Considerations in pesticide selection

You must understand your pest problems, observe the environmental concerns where they're being used, and know the pesticide's characteristics to make the right choice.

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Pesticide selection can be frustrating. But it is nonetheless a very important process:

1) Pesticides are an essential tool for maintaining quality turf. In some parts of the country, pesticides are also a sizable portion of the overall maintenance budget.

2) Our society is concerned with potential environmental hazards from pesticide use.

Several criteria are important in making the right pesticide choice. Examples contained herein will be associated with insecticides, but many of the same rules hold true for weed and disease control products.

Cost and effectiveness

How quickly a product works and how long it lasts can often be two different, separate functions.

Effectiveness is often associated with how quickly a pesticide will kill the pest, but in the case of a persistent or recurring pest, residual action may be critical. For example, Dylox (trichlorfon) works quite quickly for controlling white grubs, but provides little residual control. For some pests, such as mole crickets, residual activity may be as important as initial control because mole cricket egg hatch and nymph emergence takes an extended period of time.

Cost is always important, but must be figured in light of residual activity. A less expensive product—that has short residual activity, but will have to be re-applied more times than a more expensive, longer-lived product—may not end up being less expensive.

Many factors enter into cost: overall effectiveness, need to re-treat, application equipment, labor, the time of year to apply, and the actual cost per 1000 sq. ft. or acre.

Formulations

Some formulations may be more expensive than others. But the real cost of a product becomes more obvious once you factor in other considerations. Are they easier or quicker to apply, are they more effective or safer, or more effective against a particular pest? Which one can you put out most easily, accurately and effectively?

As a general rule, granular formulations are not "activated" until irrigation or rainfall occurs, which is necessary to move the active ingredient into the soil. Sub-surface application equipment is becoming more popular and available, and various forms are available for both liquid and granular formulations of insecticides (see photo).

Selectivity

Most conventional insecticides have a relatively broad spectrum—that is, they kill most (if not all) of the insects, bad and good alike, found in the turf. A few insecticides—particularly the biological materials such as entomogenous nematodes, fungi and bacteria—are more selective.

Some turf managers prefer a label that covers a broad spectrum of pests. However, a single application will not necessarily get all 20 different insects listed on a label. Some insects may require a higher rate. All the insects that appear on a label are rarely active simultaneously, even at low levels. And often the application technique varies with the pest. (For example, a treatment for white grubs would need to be watered in immediately, while the same application for armyworms would need to dry on the foliage.)

Many types of equipment are available for sub-surface application of insecticides in turfgrass. This unit places liquid formulations below the soil surface using low-pressure sprays into small slits created by the Coulter wheels.

Toxicity

Toxicity to people, pets, fish and birds is a prime consideration when selecting a pesticide. This label information should be considered prior to any pesticide use. It has direct effects on worker protection practices and may certainly influence where you can use it. Different formulations of the same product can also differ in their actual toxicity or hazard, even though the toxicity of the active ingredient is the same.

Several new synthetic pyrethroids have recently obtained labels for turf. Products like cyfluthrin (Tempo, Decathlon), lambda-cyhalothrin (Scimitar), bifenthrin (Talstar) and fluvalinate (Mavrik) have longer-lasting residual activity than the old pyrethroids. These products have low use rates (often between 0.05 and 0.20 lbs. of active ingredient per acre), quick knockdown and kill, and relatively low mammalian toxicity (that includes humans!). However, they are very toxic to fish, so use near water must be avoided.

Toxicity must also be considered in the context of hazard. Something may be quite toxic, but is not really a hazard because of the way it is formulated or because it is used at a low rate.

Solubility

Concerns over groundwater contamination and run-off make product solubility a concern for many turf managers. However, the likelihood of a pesticide moving in the soil is influenced by factors besides solubility, like soil type and texture, annual and seasonal rainfall, thatch and slope. Numerous formulations have been devised to help determine pesticide leaching. These formulas can then be used to rank pesticides (see above).

INSECTICIDE PESTICIDE LEACHING POTENTIAL (PLP) RATINGS

Common name	Trade name	Rate	PLP Index	PLP Rating
acephate	Orthene	3.00	60	moderate
bendiocarb	Turcam	4.10	40	low
carbaryl	Sevimol	2.10	37	low
chlorpyrifos	Dursban	1.00	21	very low
cyfluthrin	Tempo	0.09	1	very low
diazinon	Diazinon	4.30	43	low
ethoprop	Mocap	4.90	57	moderate
fonofos	Crusade	3.90	42	low
isazofos	Triumph	2.00	50	low
isofenphos	Oftanol	1.90	46	low
methomyl	Lannate	1.90	51	moderate
propoxur	Baygon	8.10	71	moderate
trichlorfon	Proxol	8.16	67	moderate

NOTES

Rate in pounds of active ingredient per acre

PLP Index = (T1/2) x (application rate) x (fraction of pesticide reaching turf [0.5 for turf])/Koc

PLP Rating based on PLP value: very low<30, low=31-50, moderate=51-75, high=76-100

PLP Rating adopted from *"Water Quality and Golf Course Superintendents,"* 1995. North Carolina Cooperative Extension Service Pub. No. WQWM-154.

Persistence

The persistence of a pesticide can be both good and bad. When a pest is present for a long time, then persistence is good. When a product persists longer than is needed and has a potential for negative environmental consequences, then it's bad.

When selecting a pesticide, choose one with the residual activity and use the rate necessary to get the job done. There are no benefits, either economically or environmentally, to over kill.

Other factors

Rotation is always a concern, because there is the potential for a pest to develop resistance to a particular pesticide. Moreover, in the case of certain soil insecticides, there may be concerns over enhanced pesticide degradation from using the same product year after year.

Chinch bugs have developed resistance to some pesticides, and a phenomenon called enhanced degradation has occurred to isofenphos (Oftanol). Although we are still unclear about the benefits of pesticide rotation in some situations, it makes good sense to occasionally rotate products if you are using high rates or or treating for a pest that has the potential to develop resistance.

Biological/biorational pesticides are now more effective and cost-efficient than ever. They are, however, a little less forgiving than conventional pesticides. Appropriate timing, application techniques, environmental conditions and pest life stage are all very critical, since some biological or biological materials have narrower ranges for optimal activity. Before selecting such a product, be sure you understand what it takes to make it work.

Alkaline hydrolysis occurs when alkaline water causes a pesticide to break down more rapidly than it might under more neutral or acidic conditions. This may result in poor performance or limited residual activity. If you use alkaline water to mix and spray pesticides, consider using a buffer or acidifier. In the case of alkaline irrigation water, which will cause the same effects, buffering is not practical. However, you can select a pesticide that is not susceptible to alkaline hydrolysis. **LM**