Mobility and Persistence of Turfgrass Pesticides in a USGA Green

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Goals:

- *Conduct mobility (leaching and dislodgeability) and persistence studies on pesticides not examined in previous work.*
- *Monitor percolate collected on a golf course site for applied pesticides*
- *Quantify volatilization of certain pesticides applied to golf turf.*
- *Develop and document the results of using best management practices (BMPs) for fenamiphos and other pesticides that appear to have appreciable mobility, including evaluation of pesticide-adsorbing amendments.*

The mobility and persistence of the herbicides dicamba and 2,4-D were investigated in two studies conducted on a USGA green at the Ft. Lauderdale Research and Education Center that is outfitted with lysimeters for collecting percolate water. In each study, the herbicides were applied twice at one-week intervals at 58 and 6 mg a.i. m^{-2} for 2,4-D and dicamba, respectively, followed the next day by 9 mm irrigation, and by subsequent irrigation to maintain soil moisture. Samples of thatch, soil, percolate water, and clippings were analyzed for 2,4-D and dicamba.

Although the dicamba application rate was only 10 percent that of 2,4-D, the recovery of these materials (expressed as mass) in percolate water was of the same order of magnitude. Detectable levels of both herbicides were observed in thatch and soil for several months. Very little (≤ 0.25 %) was recovered in clippings.

Leaching of the pesticide fenamiphos, and especially of its metabolites, has become a concern. These compounds were found in groundwater and surface waters in and around golf courses. The use of reduced irrigation for one week following fenamiphos application was studied as a means of reducing fenamiphos/metabolite leaching in a USGA green in south Florida. Leaching was reduced during the period of limited irrigation, but total leaching was equivalent for low and high irrigation treatments over a longer period that included plentiful irrigation and rainfall. It appeared that the fenamiphos and its metabolites that were not leached when

irrigation was restricted eventually leached when excessive irrigation and rainfall occurred.

The percolate collection system in the USGA green at the Ft. Lauderdale Research and Education Center was expanded to include twelve lysimeters. This will permit greater numbers of replications in studies involving two or more treatments, which is very important for pesticide studies. During excavation it was noted that 7 cm of topdressing had accumulated on the green since the lysimeters were first installed. This layer appeared to hold more water than the underlying media does. It contained somewhat higher percentages of the finer sand sizes. It also had more organic matter than either the original rooting mix or the topdressing material. No movement of rootzone mix into the coarse sand layer, or of coarse sand into the underlying gravel was observed during excavation for the newly added lysimeters.

Volatilization of the organophosphate pesticides isazofos, chlorpyrifos, and fenamiphos was measured in two studies using the Theoretical Profile Shape technique. Volatilization was greatest for chlorpyrifos, and least for fenamiphos. Volatilization was less for an application that was followed by rainfall than for one followed by dry weather. Isazofos volatilization amounted to one and nine percent of that applied for the two rainfall situations, respectively.

Evaluations of pesticide dislodgeability and subsequent risk assessments were conducted in conjunction with a M.S. graduate student. The initial study was conducted on a *TIFDWARF* bermudagrass green overseeded with *Poa trivialis* to provide paired plots that were either overseeded or not overseeded. A second study was conducted with organophosphate pesticides on a bermudagrass green.

Dislodgeability methods were: cheesecloth rubbed on the treated turf surfaces, cotton and leather pressed on the turf, a golf ball putted over the turf, and a club grip rolled on the turf. The pesticides also were sprayed on the fringe of the green, and cheesecloth was rubbed on the head of a club that was swung through the turf to simulate a chipping stroke. These treatments were repeated at the end of the day, and again the next morning.

The pesticide analyses and risk assessments are incomplete at the time of this writing, although some data are available for the organophosphate pesticide study. These data demonstrate rapid decreases in dislodgeable pesticides with time after application, and particularly after irrigation.

Fenamiphos and fenamiphos metabolite adsorption by a stabilized organic polymer (SOP) was investigated in the laboratory and field. The SOP adsorbed relatively non-polar pesticides well, but the polar pesticides less well. The SOP formulation was modified to improve adsorption of less-polar pesticides. Sufficient reformulated SOP of various sand sizes has been prepared for field studies on the USGA green. The University of Florida has applied for a patent on the SOP as a soil amendment for reducing pesticide leaching without affecting the physical parameters of a USGA green, and for other uses.