Why insecticides fail

When an insecticide fails, it's rarely the insecticide's fault. Knowing the real reasons for failure might reduce callbacks

BY JOHN C. FECH and FREDERICK P. BAXENDALE

You walk on a lawn you sprayed a week ago for sod webworms and it looks horrible. In fact, the homeowner is loading up a howitzer in the driveway, and you're not sure if he's aiming at the bugs or you. If this scenario is something you can relate to; if getting maximum effectiveness out of insecticide applications is of interest to you; if saving money on pesticide purchases is important; and if pleasing your customers is a goal for your company, read on.

You can't solve a turf problem until you identify it. With insect pests that means getting down on your knees and identifying and counting them.

Measuring success

There are four ways to measure success after applying insecticides:

1. Start counting insects, looking for ones that are still alive. Compare the ratio of live insects to dead ones. Also, inspect the turf in several areas. Begin by looking at the dead and dying parts of the lawn, then move out to the edges of the damaged areas. Inspect the "good-looking" parts of the turf as well.

2. Look for the absence of live insects. This method is especially useful when counting surface feeding insects such as aphids or chinch bugs. If the insecticide application was successful, these insects will be dead and shriveled up.

3. Notice the life stage of the insect. Some insecticides are considered insect growth regulators (IGRs). These products may not kill the pest outright, but instead may interfere with the insect's normal developmental process, such as changing from one life cycle stage to another. In some cases, insects in the earliest life stages are only a small worry in terms of the potential amount of turf that can be consumed, while ones in the later life stages are much more damaging. If the IGR prevents the insects from developing into these larger, more damaging stages, the product has been successful.

4. Once the number of living and damaging insects has been determined, sketch a "quick and dirty" map of the affected and unaffected parts of the lawn. Draw circles or ovals in heavily affected areas and write in the average number of insects found per unit area (sq. ft., sq. yd., etc). Make similar notations for other lawn areas.

All of these ways to measure success must be put in the context of damage or treatment thresholds. These thresholds are flexible guidelines that are usually defined in terms of insect abundance or

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Why insecticides and miticides fail

BY BAL RAO, PH.D.

Several factors may be responsible for poor insect and mite control on ornamental trees and shrubs in the landscape. Some of the following factors may be involved in a specific pest control failure situation. By following label specifications and by process of elimination one should be able to narrow down or identify the cause(s) of failure. Generally, it is not the insecticides or miticides which fail; instead it is the conditions to which these pesticides are exposed and people expecting the unreasonable:

A. Failures related to label: not reading and/or following label specifications

B. Failures related to identification: not knowing the pest or plants well
— Improper plant, insect and /or mite identification
— Pest is difficult to manage due to its morphology and/ or high reproductive potential
— Insect and/or mite resistance from repeated use of a specific pesticide-resistant biotypes
— Sensitive plants
— Pest is known to be very difficult to manage - people may not be aware of this
— Pests blown or moved from near by untreated areas after treatment
— The pest is managed but the damage remains- concern for failure from uninformed person
— Life cycle of insects and number of generation

— Rao is with The Davey Tree Expert Company. See his column, "Ask the Expert," in next month's issue of this magazine for more details on ornamental insecticides.

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damage that can be tolerated before taking action. They're based on many variables including pest species, abundance and life stage; species and cultivar, vigor and value of the plant or turfgrass; relative effectiveness and cost of control measures; and time of year. The site's location and function will also impact the damage threshold. Low maintenance sites such as cemeteries, school grounds and parks can usually tolerate much higher levels of insect infestation than turf areas associated with banks, insurance buildings and theme parks. Threshold guidelines for specific insects on a variety of landscape plants and turfgrasses are available from many sources, including your local cooperative extension office.

Perception vs. reality

You may have heard the phrase, "For the uninformed, perception is reality." It means that if you don't know the significance of what you're looking at, you may jump to false or irrelevant conclusions.

The first aspect of this phenomenon to consider is misdiagnosis. Did the insecticide application actually fail, or did other factors injure the turf? For example, many stressors such as drought stress, summer patch disease and soil compaction can adversely impact the health and appearance of a turf stand. In many cases, these factors are more responsible for turf damage than the number of insects present.

Dealing with multiple stressors is difficult, and what makes things more difficult is that most clients tend to be one dimensional in their understanding of turf problems. To them, their crummy lawn just has to be the fault of an insecticide failure and/or their lawn care company. They don't consider the traffic stress on their lawn, or that they're trying to grow Kentucky bluegrass on a hot, dry, sloped, wind exposed site.

Another component of misdiagnosis is misdiagnosis. An example of misdiagnosis is when the lawn care technician or grounds manager identifies a problem as grub damage when it's really billbug damage. For more information on this subject, read "Controlling Turfgrass Pests (2nd Ed.)" by T.W. Fermanian, M.C. Shurtleff, R. Randell, H.T. Wilkinson and P.L. Nixon, and "Integrated Turfgrass Management for the Northern Great Plains" edited by F.P. Baxendale and R.E. Gaussoin.

