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.*

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

Research evaluating the washoff of pesticides from SOUTHSHORE creeping bentgrass foliage was conducted in the summer of 1995 and 1996. The turf was mowed to 5/8 inches prior to the application of each pesticide and approximately 1.25 inches of simulated rainfall was applied 1, 8, 24 and 72 hours after pesticide application.

Pesticide washoff from the foliage was determined by mowing strips of turf at a 3/8-inch height immediately before and after simulated rainfall. The strips were located adjacent to one another inside 6 by 7 foot plots.

Three formulations of chlorothalonil, (Daconil 2787 4F, Daconil Ultrex WDG, and Daconil 2787 5G) were applied at a target rate of 9 lbs chlorothalonil per acre on four dates in 1995, and on two dates in 1996. Each formulation was applied to a separate block of turf on each of the six dates, and to a single plot within each block sampled at one of the four designated residence time intervals. Similarly, four replicate blocks of SOUTHSHORE creeping bentgrass were treated with target rates of 0.5 lbs dicamba per acre or 7.7 lbs of carbaryl per acre on a single date in 1995, using Banvel or Chipco Sevin 4SL.

Chlorothalonil was more resistant to washoff than carbaryl or dicamba. Over the

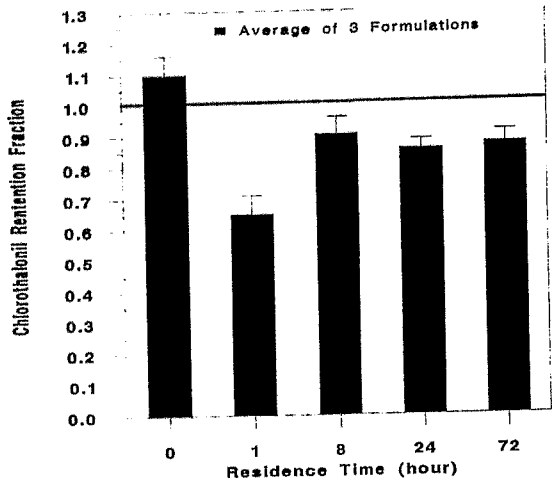

Figure 16. Washoff of chlorothalonil from bentgrass foliage. Means and standard errors are based on six replicates. A total of 1.24 (+ 0.01) inches of simulated rainfall was applied at the prescribed residence times.

72-hour evaluation period, foliar levels of chlorothalonil were 20 to 46 percent higher in turf treated with Daconil 27875G than in turf treated with F or WDG formulated Daconil 2787. There was, however, no difference among the three formulations in the fraction of chlorothalonil that was removed by rainfall. When averaged over the 3 formulations, about 35 percent of the chlorothalonil was removed from the foliage when rainfall occurred 1 hour after application. At longer residence times, no more than 15 percent of the chlorothalonil was removed from the foliage with rainfall.

Rainfall that occurred within 8 hours of the application of Banvel removed 70 percent of the dicamba present on the foliage. Dicamba became more resistant to washoff at longer residence times. Only 44 percent of the dicamba present on bentgrass foliage was removed when rainfall first occurred 72 hours after application of Banvel.

Replicate measurements of the fraction of carbaryl retained on bentgrass foliage were variable. The amount of carbaryl washoff, however, did not vary much with residence time. Washoff of carbaryl from bentgrass foliage ranged from 64 to 79 percent over the 72 hour residence time evaluation period.

Research in 1997 will focus on conducting sorption and transport studies aimed at obtaining the transport parameters needed to model 2,4-D, carbaryl and chlorothalonil movement using equilibrium and non-equilibrium forms of the convection dispersion equation. Our initial transport study conducted in 1996 revealed that the presence of a surface thatch layer reduced the transport of 2,4-D through shallow (i.e., 6 inches deep) soil cores by at least 50 percent. Cores having a 3.5 year old 0.7-inch surface layer of SOUTHSHORE creeping bentgrass thatch were more effective in reducing 2,4-D transport than cores having a 6 year old 1.3- inch surface layer of MEYER zoysiagrass thatch.