INSECTICIDE USE IN LAWN CARE

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Are the insecticides of the 1990's as good as the old ones, like DDT, chlordane and Dieldrin? The answer is yes. In fact, most of them are more toxic to insects than DDT and chlordane. The difference is that they are not as persistent. But that is by design, and lawn care is probably more efficient since we stopped using those products. The half-life of chlordane in soil has been estimated at about 5 years. At first it seems wonderful to have a product that remains active for an entire year or longer. The problem with persistent products is that pest species tend to develop resistance to insecticides faster than predators do. As a result, we ended up with some serious problems with Japanese beetle and chinch bug in areas where they became resistant to chlordane. Aside from problems with insect management, persistent insecticides also fail to meet current water quality standards. We quit using Dieldrin in the late 1960's, yet Dieldrin levels in lake trout from Lake Michigan did not peak until the late 1970's, and are still above pre-Dieldrin levels. The most persistent insecticides used today have a half-life of about one-year, and most degrade within a few weeks of when they are applied.

As we have learned more about insects and pesticides over the last 30 years, a more sophisticated approach to insect control replaced the old "preventive" approach, where insecticides were used almost like fertilizers. Most lawn care professionals today use an integrated pest management (IPM) approach where natural predators do most of the work, and insecticides are used as spot-treatments when natural control is not sufficient. We have an excellent group of insecticide products labeled for use on turf. When used according to label directions these products provide good insect control. Even so, I often hear about insecticides that "don't work". Sometimes these stories are repeated so often that people assume they are true without ever trying the product in question. Over the last 15 years I have made notes on cases where insecticides "didn't work".

Why Insecticides Don't Work

1. Unreasonable expectations. For some reason people expect a good insecticides to eliminate all of the insect pests. When they check a lawn a few weeks later they may be surprised to find some chinch bugs or grubs, and conclude that the insecticide did not work. If all of the insects were killed, this would be 100% control. This rarely happens in biological systems. If you look at the results of insecticide trials from research and extension specialists at universities, typical levels of control are 78% for Japanese beetle grubs, and 66% for chinch bugs. Don't expect miracles.

2. Improper evaluation of product effectiveness. In most cases where an insecticide is reported as a failure, the number of insects present before and after application were not determined. If someone calls me claiming to find 5 grubs per square foot after an insecticide treatment, the first question I ask is *when* was the insecticide applied. Insecticides applied for grub control should not be evaluated until at least 3 weeks after application. Granular formulations, in particular, should not be evaluated for at least 3 weeks. The second question I ask is how many grubs were present before the insecticide was applied. It is impossible to determine how well an insecticide worked unless you count grubs before and after treatment. Having 5 grubs per square foot after treatment could be good control if you started with 20 per square foot. A good way to determine how well an insecticide works is to count grubs, or whatever the target insect is, in four different places before treatment. Return to the same four areas for your final evaluation. Allow 2 weeks for chinch bugs and 3-4 weeks for grubs.

There is one other problem that research tests account for and the before and after counts do not: a sudden decline in insect numbers because of disease, weather, or predators. The only way to know about a sudden population crash happening at the same time as your insecticide treatment is if you have an untreated (check) area. This sometimes happens with chinch bugs. A good rain stimulates activity of *Beauveria*, a fungus that causes a disease of chinch bugs. If *Beauveria* spreads through a population of chinch bugs on a lawn, it doesn't matter what insecticide was applied; the chinch bugs will be nearly gone when you return for evaluation. This type of situation can make any product look good.

3. Incorrect selection of product. In most cases, the product effectively controls insects listed on the label. Avoid using insecticides to treat insects not on the label. For example, cutworms and chinch bugs are on the Mavrik label but not grubs. This is for a good reason: Mavrik and most synthetic pyrethroids bind tightly to thatch and other organic matter never penetrating into the soil where the grubs are. Dursban also binds to thatch, and therefore works better when applied to bare soil or when injected into the soil for grubs. Occasionally, insects are listed on labels when the average level of control is less than 50%. Seek out unbiased test data whenever possible. Test data presented by a manufacturer is accurate but selective. The producer usually chooses the best tests to present information about their product.

