LT 9

Dislodgeability of Pesticide Residues

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There is a great deal of interest from homeowners and golfers concerning their exposure to turf applied pesticides and the associated risk. The principal criteria used to evaluate this risk are the inherent toxicity of the product applied and the amount of exposure. The toxicity of all pesticide products is well established and comparisons between products can be easily performed. Determining the likelihood for exposure to turf applied pesticides has been the focus of several interesting research projects.

The main route for exposure in a turf system is dermal or through the skin from contact with the turf surface. The amount of pesticide that is available for dermal exposure is called the *dislodgeable* fraction. Once the pesticide solution hits the turf, there are four general areas the product can go. It can be absorbed into the plant through the leaf blade, adsorbed onto the leaf blade, adsorbed onto the soil/thatch area, or volatilized into the air. Again, the area we are most concerned about is the amount left on the leaf blade that can be rubbed off or dislodged by a person. As you can imagine, there are many factors that influence the amount which can be dislodged. They include the product formulation (dry, liquid, EC, WP), temperature, moisture, humidity, turf density, and time after application to name a few.

Several experiments have been conducted to evaluate the amount of dislodgeable residue. Hurto (1990) applied several insecticides and pre-emergence herbicides to Kentucky bluegrass by using wettable powder, dispersible granule, flowable, and emulsifiable concentrate formulations. Clippings were collected by mowing the area immediately after application and at 1,2,3,7, and 14 days after treatment (DAT). In addition, half of the plots were irrigated two hours after treatment and clippings collected to evaluate the effect of additional water on dislodgeability. The clippings were washed with a detergent to dislodge the chemical and then analyzed. Approximately 13-30% of the amount applied could be dislodged within one hour after treatment from the non-irrigated plots. The amount collected from the irrigated plots fell by nearly 50% for all formulations except for the emulsifiable concentrates which were not as affected by the irrigation. The average amount collected decreased rapidly over time to 3.3% 1 DAT, 2.7% 2 DAT, 1.9% 3

DAT, and 0.3% 14 DAT.

In a similar study, Sears (1992) applied diazinon, Dursban, and Oftanol to Kentucky bluegrass. Sears, however, included a few more treatments. They compared granular versus liquid formulations of diazinon, and placed shade cloth over portions of the test area to investigate the influence of the sun on dislodgeability. Sears used cheesecloth to wipe the turf canopy after application. The overall amounts detected were lower than the Hurto study, but the trends were similar. The lowered detection s may be explained by the difference between the washing method used by Hurto versus the cheesecloth wipe method. Nearly 10% of the diazinon amount applied was dislodged immediately after treatment. That fell to 0.3% by 1 DAT. There were 20 times more liquid diazinon detected compared to the granular formulation immediately after treatment. By 1 DAT the levels were similar. Irrigation reduced the amount for all timings, while sunlight did not affect the dislodgeability of any of the treatments.

Some of the more interesting studies were conducted by a group of researchers at the University of Guelf in Ontario, Canada (Harris 1,2). They used human volunteers to determine the amount of exposure by having them walk and sit in treated areas. They chose the herbicide 2,4-D because it is excreted in the urine quickly after exposure. The product was applied at label rates to a large lawn area on campus. They released 10 volunteers into the area one hour after treatment. Five of the people wore a short sleeve shirt, long pants, shoes and socks. The other five wore a short sleeve shirt, shorts, and no shoes or socks. They remained in the treated area for 60 minutes and walked, sat or lied down in the area for five minute intervals. Another group of ten people were released into the treated area 24 hours after treatment and instructed to perform the same tasks. Urine was collected from all subjects for four consecutive days after the exposure period.

No detectable residues were collected from the group that was in the area 24 hours after treatment. This included the people that were clothed in only shorts and shirts. Only three people had detectable residues in the group that entered the area one hour after treatment. All three were in the shorts/shirt group. The highest amount was from a subject who removed his shirt during the test. The amount accumulated for this subject was 0.426 milligrams of 2,4-D. The other two detections were between 0.10-0.15 milligrams of 2,4-D. The World Health Organization (WHO) calculations, the acceptable daily intake of 2,4-D was approximately 24 milligrams per day for these subjects. Clearly the amount of exposure is well below the WHO limit.

Part of the importance of these studies are the recommendations that we can offer to people concerned about exposure. Certainly, we should

strive to reduce the potential for exposure to pesticide products applied to lawn areas. Once liquid products are dried on the leaf, the potential for exposure is greatly reduced, and the potential for exposure continues to decrease over time. The largest reduction is within the first 24 hours. The addition of irrigation also reduces the potential for exposure. These conclusions are particularly important for reducing the exposure of these products on the more sensitive portions of our population such as children.

These conclusions coincide with our current posting and notification procedures in Michigan. Specific signs are required to be placed on lawns that have been treated by commercial applicators and suggest that you stay off the area until it is dry.

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