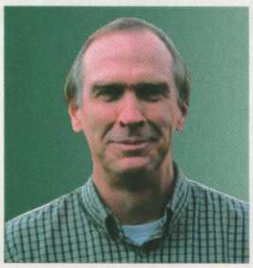
Does Turf Affect Runoff?

Research shows turf absorbs pesticides, but doesn't filter them

BY BRUCE BRANHAM AND DAVID GARDNER

Like it or not, turfgrass management is considered a close cousin of production agriculture. Problems identified in production agriculture are assumed to apply to turf as well. Turf is also managed more intensely than a typical corn crop, which seems to be the measuring stick for production agriculture. So it may be logical for government regulators, environmental activists and concerned citizens to assume that highly maintained turfgrass sites present more risk to the environment than production agriculture.



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The USGA supported a research project at the University of Illinois for the past three years to document pesticide dissipation in turf vs. bare soil. These side-by-side studies were designed to determine exactly the role of turfgrass and associated thatch on the fate of pesticides applied to turf.

We examined the dissipation rate and leaching of five pesticides used in turf. We focused on newer pesticides where little previous information on dissipation rates and leaching existed. The five pesticides we chose (Table 1) consisted of three fungicides, one insecticide and one herbicide. These pesticides were chosen to have a range of physical characteristics that result in differing potentials to leach.

Each pesticide was applied to bare soil or to the same soil covered with a bentgrass turf. Thus, we were able to directly compare the effect of turf with the same soil type, irrigation and natural precipitation rates. The bare soil was created by stripping the sod cover prior to pesticide application.

We acknowledge that even this comparison may be flawed since stripping the sod from a turf does not give the same kind of soil as would be found in a row cropping system. The higher level of root mass associated with turf will likely yield higher microbial populations than under a normal fallow soil condition.

What did we discover?

After completing these experiments with five different pesticides, some trends emerged. Our most illuminating finding is that pesticides classified in the immobile or moderately mobile category tend to have shorter half-lives in turf than in bare soil (Table 2). The more rapid dissipation is because of the high levels of microbial activity found in thatch.

For pesticides that are immobile, the faster rate of dissipa-

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Table 1

Physical properties of pesticides used in dissipation studies

Pesticide	Soil absorption coefficient	Water solubility (PPM)	Previously estimated half-life (days)
propiconazole	650	110	110
halofenozide	–	510	–
ethofumesate	340	50	30
cyproconazole	–	140	90
mefanoxam	50	26,000	70

Table 2

Half-lives (in days) determined in turf or bare soil from experiments conducted in Urbana, Ill., from 1996-1999.

Pesticide	Bare soil	Turf
propiconazole	29	12-15
halofenozide	>64	>64
ethofumesate	51	3
cyproconazole	128	8-12
mefanoxam	7-8	5-6

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tion has few benefits, from an environmental perspective, since these products tend not to leach. Decreasing soil or turf residence times could reduce the likelihood of runoff of these pesticides, since they will be present in the environment for shorter periods of time. Pre-emergent herbicides, which need to remain present for several months to provide effective control, are often applied at higher rates in turf than in row crop agriculture. For this group of pesticides, field experience has already shown that pesticides break down faster in turf than in bare soil.

The real value of turf appears in the case of pesticides that are moderately mobile. These products may leach to groundwater when conditions favorable for leaching are present, such as sandy soils, high rainfall or irrigation following application, or low soil organic carbon content. In other systems, the potential for leaching of these pesticides does exist, but it appears unlikely that these products would leach to a significant extent because of the capacity of turf to sorb and degrade these compounds.

