

Quantifying the Effect of Turf on Pesticide Fate

Bruce E. Branham

University of Illinois

Goal:

- *Quantify the ability of the turf organic matter to bind, degrade and slow the movement of a pesticide through the soil.*

This research project was initiated in the spring of 1996. The first experiment was designed to measure the impact of the surface organic matter present in a mature turf on the vertical movement and rate of dissipation of a pesticide used in turf. The fungicide cyproconazole was chosen for this experiment since it is a relatively new pesticide used in turf, with little published information regarding its fate in turf.

In order to determine the effect of turf and associated organic matter, four organic matter treatments were created. A normal bentgrass fairway mowed at 1.25 cm was used as one organic matter treatment. Strips within this area were thinned of surface organic by vertical mowing until 67 and 33 percent of the organic matter in a full turf remained. The last organic matter treatment was the removal of the sod, leaving the underlying bare soil.

Movement and dissipation were measured using a mini-lysimeter approach. The mini-lysimeters were 20 cm diameter by 30 cm lengths of PVC that were inserted into the turf, flush with the soil/turf surface. The lysimeters were treated with cyproconazole on July 15, 1996 at a rate of 400 gm a.i. ha⁻¹ (0.36 lbs a.i. A⁻¹). Lysimeters were removed from the soil at 2 hours after application, and at 4, 8, 16, 32, 64, and 128 days after application. Each organic matter by sampling date treatment was replicated three times.

After the lysimeters were removed from the soil, the plastic was cut open and the core sectioned into verdure (any green leaf tissue), thatch, and 0 to 1, 1 to 3, 3 to 5, 5 to 15, and 15 to 30 cm soil intervals. Each

sample will be extracted for cyproconazole and residues determined by gas chromatography.

To date, the 2 hour after application sampling has been completely analyzed. Each sampling date requires 81 separate extraction, purification, and analysis steps. So far, the data support the strong sorptive properties of turfgrass leaves and thatch. In the full-turf treatment, 90 percent of the applied cyproconazole was recovered in the verdure sample at 2 hours after treatment, even with a relatively high spray volume of 1.5 gallons per thousand square feet. An additional 9 percent was recovered in the thatch and only 1.1 percent of the applied material was in the 0 to 1 cm soil depth.

In the 33 percent organic matter removal treatment, 18 percent of the applied cyproconazole was in the verdure, 59 percent was in the thatch layer, and 22 percent was in the 0 to 1 cm soil depth. For the 67 percent organic matter removal treatment, 96 percent was in the thatch layer and 4 percent was in the 0 to 1 cm layer. In the bare ground treatment, all of the material was in the 0 to 1 cm soil layer. This data is preliminary as some of the samples will require confirmation.

The data will be more interesting as the other sampling dates are analyzed and degradation rates and vertical movement can be correlated to surface organic matter content. This study will be expanded and repeated in 1997.

Table 12. Cyproconazole distribution 2 hours after treatment in a creeping bentgrass fairway with four levels of organic matter (i.e., verdure and thatch) above the soil surface.

Cross-Section	Cyproconazole Recovered ¹			Full Stand
	Bare Soil	67% OM Removed	33% OM Removed	
	----- mg kg ⁻¹ sample -----			
Verdure	---	---	387.0	659.0
Thatch	---	23.4	17.8	3.0
0-1 cm soil	10.4	0.357	2.04	0.177
1-3 cm soil	nd ²	0.017	nd	nd
3-5 cm soil	nd	nd	nd	nd
5-15 cm soil	nd	nd	nd	nd
15-30 cm soil	nd	nd	nd	nd

¹ Limit of detection is 0.010 mg cyproconazole per kg soil and 0.60 cyproconazole per kg plant tissue.

² nd = non-