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## Pesticide and Nutrient Fate

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pyrifos insecticides, and the fungicide metalaxyl.

Twenty centimeter diameter turf-soil cores were excavated to a depth of 61 cm from local field environments and transported to the laboratory one week prior to application and approximately 1, 14, 30, 60 and 120 days after application. Four cores were removed on each sampling date at each location. The cores were sectioned into verdure, thatch, mat and multiple soil depths, and then prepared for residue analysis.

Experiments addressing the fate of nitrogen and phosphorus were conducted at Iowa State University. Fourteen soil columns were encased in cement, extracted from the field, and transported to the greenhouse. Nitrogen and phosphorus were applied to the columns and two watering regimes of 2.54 cm (1 inch) immediately following nutrient application and four 0.63 cm (0.25 inches) applications during a one-week period were used to determine the effects of irrigation rates on nitrogen volatilization and movement through the turf/soil profile.

### *Washington State University*

*Quantification and Fate of Nitrogen from Amended Sand Putting Green Profiles - Dr. Stanton E. Brauen and Dr. Gwen K. Stahnke*

The Pacific Northwest has a history of constructing sand greens from pure sand, some with coarse particle sizes and without amendment, to reduce the cost of construction. A major concern is whether nitrate nitrogen leaching from putting green profiles constructed of sand alone, or peat/soil amended sand, can be prevented through efficient irrigation practices, efficient nitrogen fertilizer application, reduction in total nitrogen fertilization rate, or use of deeper sand profiles. This research project will evaluate the susceptibility of these systems to nitrate nitrogen leaching and provide guidance for its correction, reduction or elimination.

Lysimeters were constructed during 1991 from local funds and labor. Thirty-six of the 1.2 m x 2.5 m (4 ft. x 8 ft.) lysimeters were seeded to creeping bentgrass in early October and were overseeded to local ecotypes of annual bluegrass in the spring of 1992. The turf is managed as a putting green and traffic is applied with a Brinkman traffic simulator equipped with golf cleats.

The growing medium consists of 30 cm (12 inches) of USGA specification sand, either alone or

amended with ten percent sphagnum peat and two percent fine sandy loam soil. The three annual nitrogen application rates are 195, 390, and 585 kg ha<sup>-1</sup> yr<sup>-1</sup> (174, 348, and 526 lbs. per A respectively) and two application methods (granular slow release/soluble N fertilizer in four-week applications and biweekly granular slow release N with liquid ammonium sulfate).

Leachate data collection began the last week of October, 1991, with the beginning of fall rains. Soil-water percolate from each lysimeter is monitored and quantified on 24 hour intervals during leachate production periods. Leachate samples are analyzed by nitrate and ammonium ion sensitive electrodes and ion analyzer.

### *University of Nevada, Reno*

*The Effect of Salinity on Nitrate Leaching from Turfgrass - Dr. Daniel C. Bowman, Dr. Dale A. Devitt, and Dr. Wally W. Miller*

This project was initiated in March of 1991, and has a field (Las Vegas) and greenhouse (Reno) component to examine the effects of saline irrigation water on nitrate leaching from a soil root zone and on nitrogen uptake by turfgrasses.

**Las Vegas:** The irrigation system and sampling hardware (lysimeters, tensiometers, neutron probe access tubes, ceramic extraction cups, and associated plumbing) were installed at Horseman's Park in southeast Las Vegas during the spring and summer. Plots were then seeded with either 'NuMex Sahara' bermudagrass or 'Monarch' tall fescue at rates of 50 and 393 kg ha<sup>-1</sup> (45 and 350 lbs. per A), respectively. Each turf was established under typical fairway management conditions. Bermudagrass plots were overseeded with Palmer/Prelude perennial ryegrass in October. The saline irrigation treatments were initiated in January 1992, after which data collection began.

