

Runoff of Trifluralin, Metolachlor, and Metribuzin in Louisiana

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1. Introduction

Trifluralin [2,6 - dinitro - N,N - dipropyl - 4 - (trifluormethyl) benzenamine], metolachlor [2 - chloro - N - (2 - ethyl - 6 - methylphenyl) - N - (2 - methoxy - 1 - methylethyl) acetamide] and metribuzin [4- amino - 6 - (1,1 - dimethylethyl) - 3 - (methylthio) - 1,2,4 - triazin - 5(4H)one] were the selective herbicides for the preemergence control of annual grasses and broad leaf weeds in soybean, corn, cotton, and peanut production in Louisiana (Humbrug, 1989). The 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 175 ng/mL, respectively (Goodrich et al., 1991). Water solubilities were 0.3 mg/L of trifluralin, 530 mg/L of metolachlor and 1220 mg/L of metribuzin (Humbrug, 1989). The Koc values for trifluralin, metolachlor and metribuzin were 875, 135 and 96, respectively (Kim and Feagley, 1998).

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

2. MATERIALS AND METHODS

1) Experimental Site

This study was conducted at the Louisiana Agricultural Experiment Station's Ben Hur Farms about 6 km south of Baton Rouge, Louisiana. The research farm was located on the Mississippi River alluvial flood plain with a 0.1% slope. Plots are arranged to give 1683 g/ha of trifluralin, 2759 g/ha of metolachlor and 609 g/ha of metribuzin.

2) Sample Collection

An automatic water sampler was installed at each H-flume. Surface runoff water samples at the H-flumes were taken a 500 mL sample at a 20 minute time intervals during surface runoff events. All water samples were transported immediately after collection to USDA laboratory at Baton Rouge, LA, where they were stored frozen until analyzed.

Soil Samples were collected with 8.3 cm diameter soil auger. Soil auger was pushed vertically into the ground to obtain depth of 0-15 cm. Each sample was air dried for one week and grounded to pass a 2 mm sieve and stored at about -10°C until analyzed.

3. RESULTS AND DISCUSSION

The concentrations of trifluralin in runoff water are 0.09 ng/mL - 0.02 ng/mL, which are smaller than 2 ng/mL for trifluralin of the Environmental Protection Agency (E.P.A.) advisory for drinking water. The concentrations of metolachlor in runoff water are in the range from 221.5 ng/mL to 9.0 ng/mL, which are much or less than 175 ng/mL for the E.P.A. advisory of metolachlor. The concentrations of metribuzin in runoff water are 56.2 ng/mL - 1.5 ng/mL, which are much or less than 10 ng/mL for the E.P.A. advisory of metribuzin. The concentration of trifluralin in the runoff water is substantially less than the E.P.A. advisories. Metolachlor and metribuzin will be expected to exceed those of E.P.A. advisory early in the application season. But the concentration of metolachlor and metribuzin in the run off water will be expected to decrease quickly to levels below these E.P.A. advisories in Louisiana of the Southeastern United States. The total loss of trifluralin in runoff water is 0.005% of applied amount during 89 days after application. The total losses of metolachlor and metribuzin in runoff water are 4.67% and 5.36% of applied amount during 22 days after application. Trifluralin is moved much more hardly in the runoff water. However metolachlor and metribuzin are moved much more easily in the runoff water.

4. CONCLUSIONS

The runoff indices (RI) of metolachlor and metribuzin are about 440 and 34820 times that of trifluralin, respectively. The trends of runoff indices (RI) are confirmed in this Louisiana field study. Trifluralin is strongly adsorbed into soil, and show negligible runoff. While metolachlor and metribuzin are readily adsorbed on soil, runoff water contamination of metolachlor and metribuzin are high.

The concentration of trifluralin in the runoff water are substantially less than the E.P.A. advisory for drinking water. Metolachlor and metribuzin are shown to exceed those of E.P.A. advisory early in the application season. But the concentration of metolachlor and metribuzin in the run off will be expected to decrease quickly to levels below these E.P.A. advisories in Louisiana of the Southeastern United States

The results of the study are illustrated that main factors governing the runoff of

pesticide in the field are (1) the chemical properties of pesticide, (2) the amounts of pesticide applied, (3) the amounts of runoff water, (4) the time that is elapsed between pesticide application and the first runoff events, (5) the persistence in the soil.

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