LIFE AFTER DURSBAN:

The new insecticides

The rules are changing for insect control, so be prepared by understanding your alternatives

DR. PATRICIA J. VITTUM

The rules of pest management are changing. The 1996 Food Quality Protection Act (FQPA) is having a significant impact on the availability of pesticides you can use to manage turf.

In particular, the organophosphate and carbamate insecticides are being subjected to intensive review, and many will be pulled from the market within the next two years. The maker of chlorpyrifos (Dursban) just recently cancelled its use in an agreement with the United States Environmental Protection Agency (EPA).

We will be losing many more of our tried and true products, like isofenphos (Oftanol) and bendiocarb (Turcam) by the end of 2001. There are many who think diazinon and trichlorfon (Dylox or Proxol) will become casualties, too.

Where does that leave us in the short term? You do have options. New products will take the place of the organophosphates and carbamates, and there are some biological control options under development that might be reliable enough to be used in finely manicured turfgrass settings.

Fortunately, many of the insecticide manufacturers anticipated the changing government regulations and have developed new chemistry with more benign environmental profiles. Here are some of them:

The pyrethroid option

Pyrethrum is a natural product derived from certain chrysanthemums in Africa, and provides a rapid "knockdown" of insects, acting like a stun gun. However, many insects recover and walk away. In the 1940s, chemists studied pyrethrum and felt they could design compounds that resembled it structurally but would not have the perceived disadvantages (short residual of hours rather than days, quick breakdown in sunlight and limited ability to kill target insects).

Several iterations of pyrethroids were developed in the next 40 years. Some have become popular in the turf market because they are

relatively immobile in water (and less likely to reach ground water than other products). They remain in the thatch, where they can be effective against surface insects.

Most of the current products work within one or two days after application, remain active for two to four weeks and hold up well in sunlight. (Pyrethroids can be sensitive to high temperatures, so mid-summer applications may be less effective than those made in cooler periods.) Application rates usually are an order of magnitude lower than those of the organophosphates and carbamates — 0.1 lb. AI/acre versus 2 to 5 lb. AI/acre.

Best application spots. Because pyrethroids often do not penetrate past the thatch, they are not normally recommended for use against soil insects like white grubs. For the same reason, they are ideal candidates to control insects that remain on the surface or in the upper layers of the thatch, such as annual bluegrass weevil adults or black turfgrass ataenius adults. Pyrethroids have become popular choices to control chinch bugs, cutworms and webworms, all of which spend most of their time in the thatch or on the surface.

Commercial examples. Several synthetic pyrethroids are available and labeled for some uses in turf, including bifenthrin (Talstar), cyfluthrin (Tempo), deltamethrin (Deltagard) and lambda-cyhalothrin (Battle, Scimitar). Application rates range from 0.05 to 0.2 lb. AI/acre, depending on the product and target insect.

Thiomethoxam — a neonicotinoid

Thiomethoxam is a new insecticide in the process of being released by Novartis (soon to be Syngenta), and will be marketed as Meridian in the turf market and Flagship in the ornamentals market. It reduces populations of many different kinds of insects, including those with sucking (e.g. aphids) and chewing mouthparts (e.g. white grubs). While it is relatively soluble in water, it is systemic (translocated through the xylem) so it is rapidly taken up through the roots.

This material remains active for about 50 days in soil, which is longer than many materials currently available. Insects that come in contact with or ingest it change their behavior almost immediately — they stop feeding or using their antennae to inspect their surroundings. Application rates usually are less than 0.5 lb. AI/acre.

Best application spots. Thiomethoxam appears to be effective against many of the white grub species — perhaps in part because it is relatively soluble and can reach the root zone with post-application irrigation. Because of its relatively long residual, it can be applied somewhat earlier in the year than the "traditional" products. (Current use patterns involve application beginning within a week or two of the time when adult beetles begin laying eggs.) It also can be used as a soil or foliar application in ornamentals because it is systemic.

Targeted new products can reduce populations of grubs, here shown under the turf layer.

Field trials indicate thiomethoxam has activity against a wide range of insects in the ornamentals market, especially aphids, whiteflies and mealybugs. It tends to be less detrimental to beneficial insect species than contact insecticides (because the beneficial insects like predatory beetles feed on other insects, not on plant material). It may be an option in areas where less benign products could lead to problems and

continued on page 46

The organophosphate and carbamate insecticides are being subjected to intensive review, and many will be pulled from the market within the next two years.

continued from page 45

may have activity against red imported fire ants.

A chloronicotinyl compound

Imidacloprid (Merit) has been used in turf for several years so should not be considered "new," but its properties are different than insecticides like Dursban or Oftanol. Both imidacloprid and thiomethoxam have similarities in their chemical characteristics — both are systemic and can be used against soil insects as well as insects feeding on ornamentals.