**Reno:** Seventy-two 15 cm (6 inches) diameter by 61 cm (24 inches) deep soil columns were equipped with ceramic extraction cups embedded in diatomaceous earth and back filled with a loamy sand. Each extraction cup is connected by tubing to individual collection bottles, which are in turn connected to a common vacuum line. The 36 columns then were seeded with either 'NuMex Sahara' bermudagrass or 'Monarch' tall fescue at the rates discussed above. Establishment and growth was rapid in the greenhouse for both species, and a dense sward has developed. Columns were

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fertilized once each month with ammonium nitrate at a rate of 50 kg N ha<sup>-1</sup> (45 lbs. per A). Supplemental iron was added regularly to correct some incipient chlorosis in the young bermudagrass. The leaching fraction treatments were started in January, 1991, and samples were collected weekly and analyzed for nitrate and ammonium.

### *Pennsylvania State University*

#### *Surface Runoff of Pesticides and Nutrients Applied to Golf Turf - Dr. Thomas L. Watschke*

Research plots were established with creeping bentgrass and perennial ryegrass on a sloped area to evaluate pesticide and nutrient runoff. Shortly after germination, irrigation was used to produce steady-state runoff, and hydrographs were generated from the runoff data. In 1992, leachate and runoff samples were evaluated for nitrogen and phosphorous levels. Currently, pesticide concentrations in runoff and leachate are being analyzed.

### *University of Massachusetts*

#### *Volatilization and Dislodgeable Residues of Pesticides and Nutrients Applied to Golf Turf - Dr. Richard J. Cooper and Dr. John M. Clark*

The objective of this study is to determine the gaseous losses (volatilization) and dislodgeable foliar residues of pesticides applied to golf course turf. To date, limited work has shown that volatile loss of some pesticides applied to turf approaches 15 to 25 percent of the total applied.

Airborne pesticide residues were assessed using the high-volume/theoretical profile shape method (i.e., high volume suction fan sampling air above the turfgrass area). Dislodgeable residue samples are determined by vigorously wiping cheese cloth over several one-square-foot areas. During the last two years, volatile and dislodgeable samples for pesticides were collected over a two week sampling period. Samples were extracted and stored for future analysis.

### *University of Florida, IFAS*

#### *Mobility and Persistence of Turfgrass Pesticides in a USGA Green - Dr. George H. Snyder and Dr. John L. Cisar*

The purpose of this project is to evaluate

percolate water from a USGA-specification green and evaluate various methodology practices for pesticide analysis.

Stainless-steel lysimeters were installed in a USGA-specification green at the University of Florida, IFAS, Ft. Lauderdale Research and Education Center. They were fitted with stainless-steel lines for off-site collection of percolate water. Lysimeter performance was tested in three ways to determine the completeness of sample recovery and to investigate the effect of sample residency time. It was determined that recovery equaled or exceeded 97 percent.

Methods were validated for determining certain organo-phosphate pesticides in percolate water, thatch, soil, and grass clippings. In 1992, the fate of six pesticides were evaluated and the methods were developed for determining dislodgeable residues.

### *University of Georgia*

#### *Evaluation of the Potential Movement of Pesticides Following Application to a Golf Course - Dr. Albert E. Smith and Dr. David C. Bridges*

The objectives of this project are to: 1) determine the potential movement of pesticides from treated bermudagrass and bentgrass greens into surface runoff and groundwater, and 2) determine the potential movement of pesticides from treated bermudagrass fairways into surface runoff and groundwater.

The greenhouse lysimeter facility has been constructed to simulate golf course greens with 'Pennecross' bentgrass and 'Tifgreen' bermudagrass turf. Thirty-six individual lysimeters were constructed by mounting a turfgrass growth-box on a PVC column containing a soil profile developed according to USGA specifications. An automatic track-irrigation system was developed for controlling the rates and time for irrigation. The daily irrigation of 0.63 cm (0.25 inches) of water and a weekly rain event of 2.54 cm (1 inch) are controlled by an automatic timer. Pesticide treatments began for this project in October, 1991.

The field lysimeter facility consists of small bermudagrass and bentgrass greens established on 56 cm (22 inches) diameter lysimeters installed below the sod. The 20 lysimeters have drainage lines installed at the bottom of the lysimeter for collection of leachate from the soil profile developed according to USGA specifications.