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 phenoxy-acid herbicides dicamba and 2,4-D were investigated in two studies conducted on a USGA green at the Fort 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 active ingredient (a.i.) per square meter for 2,4-D and dicamba, respectively. Although the dicamba application rate was only 10% that of 2,4-D, the recovery of these materials (expressed as mass) in percolate water was of the same order of magnitude, being approximately 10% of that applied for dicamba and 1% for 2,4-D. Detectable levels of both herbicides were observed in thatch and soil for several months. Very little ($\leq 0.25\%$) was recovered in clippings.

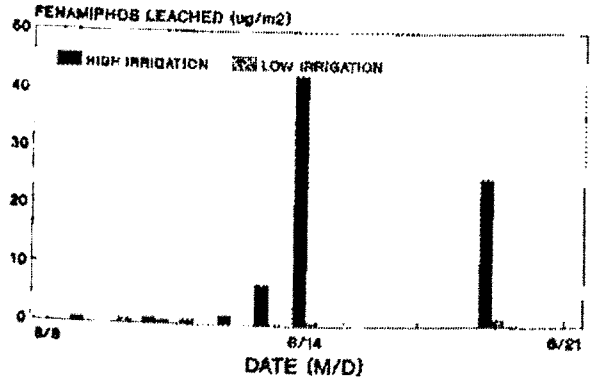
In previous studies, fenamiphos, and especially its sulfoxide and sulfone metabolites, were sufficiently mobile to be observed in percolate waters. Three approaches were investigated to reduce leaching and/or improve efficacy of fenamiphos: I) irrigation management, ii) surfactants, and iii) adsorbents.

Fenamiphos leaching in plots receiving twice-weekly irrigations during the week following application was less than 2% over a three-week period of that observed in plots receiving daily irrigations. Fenamiphos metabolite leaching also was dramatically reduced by restricting irrigation, except in the samples collected following a 72 mm rainfall. This event occurred two weeks after the fenamiphos application and the metabolite

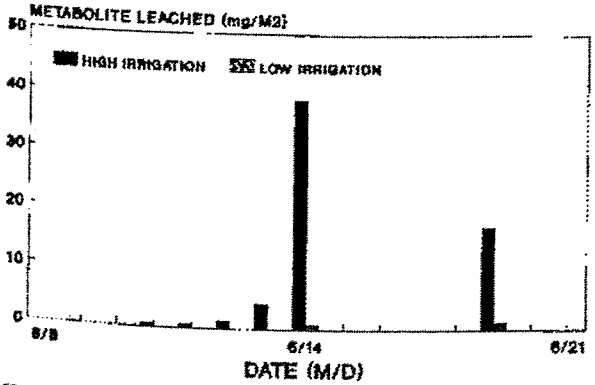
found in leachate from reduced-irrigation plots exceeded that found in plots receiving daily irrigation. Over a three week period, metabolite leaching was approximately the same in the two irrigation treatments.

Thatch strongly adsorbs fenamiphos, but nematodes are most prevalent in the underlying soil. In field studies, surfactant applied to the soil one month before fenamiphos, the same day as fenamiphos, or with the fenamiphos did not greatly increase the movement of fenamiphos through the thatch into the soil. None of the surfactant treatments enhanced the control nematodes.

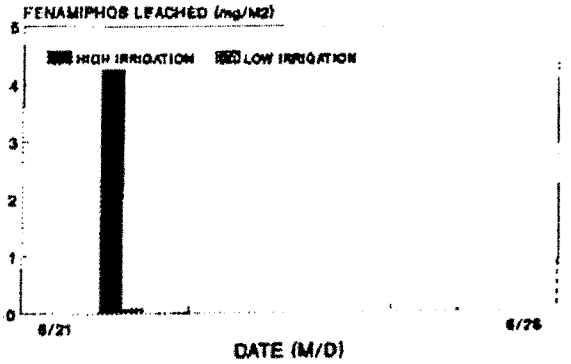
A method was developed for rapidly screening surfactants in the laboratory for their ability to reduce fenamiphos adsorption by thatch in order to identify candidate surfactants for future field trials. A zeolite soil amendment was evaluated for reducing fenamiphos and fenamiphos metabolite leaching in sand columns. The zeolite reduced saturated hydraulic conductivity by 94% and allowed 42 and 75% of the fenamiphos and metabolite to leach.



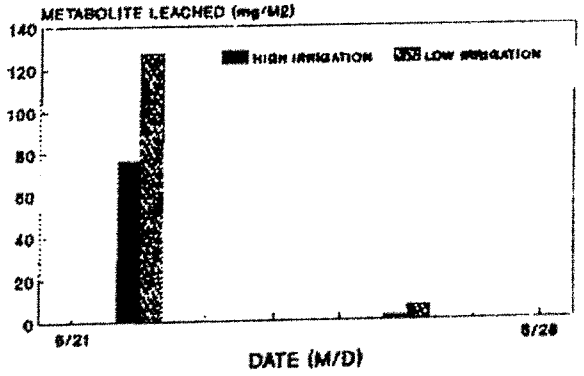
Effect of high and low irrigation on fenamiphos leaching for two weeks after application. Lower irrigation reduced leaching during this period.



Effect of high and low irrigation on leaching of the fenamiphos metabolites (sulfoxide and sulfone) for two weeks after application. The low irrigation treatment was effective in reducing the amount of metabolite leaching.



Following a high rainfall event two weeks after the fenamiphos application, the low irrigation treatment effectively reduced the amount of the parent compound found in leaching samples.



The high rainfall which occurred two weeks after the fenamiphos application caused the metabolites to leach through the putting green profile. The low irrigation treatment did not reduce the amount of metabolite leaching through the green.