Other reasons why insecticides fail

Assuming the insect has been properly identified, that there are many of them feeding on the turf and that no other site-related or customer-related factors (dumping ice cream freezer salt on the lawn, etc.) seem to be causing the turf to decline, consider the following factors that can affect insecticide performance:

- **Photodegradation** — This occurs when the insecticide formulation is exposed to light. Photodegradation occurs primarily when surface feeding insects (aphids, sod webworms) are the targets. The botanical insecticides, older pyrethroids, Bacillus thuringensis and entomopathogenic (beneficial) nematodes are particularly susceptible.
- **Microbial degradation** — This occurs when tiny soil-inhabiting organ-

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isms called microbes feed on the insecticide, reducing the amount of active ingredient available to kill the target pest. A classic example of this is when Oftanol failures in the 1980s were linked to accelerated microbial degradation.

▶ **Volatilization** — This involves the loss of insecticide from the grass or soil surface through evaporation. This could reduce application effectiveness, as well as increase the potential of human exposure. High air temperatures and windy conditions increase insecticides' volatility, so make sure to apply on cool, cloudy and calm days.

▶ **Insect resistance** — Much is said about resistance, but, in actuality, there have been few documented cases in turf and landscape settings. Resistance is the greatest concern in situations where applications of the same insecticide are repeated over an extended time period. For example, two-spotted spider mites can have many generations each year in a typical landscape. If several generations are sprayed with the same miticide, the possibility of resistance can increase. Certain chlorinated hydrocarbons, carbamates, organophosphates and synthetic pyrethroids seem especially vulnerable to insect resistance.

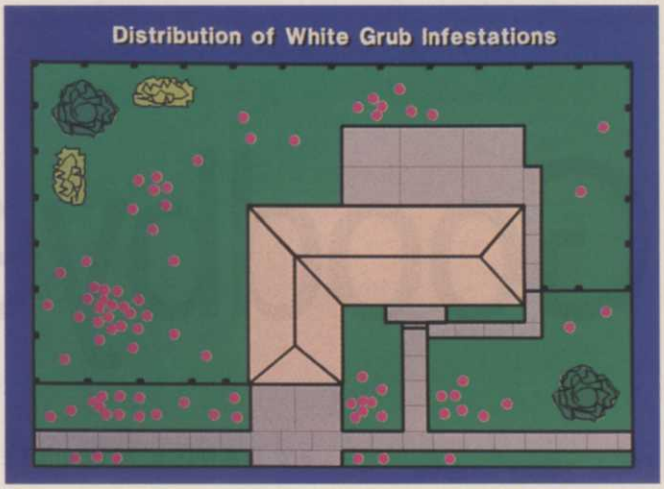
Several practices can reduce the likelihood of developing insecticide resistance. These include:

1. *Spot treating rather than using total cover sprays of the entire lawn or landscape*
2. *Using shorter residual insecticides*
3. *Alternating between classes of insecticides*
4. *Planting turfgrasses and landscape plants with genetic resistance to insect pests*
5. *Selecting non-chemical methods of insect control*

▶ **Application errors** — The most common errors involve equipment misuse. Clogged nozzles, gaps in coverage and so on are likely to be the culprit. Make sure to calibrate your sprayers and spreaders before each application. It's amazing how often nozzles don't deliver the proper amount of formulated material. Remember to use spray marker indicators to reduce coverage errors.

▶ **Selecting the wrong insecticide** — Many insecticides work better for certain insects and not at all on others. Check with your local cooperative extension office for the latest control recommendations for specific turf and landscape pests in your state. Resist selecting a certain pesticide that your supplier offers at a reduced price. It may work well for insect A, but not for insect B.

▶ **Improper timing** — Each pest has a "stage of vulnerability" when it's most susceptible to an insecticide application. Once certain insects grow out of that vulnerable stage, they can be impossible to control. For example, if a contact insecticide is applied to the egg or early larval stages of the bluegrass billbug, satisfactory control is unlikely. However, if the same insecticide is properly applied at the adult stage, is much more likely to produce acceptable results.



Turf managers often map properties to better predict where insect problems are most likely to occur and areas that should be watched.

▶ **Inadequate irrigation (related to a "failure to penetrate the thatch" factor)** — This problem is most serious in the case of insecticides applied for control of soil dwelling insects such as white grubs. Liquid formulations can dry on leaf blades, and the active ingredient in both liquid and granular formulations tends to be tied up by thatch before it can move down into the insect's feeding zone. Reduce this factor by selecting granular formulations for soil insects, informing the customer about the importance of adequate pre- and post-treatment irrigation, and consider core aeration to assist with the chemical's downward movement.

▶ **Using the wrong rate or formulation** — Thoroughly read and follow label directions. Be sure to use the correct rate for the target pest. Use liquid formulations for blade and leaf feeding insects where a surface residual is necessary for effective control.

▶ **High water pH** — This is perhaps the most overlooked reason for insecticide failures. The pesticide label shows the desired pH range of the water in the spray tank. In many parts of the country, the water pH is highly alkaline, sometimes in the range of 9 to 10. An insecticide that performs well at a pH of 5.5 can have its residual activity reduced from several days to several hours in alkaline water. Test your water if you suspect this is a problem.

Regardless of the insecticide used or the pest controlled, a successful application is directly related to accurately identifying the target pest, understanding the insect's life cycle and habits, determining the best time to apply the insecticide, using the appropriate formulation at the correct rate and ensuring the insecticide reaches the target pest's feeding zone. An accomplished turf manager will strive to do this with every application.

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