

New insecticide options

These new target-selective insecticides give turf managers new hope in pest management

BY DANIEL POTTER, PH.D.

In the past 10 years there has been radical change in the kinds of insecticides available to turf and landscape managers. Organophosphates (OPs) and carbamates that had previously been mainstays were restricted, and old standbys like diazinon, Mocap (ethoprop), Oftanol (isofenphos) and Turcam (bendiocarb) were lost. Passage of the EPA's controversial Food Quality Protection Act in 1996 had many Green Industry professionals concerned that they would be left without any effective tools for managing insect pests.

The 1990s also saw the advent of new kinds of insecticides that can be applied at low use rates, with reduced hazard to humans and the environment, and products that work selectively against pest insects (Table 1). Many of them are more versatile and effective than past ones.

We no longer depend on just two classes of chemistry. In fact, from the standpoint of insecticides, a person could argue that we're in a stronger, more diverse and more defensible position today than just a decade ago. Let's take a look at current trends in turf insecticides and what may be on the horizon.



Grubs and billbugs

From 1969 to 1994, short-residual OPs and carbamates were the only option for grub control (Table 1). Turf professionals used these materials curatively, targeting young grubs. If the timing was too early, the residues would degrade before the eggs hatched. If it was too late, the large grubs would have already caused damage and be hard to control. The insecticides required immediate watering-in, and their broad toxicity to humans, birds and other non-targets made them less than ideal to use. In addition to the aforementioned products, Crusade (fonofos) and Triumph

During the 1990s, management strategies for soil insects such as masked chafers (left), Japanese beetles (right), grubs and mole crickets shifted from curative to preventive control.

(isazafofos), both OPs, were canceled for turf usage in the 1990s.

Registration of Merit (imidacloprid) and MACH2 (halofenozide) during the 1990s revolutionized grub control. These pesticides' residues persist in soil for several months, allowing flexibility in application timing. Both products, especially the granular formulations, are forgiving if not immediately watered in.

Merit, which belongs to a new class of insecticides called chloronicotynyls, selectively disrupts insects' nerves. MACH2 mimics the activity of the insect molting hormone, causing a premature, lethal molt. Both products are target-selective, which means they have low inherent toxicity, except to insects. Registration of Meridian (thiamethoxam), a new thianicotynyl with a control spectrum similar to Merit's, is expected within the next year.

Applied before egg hatch, Merit and MACH2 usually provide excellent (>90%) control. Throughout most of the cool-season and transition turfgrass zones, the optimal treatment window for controlling annual grub species (e.g. Japanese beetles, masked chafers) with either product is June 10 to July 21. That timing ensures that fresh residues are in the soil at egg hatch.

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Preventive grub insecticides do have limitations. Neither Merit nor MACH2 works well against large grubs. MACH2 will control small- to mid-sized grubs (up to the second instar) for several weeks after egg hatch, but as a "rescue" treatment it works too slowly to discourage skunks and other predators from digging. Both insecticides work well against masked chafers, Japanese beetles and black turf atenius grubs. MACH2 is less effective than Merit against European chafers and Asiatic garden beetles, but it's



Most of the newer insecticides are target-selective, providing reduced hazards and low environmental risk. Here, grubs were induced to undergo an abnormal, lethal molt following ingestion of MACH2, a molt-accelerating compound.

more active than Merit against cutworms and other caterpillars.

The downside of preventive grub control is that the decision to treat must be made before the extent of infestation is known. Turf managers who practice IPM, reserving preventive treatments for high-risk areas, often find they must spot-treat some areas in late summer. Fast-acting soil insecticides provide the safety net in such situations.

With last year's cancellation of Turcam (bendiocarb), Dylox (trichlorfon) and Sevin (carbaryl) are the only fast-acting products left for curative grub control. Carbaryl has the drawback of being toxic to earthworms, bees and beneficial parasitic wasps. Losing these products would leave few options other than blanket preventive control.