Timing treatments will become more critical with the new insecticides in development.

Imidacloprid is much slower acting than the traditional materials when used in turf — it may be two weeks before you begin to see dead grubs. But it remains active in the soil much longer than traditional products. Some managers apply it in the spring, allowing that application to control grubs that emerge in late summer.However, these early spring (April or May) applications will not have any significant effect on the grub population already present (having just emerged after the winter).

Some "season-long control" claims that appear in marketing releases can be misleading. Some people read "season-long control" and expect that a spring application will control everything for the entire growing season (including the grubs that are already present in the spring). At least with white grubs, that is not necessarily true.

Imidacloprid does have the residual activity to affect grubs in late summer, but most university entomologists urge turf managers not to make applications too early.

Why not wait until just before the young grubs begin to hatch out of eggs? Then, the pesticide will be that much fresher and have a better chance to provide control.

Halofenozide timing

While halofenozide (Mach 2) is hardly new either, we should mention a few things about it. It could be considered a growth regulator because it is a "molt accelerating compound." An insect enters the molt before it has had a chance to save up the energy it will need to complete the molt. In other words, the process is virtually guaranteed to fail. In most cases, an insect that encounters halofenozide stops feeding quickly, so damage does not worsen. The insect usually dies within two or three weeks, sometimes even sooner.

Vertebrates (including people and their pets) don't molt, so halofenozide is much less toxic to vertebrate organisms than most other insecticides currently available. Nevertheless, the label notes it does have characteristics (solubility, half-life, etc.) similar to those that are eventually detected in ground water. The usual precautions should be taken to provide adequate buffer zones when treating areas near surface water or sensitive soils.

Best application spots. Halofenozide is most effective when targeting small stages of immature insects such as white grubs and various caterpillars. Its interference with the molting process can be effective against young insects.

Some suppliers say that halofenozide provides "season-long control" against white grubs, but the field data reports are contradictory. Most studies that involve April, May or early June applications do not provide significant reductions in grubs that are already present in the spring.

This makes sense when we consider the material's mode of action — the grubs are

continued on page 48

Expect additional restrictions at the federal and local levels on the use of turf and ornamental insecticides.

continued from page 46

already in their largest stage of development by the time it is applied so the only molt that might be compromised is the molt from grub to pupa. By then, the damage is already done. However, applications made within a month after adult beetles begin to lay eggs appear to work well.

This material remains active in the soil long enough to be effective when larvae first emerge. Trials indicate that late summer applications (usually at slightly higher rates) can also be effective against grubs after they have been feeding for a couple of weeks. So halofenozide can be used as a preventive (early summer application relying on residual activity to control young grubs beginning their first molt) or as a curative (late summer application controlling mid-sized grubs before they reach full size).

Field trials confirmed that some species of grubs are less sensitive to halofenozide than others. Generally, European chafers are much less vulnerable, as are oriental beetles. Fortunately, Japanese beetles and masked chafers are relatively sensitive, so it can be a good control option. It also can be effective against species of caterpillars, including some cutworms and webworms.

Spinosad for caterpillars

Spinosad, sold as Conserve, is a byproduct of a soil bacterium that affects acetylcholine receptors on nerve cells. But it works differently than other materials. It does not appear to affect the receptors on vertebrate nerve cells in the same way, so it is much less toxic to mammals and other vertebrates than the OPs and carbamates.

It is being used on ornamentals and turf to control various caterpillars. Spinosad is relatively specific, even within the caterpillar group, but one advantage is that it seems to have little impact on most beneficial predatory insects found in turf. It can be used to control sod webworms, cutworms and armyworms, but is most effective if applications are made when those caterpillars are still quite small. It is not effective against chinch bugs, ants, grubs, billbugs or mole crickets.

Spinosad is still relatively new in the turf market and the full profile is not yet understood. But we can expect to see more products like spinosad coming on the market within the next few years. **LM**

— The author is associate professor in the Department of Entomology, University of Massachusetts, Amherst, MA.

Watch for more impact to come

As FQPA's impact continues to grow, we can expect more traditional insecticides to be removed from the turf market. At the same time, new products with very different chemistries and modes of action are being developed. Compared to the materials we have used for the past 40 years, these new products will have:

- lower levels of acute toxicity to vertebrates,
- lower rates of application and lower solubility and
- more targeted control against some of the turf insect pests but not all.

Expect additional restrictions at the federal and local levels on the use of turf and ornamental pesticides. One of the most predictable offshoots of these regulations will be greater emphasis on finding biological control options with the reliability and consistency that is critical to successfully managing turf insects.

You will have to be even more vigilant, monitoring insect activity and knowing the specifics of the life cycle of each pest. Then, you will have to match the pest with the best of the products available, and remember that each product has notable strengths and weaknesses. Timing will be even more critical.

— Pat Vittum