While metolachlor and metribuzin was readily adsorbed on soil, leaching potential of metolachlor and metribuzin were high.

The concentration of metribuzin in ground water with shallow aquifers was expected to exceed the 10 mg/L of Environmental Protection Agency (E.P.A.) advisory for drinking water early in the application season. The concentration of trifluralin and metolochlor were expected substantially less than the 2 ng/mL for trifluralin and 175 ng/mL for metolachlor of E.P.A. advisory in near surface aquifers on Louisiana of the Southeastern United States.

CONCLUSIONS

Trifluralin is strongly adsorbed into soil, and showed negligible leaching. While metolachlor and metribuzin is readily adsorbed on soil, leaching potential of metolachlor and metribuzin are high. The leaching patterns in the field study are also consistent with the column leaching in the laboratory study that metolachlor and metribuzin are fast leaching in the leachater water, and trifluralin moved much more hardly in the leachater water (Kim and Feagley, 1998).

The concentration of metribuzin in near surface aquifers is expected to exceed that of EPA advisory for drinking water early in the application season. The concentration of trifluralin and metolochlor are expected substantially less than those of the E.P.A. advisories in the ground water with shallow aquifer on Louisiana of the Southeastern United States.

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