Good products for controlling billbugs still exist. Merit and MACH2 both have

systemic activity that will control young larvae within grass stems, as well as older ones that feed on roots in the soil. Either product applied at high label rate from mid-May to early June will preventively control billbugs, with residues persisting long enough to control white grubs later in summer. Alternatively, a pyrethroid can be applied in late April to mid-May to intercept female billbugs before they lay eggs in the stems. Consult entomologists at your state university for optimal timing in your area.

Surface-feeding pests

Cancellation or restriction of OPs and carbamates has had little impact on turf managers' ability to control surface-feeding pests. Some of the newer classes of insecticides work just as well, or better, than the old standbys.

Pyrethroids, including Talstar (bifenthrin), Tempo (cyfluthrin), DeltaGard

TABLE 1. INSECTICIDES THEN AND NOW

Note the greater diversity of today's products. Source: "Turfgrass Management for Golf Courses" by James B. Beard, 1st (1982) and 2nd (2001) editions¹

INSECTICIDES LABELED IN 1982			INSECTICIDES LABELED IN 2001		
Trade name	Chemical name	Chemical class	Trade name	Chemical name	Chemical class
Aspon	propyl thiopyrophosphate	OP	Amdro/Maxforce	hydramethylnon	bait
Diazinon	diazinon	OP	Award/Logic	fenoxy carb	bait
Dursban	chlorpyrifos	OP	Choice/TopChoice	fipronil	phenyl pyrazole
Dylox, Proxol	trichlorfon	OP	Conserve	spinosad	spinosyns
Dasanit	fensulfothion	OP	Deltagard	deltamethrin	pyrethroid
Malathion	malathion	OP	Dursban	chlorpyrifos	OP
Mocap	ethoprop	OP	Dylox	trichlorfon	OP
Oftanol	isofenphos	OP	MACH2	halofenozide	molt accelerator
Orthene	acephate	OP	Merit	imidacloprid	chloronicotynil
Sevin	carbaryl	carbamate	Orthene	acephate	OP
Turcam	bendiocarb	carbamate	Sevin	carbaryl	carbamate
			Talstar	bifenthrin	pyrethroid
			Tempo	cyfluthrin	pyrethroid

¹Note that not every product is labeled against all pests, and that some state restrictions may apply. Always read the label!

(deltamethrin), Scimitar (lambda-cyhalothrin) and Astro (permethrin) work great against cutworms, armyworms and sod webworms.

Pyrethroids are synthetic versions of pyrethrum, a natural botanical insecticide, but with enhanced properties. They provide rapid knockdown of pests at low rates. Remember this when comparing costs because the price per gallon seems high until you factor in cost per application. Although they have low inherent toxicity to mammals and birds, most are labeled as "restricted use" because they're toxic to fish. They also work well against chinch bugs, greenbugs and other sucking pests, and for targeting adult females of billbugs or black turfgrass ateniens before they lay eggs in spring. They aren't effective against grubs because they bind in thatch and don't reach the root zone.

Conserve (spinosad), a novel insecticide derived from fermentation of a naturally

occurring bacterium, is also highly effective against cutworms, sod webworms and armyworms. It has low-use rates and low toxicity to humans and wildlife. MACH2 (halofenozide), especially liquid applications, also works well for turf-feeding caterpillars. Applied for grub control, Merit has systemic activity against chinch bugs, greenbugs and other sucking pests.

Regarding older chemistry, Dursban (chlorpyrifos), Orthene (acephate) and Sevin (chlorpyrifos) are still labeled against cutworms and other surface-feeders on golf courses. Labeled rates for some products (e.g. Dursban) have been reduced. Orthene and Dursban are no longer labeled for home lawns. Turcam was canceled in 2001. Diazinon is no longer labeled for golf courses or sod farms; all other uses will be phased out by 2003.

