Pesticide and Nutrient Fate

Introduction

Use of chemicals for the control of turfgrass pests, in conjunction with other cultural practices, has had a tremendous effect on the quality of turfgrass grown for golf courses and lawns. Chemical control of pests is only one of the several techniques used on golf courses to sustain turfgrass quality and reduce labor and energy costs.

Despite the obvious cultural and economic benefits, conflicts have developed over pesticide and fertilizer use in relation to environmental quality issues. Chemical residues have been associated with adverse environmental and potential human health effects including: 1) implication of some pesticides as potential human carcinogens, 2) long-term contamination of soils with persistent chemicals, 3) contamination of water resources, and 4) effects on non-target organisms.

Although the existing research results on the fate of chemicals applied to turfgrass is encouraging, much of this available scientific information has been derived from agricultural rather than turf systems or was conducted under a limited set of conditions (i.e., climates, soils, irrigation, turfgrass species, etc.), leaving room for uncertainty.

Based on these concerns, a three-year research program to investigate pressing pesticide and nutrient fate issues specifically relevant to golf course and turfgrass systems was implemented. The overall objective of the research is to understand the mass balance, fate and persistence of pesticides and nutrients applied to turfgrass systems.

These studies cover a wide range of golf course management factors, climates, and sampling methods which include:

- Putting green soil mixtures (sand, sand/peat) and fairway soil textural classes (sand, loam, silt loam)
- Thatch development
- Soil profile sampling depths
- Turfgrass species maintained under golf course conditions
- Irrigation regimes

This section first describes the specific objectives and procedures of each pesticide and nutrient fate research project. Afterwards, the preliminary results for these projects are summarized, in general terms, to note the significance of their findings. The summary includes preliminary results concerning the subsurface and surface loss of nitrogen and phosphorous, and the mobility and persistance of pesticides.

Cornell University

Mass Balance Assessment of Pesticides and Nutrients Applied to Golf Turf - Dr. A. Martin Petrovic

The objective of this project is to more fully understand the fate of pesticides and fertilizers applied to golf turf evaluated over a wide range of conditions. These experiments are being conducted at the ARESTS facility (Automated Rainfall Exclusion System for Turfgrass Studies) which is composed of 3.2 m x 3.2 m (10 ft. x 10 ft.) draining lysimeters (i.e., devices for the collection of water percolating through the soil), a rainout shelter, and an irrigation and drainage collection system. Factors evaluated are three soil textures (acid sand, sandy loam and silt loam) and two simulated growing season precipitation patterns (normal and wetter-than-normal). In this case, rainfall patterns for 1950 and 1917 were used for normal and wet, respectively.

Evaluated, thus far in this study, were applications of mecoprop, triadimefon, and trichlorfon applied to a simulated creeping bentgrass fairway. A ^{15}N labeled urea/methylene urea fertilizer containing phosphorus also was applied and will be monitored during the research project. Measurements taken include clipping yields and leachate from all or some of the lysimeters. The leachate samples are being analyzed for the concentration of nitrate, ammonium, phosphate, mecoprop, triadimefon, and trichlorfon.

Michigan State University

Groundwater Contamination Potential of Pesticides and Fertilizers Used on the Golf Course - Dr. Bruce E. Branham

This project is designed to examine the leaching potential of nitrogen, phosphorus, and pesticides under field conditions. Four lysimeters have been installed at the Hancock Turfgrass Research Center on the Michigan State University Campus. These lysimeters are 1 m^2 (10 ft^2) in surface area and are 1.2 m (4 ft.) deep. The soil within the lysimeters are intact cores that were not disturbed during the construction of the lysimeter. Data from these lysimeters will reflect conditions that oc-