Modeling Pesticide Transport in Turfgrass Thatch and Foliage

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Goals:

- *To quantify the washoff of pesticides from bentgrass foliage as a function of time after application and pesticide formulation.*
- *To determine the effect of solution residence time on the sorption of pesticides to turfgrass thatch.*
- *To determine if the linear equilibrium form of convection/dispersion equation is able to provide accurate estimates of pesticide transport in turf.*

Pesticides applied to mature turf move into the soil only after being washed off foliage and moving through turfgrass thatch. Attempts to predict the movement of pesticides applied to turf require that the retention characteristics of the pesticide to foliage and the sorptive properties of the pesticide to thatch be known.

Pesticide movement from foliage to underlying porus media layers is usually modeled using foliar washoff algorithms. The use of foliar washoff algorithms requires accurate estimates of the fraction of applied pesticide that is deposited on the foliage, and of the fraction of pesticide that is removed from the foliage as a function of rainfall amount. In the case of the latter, the amount of time elapsed between pesticide application and the first rainfall event can significantly affect the fraction of pesticide removed from the foliage.

In the summer of 1995, dicamba, carbaryl and three formulations of chlorothalonil were applied to creeping bentgrass maintained at a cutting height of 5/8 inches. One, 8, 24, or 72 hours after pesticide application, 1.2 to 1.3 inches of rainfall was applied using a rainfall simulator. Foliage samples were collected immediately before and after simulated rainfall. The foliage samples are currently being analyzed to determine the effect of pesticide formulation and residence time for the washoff of pesticides from creeping bentgrass foliage.

Many pesticide transport models, such as PRZM2 and LEACHM, use the linear equilibrium form of the convection-dispersion equation to predict pesticide movement in porus media. A major assumption inherent in the use of this form of the convection-dispersion equation is that the residence time of solution containing the pesticide is of sufficient duration that sorption equilibrium between the solution and porus media is achieved. It has been hypothesized that turfgrass thatch differs from soil in that it exhibits non-equilibrium pesticide sorption. In such cases, pesticide movement within the media may be predicted with greater accuracy when a nonequilibrium form of the convection-dispersion equation is used to model pesticide transport.

In the summer of 1995, Ms. Sanju Raturi, a Ph.D candidate in the Agronomy Department, began to conduct a series of studies to determine the sorption kinetics of 2,4-D, carbaryl and chlorothalonil to creeping bentgrass and zoysiagrass thatch. Ms. Raturi will use the sorption information to evaluate the performance of linear equilibrium, one-site kinetic non-equilibrium, and two-site kinetic non-equilibrium solute transport models to predict pesticide movement in thatch/soil profiles.