Mole crickets and fire ants

Registration of Chipco Choice (fipronil)

during the 1990s provided a powerful new option for residual control of mole crickets on southern golf courses. First in a new class of insecticides called phenyl pyrazoles, fipronil is the active ingredient in some of the world's most effective insecticides including Frontline on-animal flea control, Combat for household pests, and Termidor, a new termite product.

Originally limited to custom slit (sub-surface) application, the label was expanded in 2001 to include other pests and sites. TopChoice, a new granular product, is registered in 13 southern states for control of fire ants, mole crickets and nuisance ants on golf courses, sports fields, commercial and home lawns, sod farms and other turf sites. A single broadcast treatment controls fire ants for up to a year, while also controlling mole crickets (four months) and mound-building nuisance ants (three months or more). Other options for mole crickets include preventive

control with Merit, or curative control with Orthene or pyrethroids.

Fipronil is also available as Firestar, a new bait formulation that can be used as a mound or broadcast treatment for fire ants. Abamectin (Affirm), fenoxycarb (Logic, Award) and hydramethylnon (Amdro) are other effective fire ant baits containing reduced-risk insecticides.

Nuisance ants

Small, mound-building ants (e.g. *Lasius neoniger*) are largely beneficial in lawns and golf course roughs because they prey on the eggs and small larvae of other pests. Ant predation is a key reason why such sites aren't normally inundated by sod webworms, cutworms and grubs. Ants can become a problem when their mounds smother turf, dull mower blades, and disrupt the smoothness and uniformity of putting greens and tees. Ant mounds are usually less noticeable in fairways, roughs and lawns.

Problems with nuisance ants seem to be increasing nationwide. One theory why is

that residues of chlordane and other highly persistent turf insecticides used in the 1960s and early 1970s have finally declined. Replacement of diazinon (which is highly active on ants) with the new, more target-selective grub insecticides may also have allowed ants to gain a foothold on golf courses.

Controlling nuisance ants is difficult because fast-acting insecticides usually kill only a portion of the workers foraging on the surface and fail to eliminate the queen in her underground nest. Golf superintendents who have traditionally used OPs (e.g. Dursban) for ant suppression will find that pyrethroids work about as well. At best, such treatments suppress mound building for a few weeks after application. Some entomologists feel that Merit suppresses ants, but it hasn't been effective for that purpose in my trials.

TopChoice containing fipronil is highly effective against nuisance ants, but it's only labeled for use in the South. Aventis is seeking to broaden the fipronil label so that granular products for nuisance ant

control on northern golf courses might be available soon. In the meantime, golf superintendents can spot-treat nuisance ants on putting greens with Maxforce Fine Granule Insect Bait containing hydramethylnon. My tests showed that sprinkling a small amount of bait around the mounds will knock out individual nests within a few days. Ants won't take wet bait, so withhold irrigation for 12 to 24 hours to allow time for the worker ants to collect the bait pellets.

Earthworms

Earthworms are beneficial in turf because they alleviate soil, increase air and water infiltration, and help break down thatch. Thatch is rarely a problem in lawns with healthy earthworm populations. Worms nonetheless can be a nuisance on golf courses when their castings occur on putting greens, dulling mower blades and creating a muddy mess.

Certain insecticides and fungicides restricted during the 1990s (e.g. Turcam, Mocap, Crusade, Benlate) were toxic to earthworms. Although not labeled for earthworms, some golf superintendents who used them probably were motivated by the "added value" of suppressing earthworms and castings on closely-mowed playing surfaces. Still-labeled pesticides that suppress earthworms as a side effect include Sevin and the fungicide thiofanate-methyl. Note, however, that neither product is labeled for that purpose. In fact, there are no registered pesticides for earthworm control in the United States.

— Daniel Potter is professor of turf and landscape entomology at the University of Kentucky. His book, "Destructive Turfgrass Insects: Biology, Diagnosis, and Control," is available from Ann Arbor Press (800/858-5299) or the PLCAA or GCSAA bookstores.



Several newer classes of insecticides effectively control cutworms and other surface-feeders.