

Calibration of Computer Model Scenarios for Pesticide and Nutrient Runoff and Leaching in Turfgrass Environments

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Objectives:

1. Conduct field investigations for pesticide offsite movement such that the data can be used to calibrate regulatory computer model scenarios for turf.
2. To calibrate PRZM/EXAMS scenarios for turf such that the scenarios can be used in tier-2 exposure assessments for turf pesticides.
3. To modify the code of PRZM, as necessary, based upon the collected data to best represent the turf environment.

Start Date: 2000

Project Duration: 3 years

Total Funding: \$75,000

The objectives of this years research were to 1) instrument three sites at the Golf Club of Georgia and to monitor the green tile drainage and fairway runoff for herbicides and fungicides; 2) measure the runoff of two different formulations of the insecticide imidacloprid (Merit) on small field plots in Griffin, GA; and 3) conduct modeling based upon small plot runoff data and field data collected from the Golf Club of Georgia in Alpharetta, GA.

For objective 1, a fairway with two catch basins was instrumented in February, 2001, and two greens were instrumented in April, 2001 with Isco 6700 autosamplers. Oxadiazon (Ronstar) and dithiopyr (Dimension) were applied to the fairway in the spring and fall, respectively.

Fungicides applied throughout the year on the greens selected for monitoring were



After each event, water was collected from each plot and analyzed by high pressure liquid chromatography for residual insecticide or herbicide.

chlorothalonil (Daconil), propaconazole (BannerMaxx), flutolanil (Prostar). Soil samples were collected following applications of herbicides and fungicides and at set time intervals thereafter and water samples were collected during runoff events from either the fairway or leaching events from the tile drains of the greens.

Analytical methods have been developed for the analysis in water, soil, and thatch of all chemicals as well as selected degradation products of dithiopyr, chlorothalonil and propaconazole. Both GC/MS with chemical ionization, as well as LC/MS/MS with atmospheric chemical ionization, are being used to monitor both positive and negative ions simultaneously.

The runoff of the insecticide imidacloprid (Merit) was measured on small plots. To investigate its potential to be transported into non-target aquatic systems by rainfall events, imidacloprid was applied as Merit 0.5G and 75WP to 12 plots planted with bermudagrass on a 5% slope. The herbicide 2,4-D was applied simultaneously to the plots in order to normalize the results to prior trials conducted with other chemicals.

At a rate of one inch per hour, two-inch rainfall events were simulated at 24 and 48 hours after application and one-inch events were simulated at 96 and 192 hours. After each event, water was collected from each plot and analyzed by HPLC for residual insecticide or herbicide. Approximately 1.4% of the WP and 1.9% of the 0.5G formulated insecticides were found to be lost from the plots after four runoff events. Of the total mass lost, 64% and 30% of the loss occurred in the first and second runoff events for the WP formulation versus 75%



Researchers are measuring the capacity of pesticides to runoff treated fairways.

and 20% for the 0.5G formulation, respectively.

These values compare with a total mass export of 2.6 % for 2,4-D, of which 95% and 4% of the loss occurred in the first and second runoffs, respectively. Preliminary exposure assessment scenarios development by EPA Office of Pesticide Programs has yielded promising results based upon past and current field plot data.

Summary Points

- Soil, runoff water and tile drainage have been collected from greens and a fairway on a golf course.
- Methods have been developed for the analysis of selected herbicides and fungicides used on the golf course as well as their degradation products.
- Approximately 1.5-2 % of the applied mass of the insecticide imidacloprid was transported from turf plots in runoff water after four rainfall events.
- Most of the loss occurred in the first two events.