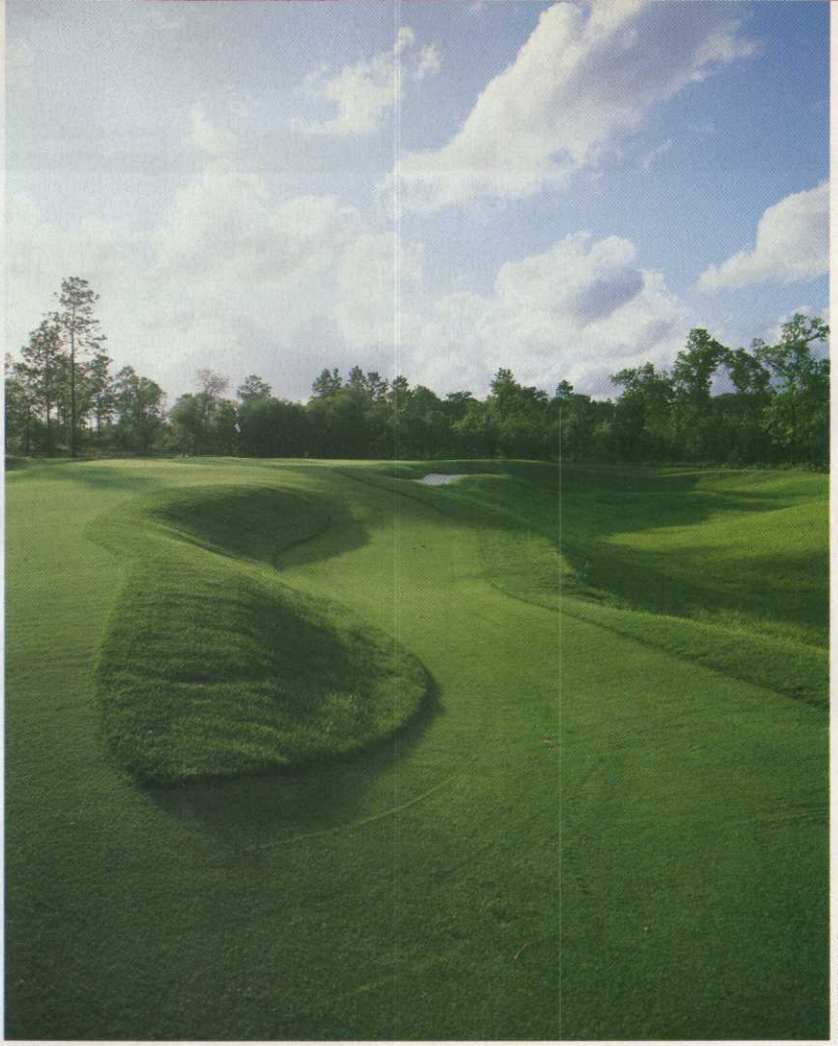
On a less positive note, pesticides classified as mobile tend to behave the same regardless of whether they are applied to turf or bare soil. We believe this is because the thatch does not retain these mobile pesticides, and so they bypass the beneficial environment of the surface layer of turf. Two mobile pesticides, mefanoxam and halofenozide, were tested and both products quickly reached the lowest layer we sampled, 6 to 12 inches, by four days after application.

These products may dissipate more rapidly in thatch than in soil but tend to move through the layer quickly and aren't there long enough to derive the benefit of thatch on pesticide dissipation. While small percentages of the total pesticide application rate leached to the lower soil depths, these are important amounts because once they reach these depths there's little likelihood they will be transformed before reaching groundwater.

One practical result of this research is the recommendation that irrigation following application of a mobile pesticide be light and infrequent as practical. While rainfall can't be controlled, irrigation should be light enough that it doesn't move these products through the thatch for the first four to seven days after application.

Does turf influence pesticide leaching?

Perhaps the best way to view turf is not as a wonderful filtration system that degrades everything we apply to it, but rather a highly sorptive layer of organic matter teeming with microbial activity that will reduce the potential problems caused by the introduction of pesticides into environment. It will not eliminate these problems, but will dampen their impact on water resources.



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Superintendents shouldn't view turf as a filtration system that degrades pesticides. Instead, it should be viewed as a sorbtive layer that reduces potential problems rather than eliminates them.

Special care should be exercised when using pesticides that are considered mobile in soil. These products are most likely mobile in turf. Irrigation practices should be modified to retain these pesticide within the thatch layer as long as possible.

When a choice exists, choose pesticides that are classified as moderately mobile or immobile over those classified as mobile.

It is the responsibility of the superintendent to make wise choices regarding pesticides use and selection that minimize the risk of ground or surface-water contamination. You have a good system to manage, but it still must be managed well. ■

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