Recreational Exposure of Golfers to Pesticides Applied to Golf Courses

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Number of Years: 1
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Objectives:

1. *The role of vapor pressure and temperature will be evaluated in terms of developing a screening system for turfgrass pesticides.*
2. *Pesticides with possible safety concerns will be further evaluated in the context of best management practices, including the role of spray volume and adjuvants.*
3. *The role of thatch accumulation on the dissipation of volatile and dislodgeable residues will be assessed.*

This ongoing study seeks the best management practices that reduce the potential for golfer exposure to volatile and dislodgeable foliar residues of turfgrass pesticides. Major routes of pesticide exposure for humans are primarily through inhalation and dermal penetration. Our past research has determined that pesticides with high vapor pressures and inherent high toxicities result in Inhalation Hazard Quotients (IHQs) and Dermal Hazard Quotients (DHQs) greater than 1.0, an action level for concern.
Two approaches, the use of spray tank adjuvants and managing post-application irrigation levels, have been examined. During the 1998 growing season, the adjuvant, Silwet L-77, was applied to tank mixtures with the expectations of improving thatch penetration, suppressing volatilization and reducing dermal exposures. Three pesticides with high to intermediate vapor pressures (isofenphos, chlorpyrifos, and bendiocarb) were applied to small circular plots with or without the adjuvant. Two irrigation levels of 1.3 and 0.63-cm were applied to plots post-pesticide application. In 1999, the effect of irrigation levels was further examined at 0.63 and 0.32-cm following pesticide application at 1/2 and 1/4 the maximum label rates. Volatilization was measured with high volume air samplers using the Theoretical Profile Shape (TPS) method. Dislodgeable residues samples were collected by wiping treated turf-plots with dampened cheesecloth. The potential hazard associated with exposure to the volatile and dislodgeable foliar residues was determined by Inhalation Hazard Quotients (IHQs) and Dermal Hazard Quotient (DHQs) using the US EPA Hazard Quotient method.
For Day 1, volatile residues at 1.3-cm irrigation, the use of Silwet L-77 increased IHQ values for both chlorpyrifos and isofenphos. However at 0.63-cm irrigation, the use of adjuvant reduced IHQ values for chlorpyrifos and isofenphos. For bendiocarb, available residues were not affected by the use of the adjuvant in any of the situations examined. For dislodgeable residues, Silwet L-77 increased DHQ values over time for all three pesticides at both 1.3 and 0.63cm post-application irrigation. Only isofenphos exceeded DHQ values of 1.0 following the initial 15 minute period post-application at both irrigation levels (value went below a DHQ of 1.0 by 5 hrs post-application at 1.3-cm, and 27 hrs post-application at 0.63-cm).

In summary, spray-tank adjuvants have not proven to be useful approaches for mitigating pesticide exposure situations following application to turfgrass. Management of post-application irrigation appears more useful particularly when used in combination with reduced rates of pesticides and in the presence of an extending use-type of adjuvant.