4. Failure of insecticide to reach target. The most difficult group of turf insects to reach is grubs, because the insecticide must move through the thatch and soil to where the grubs are active. Insecticide applications for grubs should be followed immediately with 0.5 inches of irrigation to help move the insecticide into the soil. If irrigation is not available, it is best to use a granular formulation so the insecticide remains stable until the next rain. If a sprayable insecticide is applied to dry turf, much of it will volatilize and degrade in sunlight before a rain washes the insecticide into the soil. Spraying insecticides onto dry turf usually gives poor grub control.

5. Movement of insects back into treated areas. This is not a common problem, but it may be frustrating when it happens. The best example is Japanese beetle adults. They fly from tree to tree and back to turf, constantly moving about. Susceptible trees like *Tilia* or *Malus* may be sprayed with an effective insecticide on Monday, yet are covered with beetles again by Friday. This is because new beetles have flown to the tree since treatment, and the residue is not potent enough to kill them quickly (before even more beetles arrive). Sometimes chinch bugs will move in from a bordering lawn making the insecticide look effective in the center of a lawn and ineffective along the infested edge. Cutworm and webworm adults are moths, making them very mobile and effective at searching for new sites to deposit eggs. A spring insecticide application may suppress predators, making the lawn an ideal place for webworm or cutworm eggs and young larvae.

6. Enhanced biodegradation. One way that insecticides are broken-down or degraded is by bacteria in the soil that actually use the insecticide as a food source. If a product is used repeatedly for several years the bacteria that utilize it as a food source may become more abundant and break down the insecticide more rapidly. This is called enhanced biodegradation. It can lead to poor performance if an insecticide is expected to remain active for a long time. However, most of the time we expect insecticides to work only for 3-4 weeks after we use them. In that case enhanced degradation is not a problem. It is more likely to become a problem if an insecticide is applied in the spring and expected to work in August and September.

7. Insect resistance to insecticides. Resistance is often used as an excuse for insecticide 'failure'. I am glad that people are aware of the problem we have with some insects becoming resistant to pesticides. Indeed, this has been documented with chinch bugs and Japanese beetle becoming resistant to chlordane. However, resistance is less likely than the other items listed above to be the reason for 'failure'. Most of the products used by lawn-care companies and golf courses appear in some university tests each year. If an insect pest develops resistance to one of these products it should be observed in test results. One reason that resistance is not more of a problem is because insects move in and out of treated lawns, breeding with individuals that are not resistant, and thus preventing the build-up of a resistant population. Resistance is likely to develop first where a large proportion of an isolated population is repeatedly treated. Golf courses may be a better site for resistance problems than home lawns. The less insecticide we use, the less likely it is that resistance will become a problem.

Insecticides Labeled for use on Turf

We are currently updating MSU Extension Bulletin E-2178: Chemical Control of Insects, Diseases and weeds for Commercial Turf Managers. You should be able to purchase a copy of this bulletin from your county MSU Extension office this spring. As soon as the bulletin is printed we will make an announcement in the Landscape CAT Alert. You can order the Landscape Alert by calling Joy Landis at 517-353-4951. The following information is from the Insect Control section of E-2178.

At this time, we know of 18 different insecticides labeled for use on turf. There may be several different formulations of each chemical available. Different formulations of the same chemical may have different instructions on the package, may or may not include Workers Protection Standards (WPS) and may or may not be a restricted use product. Read the label of each product that you use

Several of the GC formulations of synthetic pyrethroid compounds are restricted use because of their toxicity to fish. Diazinon is not labeled for use on golf courses or commercial sod farms due to avian toxicity. Only products labeled with WPS information may be used on sod farms. Mocap may be phyto-toxic on bentgrasses.

Application rates are often given as a range and may be different for different insects. Always read the label to determine the proper application rate. LD50 values are determined from toxicological tests involving pure active ingredient. The LD50 is expressed as the number of milligrams of active ingredient per kilogram of body weight of the test animal. The LD50 of an insecticide is the amount of the chemical that kills 50% of the test animals. Oral LD50 values are determined from toxicity to male rats and the dermal values are determined from tests with rabbits. The higher the LD50, the less toxic the compound is to mammals.