

APPLICATOR'S LOG

Characteristics of Insecticides

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How do you decide which pesticide to use? First consider the characteristics of the materials available, then determine which fits into your management plan and site scheme best. Several of these qualities are summarized in the accompanying table of pesticides available for insect management on athletic fields today.

Chemical Class

Table 1 lists the four chemical classes into which turf insecticides fall: organophosphates, carbamates, synthetic pyrethroids and chloronicotynyls. These classes refer to the molecular structure of the insecticide. Most turf insecticides affect the target insect by interfering with the nervous system of the insect in some way. If an insect develops the ability to metabolize, that is, to break down an insecticide, it can break down other insecticides in the same chemical class.

Therefore, it is important to avoid using insecticides in the same chemical class repeatedly. Just changing from one material to another within the same class will not prevent the development of resistance. A wise turf

manager will alternate classes of pesticides from year to year or at least switch to another class within a three-year cycle of use.

Effectiveness

For each insect pest there are usually several turf insecticides which work quite well. However, there may be some materials which are labeled for use against a particular pest which actually do not work as well as you might hope.

Check with your colleagues for their experiences in the field under conditions similar to yours. Many university turfgrass researchers conduct field trials to determine efficacy of materials under local conditions. Consult with them and extension professionals to determine which materials are most likely to be the most effective in your area. Be sure to evaluate the effectiveness of applications you make yourself, so for future reference you know what works best on your own site.

Speed of Efficacy

How long does it take for the pesticide to work on the pest? How long after the application will the target insect be affected? When the window of opportunity is short, as when trying

to control a population of grubs in mid-spring in the northeast, then a relatively fast acting material might be in order.

Some insecticides (for example, trichlorfon) begin to kill insects within a couple of days after application. Other insecticides (for example, imidacloprid or isofenphos) may take a couple of weeks to begin to affect the target population. If the pest population is not noticed until late in the recommended time to treat (or even after that period has passed) you probably should choose one of the faster acting products. However, if circumstances call for application early in the recommended treatment period, one of the slower acting products would be appropriate.

Residual Activity

How long will the material remain effective against the target? Some insecticides such as trichlorfon and some of the pyrethroids break down quickly, within a few days after application. Others remain active for a few weeks (most of the turf insecticides currently available). Still others such as imidacloprid potentially remain active for ten weeks or more. The optimum timing of application of a material will depend in part on this residual activity. For example, if trichlorfon is applied early in a treatment period, it may break down and be gone before all of the insects have emerged, and so may not control a population adequately. If a slow acting but long lasting product is used late in a treatment period, it may not work fast enough, and some target insect damage may occur before the material becomes effective.

Formulation

Insecticides may be applied in a granular form with a spreader or in a sprayable form (applied using water with a sprayer). Sprayable formulations include: emulsifiable concentrate (oil-based liquid), wettable powder, flowable (water-based liquid) or water dispersible granules. Each formulation has advantages and disadvantages. As a general rule, sprayable formulations of a given active ingredient will begin to be effective slightly

CHEMICAL CLASS	COMMON NAME	TRADE NAME	SPEED OF EFFICACY	RESIDUAL	MOBILITY
ORGANOPHOSPHATE					
	acephate	Orthene	relatively fast	short	very mobile
	chlorpyrifos	Dursban	intermediate	intermediate	immobile
	ethoprop	Mocap	intermediate	intermediate	intermediate
	fonofos	Crusade, Mainstay	intermediate	intermediate	intermediate
	isazophos	Triumph	fast	relatively long	relatively mobile
	isofenphos	Oftanol	slow	relatively long	relatively immobile
	trichlorfon	Proxol, Dylox	fast	short	very mobile
CARBAMATE					
	bendiocarb	Turcam	intermediate	intermediate	intermediate
	carbaryl	Sevin, Sevinol	intermediate	intermediate	intermediate
SYNTHETIC PYRETHROID					
	bifenthrin	Talstar	fast	long	variable
	cyfluthrin	Tempo	relatively fast	intermediate	variable
	lambda-cyhalothrin	Scimitar	relatively fast		variable
CHLORONICOTINYL					
	imidacloprid	Merit	very slow	long	relatively immobile

SPEED OF EFFICACY: fast = 1-3 days; intermediate = 3-7 days; slow = 7-14 days; very slow = 2-3 weeks.

RESIDUAL: short = 1-2 weeks; intermediate = 3-6 weeks; relatively long 5-8 weeks; long = more than 2 months.

Note: these characteristics are guidelines and may vary depending on the air and soil temperatures, soil moisture, rainfall or irrigation as well as the target insect.

quicker than granular formulations of the same active ingredient.

Toxicity

Insecticides usually interfere with insect nervous systems, but they can also affect human nervous systems in a similar manner. Fortunately, the dose necessary to affect an insect is several orders of magnitude lower than the dose which affects a human. Nevertheless, some turf insecticides can be somewhat toxic to people or other vertebrates and carry a **WARNING** statement on the label. In comparison, insecticides which can be used by the general public for turf use carry a **CAUTION** statement on the label.

Remember that those at highest risk for exposure to pesticides are the applicators themselves, especially during mixing and loading operations. All precautions in terms of material handling, safety equipment, appropriate clothing, spray applications and correct use of equipment should be carefully followed.

Some insecticides are relatively toxic to many kinds of insects and other "non-target" organisms, including insect predators and parasites and earthworms. The carbamates tend to be relatively toxic to earthworms, although normally the earthworm population bounces back within a few weeks. Carbaryl is extremely toxic to honeybees. Ethoprop appears to be quite toxic to several beneficial insects. Diazinon, while it is labeled for several turf damaging insects, cannot be used on large open areas of turf as it poses a significant threat to waterfowl that may congregate on these areas. Several other insecticides appear to have relatively minor (or unmeasurable) effects on non-target organisms.

Mobility

Will this material move away from the intended target site? The mobility of a material should be carefully considered when applications are made near environmentally sensitive areas. For instance, though trichlorfon, a very mobile material, might be considered for grub control when a very small window of opportunity is available, it probably should not be used near areas of environmental sensitivity.

How well will this material move to the site where the target insect is active? Chlorpyrifos and bifenthrin are readily tied up by organic matter,

and thus may not be able to penetrate a heavy thatch when aimed at a root feeding grub population. They are probably best used for surface or leaf feeding insects.

The bottom line is that, when you, an athletic field manager, have determined that the most effective and appropriate course of action open to you is the use of an insecticide, you

should consider the different characteristics of the materials available. Select the insecticide with the characteristics which best fit your situation. Follow all label directions, safety precautions, and local, state and federal regulations in the application process. Finally, evaluate the success of the application, and keep an accurate record of how well it worked for you. □

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