Evaluating the Potential of Turf Management Practices to Mitigate Pesticide and Nutrient Loads with Runoff from Fairway Turf

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Objectives:

1. To evaluate pesticide transport with rainfall runoff and the ability of management practices to mitigate pesticide and nutrient loss with runoff.
2. To evaluate the mobility of snow-mold fungicides and late-fall fertilizer with rainfall and snow melt runoff.
3. To evaluate the impact of location of chemical application to their transport with surface runoff.

Start Date: 2005
Project Duration: three years
Total Funding: $90,000

Construction of bentgrass turf plots began in 2003 and continued in 2004, along with the assembly of a rainfall simulator. In the spring of 2005, we expanded and enhanced the rainfall simulator and improved the design of the runoff collection and containment system (flow direction shields, erosion barriers, runoff collection troughs, trough shields). The following is a summary of our research progress, including studies that were initiated prior to our research agreement, April, 2005.

Three studies were designed and implemented utilizing turf plots containing creeping bentgrass fairway turf to evaluate pesticide transport with rainfall runoff and the ability of management practices to mitigate pesticide and nutrient loss with runoff, mobility of snow-mold fungicides and late-fall fertilizer with rainfall and snow melt runoff, and the impact of location of chemical application to their transport with surface runoff.

One goal is to identify management practices that maximize pesticide and nutrient retention at the site of application. Two rainfall simulations and collection of resulting runoff were completed in August and September, following guidelines outlined in the Turf Umbrella protocol (a collaborative project with university scientist from Maryland, Mississippi, and Oklahoma). Plots were maintained according to the standardized protocol with the exception that hollow-tine aeration replaced solid-tine aeration in half of the plots.

Two rainfall simulations and collection of resulting runoff were conducted to help identify management practices that maximize pesticide and nutrient retention at the site of application.

A commonly utilized herbicide (2,4-D), insecticide (chlorpyrifos), and fungicide (flutolanil) were applied to each plot to evaluate their tranport with runoff. Forty-eight hours prior to pesticide application each plot was pre-wet to saturation to ensure uniform water distribution. Replicate samples of surface runoff water and turf/soil cores were collected for analysis to determine levels of pesticides and nutrients moved from the site of application with runoff water or leaching to the underlying soil. Chemical analysis of the runoff samples will begin in November/December, 2005.

Another goal is to evaluate the mobility of snow mold fungicides and late-fall fertilizer. Chlorothalonil, iprodione, and urea were applied to the fairway turf plots in October, 2004. Natural rainfall runoff occuring before snowfall and snow melt runoff were collected along with weather data and soil temperatures. A second study will be repeated beginning October/November, 2005 to provide replication between field seasons and additional within-season replication.

The third goal is to evaluated the effects of location of chemical application on chemical movement. Potassium bromide and fluorobenzoic acids, traditional and alternative conservative tracers, have been utilized as valuable hydrologic tools for characterizing water movement through soil. In this study, three fluorobenzoic acids (2,6-difluorobenzoic acid, o-trifluoromethylbenzoic acid, pentafluorobenzoic acid) and potassium bromide were applied to selected areas of each turf plot to evaluate water movement and the influence of location of chemical application to transport with surface runoff. Sample analysis will be completed in November, 2005.

A goal of this project is to evaluate the mobility of snow mold fungicides and nutrients from late-fall fertilization.

Summary Points

- Three studies were designed and implemented utilizing turf plots containing creeping bentgrass fairway turf to evaluate pesticide transport with rainfall runoff and the ability of management practices to mitigate pesticide and nutrient loss with runoff, mobility of snow mold fungicides and late-fall fertilizer with rainfall and snow melt runoff, and the impact of location of chemical application to their transport with surface runoff.
- A commonly utilized herbicide (2,4-D), insecticide (chlorpyrifos), and fungicide (flutolanil) were applied to each plot to evaluate their tranport with runoff. Replicate samples of surface runoff water and turf/soil cores were collected for analysis to determine levels of pesticides and nutrients removed from the site of application with runoff water or leaching to the underlying soil. Chemical analysis of the runoff samples will begin in November/December, 2005.