CHALKBOARD

TIPS FROM THE PROS

RESEARCH REVEALS ACCELERATED BREAKDOWN OF PESTICIDES

Evidence is mounting that microorganisms living in thatch are causing some highly effective insecticides for soil pests to break down rapidly after repeated use. Dr. Harry Niemczyk at Ohio State University's Agricultural Research and Development Center in Wooster, OH, suspects that poor late-summer control of grubs (scarabaeid beetle larvae) is being caused by biodegradation of insecticides in the thatch as opposed to ineffectiveness of the insecticides in the soil. He further suspects that this phenomenon is not limited to certain insecticides and in the future may be linked to poor performance of some herbicides and fungicides.

Niemczyk started looking into the problem when turf managers in Ohio, Massachusetts and New York reported isolated cases of poor control of grubs during late summer following a spring application of Oftanol, an insecticide known for season-long control of turf-damaging soil insects. Something had to be changing in the thatch and/or soil after repeated application of the insecticide.

He started combing the literature for reasons to explain the insecticide's decreasing performance in sporadic instances. One by one, he considered application timing, inadequate posttreatment irrigation, disruptive management practices, any unusual climatic factors and insect resistance. He quickly instituted laboratory tests of thatch and soil samples taken from golf courses experiencing poor late-summer grub control.

Niemczyk, with the help of Dr. R. A. Chapman, an entomologist at the Canada Department of Agriculture Research Center, London, Ontario, discovered that when a known amount of isofenphos, the active ingredient in Oftanol, was added to thatch and soil samples taken from the problem courses, it was rapidly broken down. When the same amount of insecticide was added to thatch and soil from previously untreated sites, it did not break down. Niemczyk obtained the same results in field tests last year. The culprit was something in the thatch and soil of previously treated turf, not insect resistance to Oftanol. Niemczyk suspected that microorganisms in the thatch and soil were breaking down the insecticide before it had a chance to control the grubs.

Previous studies had shown that microorganisms can adapt to the presence of a pesticide to the point of being able to use it as a source of energy, degrading the pesticide in the process. These tests also revealed that the population of these microorganisms was higher in the thatch than in the soil. "We have not directly linked microorganisms to the breakdown of insecticides in turf yet," says Niemczyk, "but something in the thatch and soil is breaking them down, in less than a week's time."

"We (Niemczyk and Chapman) propose that microorganismal adaptation to residues of isofenphos concentrated in the thatch is the major reason for the noted reduction in the residual effectiveness of isofenphos to control summer infestations of scarabaeid larvae," said Niemczyk. "It doesn't appear that this accelerated breakdown is limited to long-residual insecticides. It may well involve short-lived insecticides as well as herbicides and fungicides. It's important to stress that the problems we've seen so far do not apply everywhere. The rule of thumb should be, if a compound works, use it."

Niemczyk suspected that microorganisms in the thatch and soil were breaking down the insecticide.

However, if a pesticide you have used repeatedly for two or three years is not providing the same control it did originally, accelerated degradation, not insect resistance, may be the problem.

Until more conclusive evidence is obtained, says Niemczyk, the turf manager can try alternating pesticides and managing thatch to reduce the potential for accelerated degradation. Once a turf area adapts to degrade a particular insecticide rapidly, it maintains its ability to break down the compound for years. Furthermore, there is no practical way to completely remove thatch—nor is it desirable.

Niemczyk has found that as much as 95 percent of the residues of many commonly-used insecticides applied to turf remains in the thatch even after watering-in. He has also shown that most grub control takes place at the thatch/soil interface where the larvae consume organic material (thatch, tillers, and rhizones) treated with insecticide. "The fact that the residues are in the thatch is not all bad," he states.

The biggest problem to developing a cure for accelerated degradation is that microorganisms do not always react in a logical pattern, explains Niemczyk. Logic would suggest that if the majority of the microorganisms reside in the thatch, reducing the amount of thatch could possibly reduce the potential for accelerated pesticide breakdown. This would suggest that a program of thatch control, including aerification, proper mowing intervals, turfgrass selection and avoiding excessive fertilization, could reduce the potential for accelerated degradation. While complete removal of thatch is impractical, keeping the thatch layer under control might also permit more insecticide to reach the soil where it can possibly last longer.

Niemczyk has also been researching the movement of pesticides applied to turf. So far, tests of eight different insecticides have revealed that thatch traps much of the residue, even after posttreatment irrigation. These same insecticides applied directly to soil move into the top two inches depending largely on their solubility in water.

AMMONIUM SULFATE BOOSTS HERBICIDE PERFORMANCE

Recent studies by a University of Nebraska weed specialist for Monsanto Corporation have shown ammonium sulfate improves the control of annual grasses and broadleaf weeds by glyphosate, a nonselective postemergence herbicide. Glyphosate is the active ingredient of Roundup and Landmaster herbicides.

"Ammonium sulfate can counteract the effects of unfavorable weather conditions which tend to make weeds more tolerant to herbicides," says Dr. Fred Roeth, weed specialist at the South Central Research and Extension Center of the University of Nebraska. Roeth explains that ammonium sulfate improves the absorption of glyphosate by plants.

In similar field trials conducted by Monsanto, ammonium sulfate improved control of annual grasses by up to 25 percent and control of broadleaf weeds by up to ten percent. "It all depends on how far from optimal weather conditions are in a given year," stated Monsanto's Dr. Neal Hageman. He recommended that landscape managers in areas of unpredictable weather add 17 pounds of dry ammonium sulphate to every 100 gallons of spray solution.