Effect of Plot Size and Warm-season Grass Species on Turf Chemical Runoff

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Objectives:

1. Develop and employ a standardized protocol to measure turf chemical runoff in different regions of the United States.
2. Determine the "scalability" of turf runoff events from field plot areas.
3. Determine if grass species impacts pesticide runoff for warm-season grasses.

Start Date: 2003
Project Duration: three years
Total Funding: $90,000

This Mississippi-based project is part of a larger effort designed to improve understanding of regional hydrological and cultural differences that affect pesticide runoff from turfgrass. Using a standardized field protocol developed with U.S. EPA input, researchers at the University of Maryland, University of Minnesota, Oklahoma State University, and Mississippi State University (MSU) are cooperating to bridge information gaps that currently prevent previous USGA-funded runoff research from being fully considered in formal USEPA pesticide risk assessments.

The pesticides 2,4-D herbicide, chlorpyrifos insecticide, and flutolanil fungicide exhibit a range of physicochemical properties impacting runoff potential and were selected for inclusion in this study. Progress was made in 2004 with the completion of 18 runoff plots (12 x 30-ft) having 3% slope. Bermudagrass and zoysiagrass turfgrass plots maintained at two mowing heights are being investigated in this on-going 3-year project that is also receiving funding from the Mississippi Water Resources Research Institute.

Construction of runoff plots allows researchers to compare different pesticides in their abilities to be washed off both bermudagrass and zoysiagrass by simulated rainfall at MSU.

Two runoff events involving a total of six plots have been conducted to date. On average, 18 ± 8 % of the applied 2,4-D was measured in runoff from both grass species as compared to 2 ± 1% for flutolanil fungicide and 0.2 ± 0.1% for chlorpyrifos insecticide. The runoff results correlated well with the soil-water distribution coefficients that were determined for the Brooksville silty clay soil present at the runoff site. Soil organic carbon adsorption coefficients were 73 ml/g for 2,4-D, 576 ml/g for flutolanil, and 3551 ml/g for chlorpyrifos. These values indicate weak adsorption for 2,4-D, moderate adsorption for flutolanil, and strong sorption for chlorpyrifos.

Aereial view of the runoff plots at Mississippi State University

To date, maximum observed runoff concentrations were 962 ppb for 2,4-D, 1747 ppb for flutolanil, and 28 ppb for chlorpyrifos. The maximum concentration observed in runoff is a function of wash-off potential, foliar persistence, application rate, and rainfall intensity. Flutolanil had the highest application rate at 8.7 lb ai/A, chlorpyrifos was applied at 1 lb ai/A, and 2,4-D was applied at 0.24 lb ai/A.

A rainfall simulator was constructed to generate runoff from each of the turfgrass plots

It is too early to say that differences exist in the hydrology or pesticide retention/dissipation of bermudagrass and zoysiagrass turfgrass. The effects of plot size (i.e., scalability), mowing height, and grass species on pesticide runoff will be investigated in 2005.

Summary Points

- On average, 18 ± 8 % of the applied 2,4-D was measured in runoff from both grass species as compared to 2 ± 1% for flutolanil fungicide and 0.2 ± 0.1% for chlorpyrifos insecticide.
- Soil organic carbon adsorption coefficients were 73 ml/g for 2,4-D, 576 ml/g for flutolanil, and 3551 ml/g for chlorpyrifos. These values indicate weak adsorption for 2,4-D, moderate adsorption for flutolanil, and strong sorption for chlorpyrifos.
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