green world

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Insecticides

Where Do They Go?

from Groundwater
by Dr. Patrician J. Vittum, Associate Professor of Entomology, U of Mass.

Recent articles in newspapers and magazines and reports on the evening news have raised the public's awareness of groundwater and made many people particularly nervous about possible sources of contamination. The concerns certainly are valid, because groundwater contamination will have severe ramifications on public drinking water supplies, agricultural productivity, and recreational opportunities.

Many cases of groundwater contamination have involved the penetration of agricultural pesticides into a groundwater system. Areas like Long Island and Cape Cod are particularly sensitive because the soils are very sandy, so chemicals can leach through the soil much more rapidly than in soils which have higher organic matter content or fine texture. Because some pesticides have been found in some groundwater samples — or in private or public drinking water wells, some people then assume that any pesticide application will make its way into the groundwater. In fact, the issue is very complex and poorly understood. The ultimate movement of pesticides will depend on numerous factors, including: physical characteristics of the pesticide especially solubility, rainfall before and after application, physical characteristics of the soil (sand? loam? silt? clay?), percent organic matter in the soil, micro-organisms in the soil, persistence of the material, slope of the ground, depth of the water table, surface water and drainage, and the conditions of the lawn being treated.

Insecticide Behavior

Many of the groundwater contamination incidents which have involved pesticides actually involve insecticides. Since insecticides tend to be viewed as the most toxic kinds of pesticides to humans (and indeed some of them are), the concern about contamination has centered on insecticide applications. However, many people tend to overlook the fact that insecticide applications made to established turf behave very differently than similar applications made to agricultural crops.

Turf (perhaps more particularly thatch) serves as a sort of buffer, absorbing much of the active ingredient before it ever penetrates as far as the soil. Recent studies conducted by Dr. Harry Niemczyk at Ohio State University have tracked the movement of several insecticides over time.

One study found that 95 percent of a Triumph application (regardless of formulation) never gets past the thatch to the soil. His studies have been expanded to look at the fate of other insecticides as well, but those results have not yet been made public.

At first, the information uncovered by Dr. Niemczyk seemed contradictory to field observations because several materials were providing very acceptable levels of control of white grubs, which are primarily active in the soil, and yet Niemczyk's work implied that those materials were not reaching the soil. However, additional research using X-ray technology, currently underway at Cornell University under the direction of Dr. Mike Villani, has more fully identified the behavior of white grubs in soil. It turns

— continued on page 5

Do We Appreciate 2,4-D?

An experimental station in the Northwest shows dandelion control in the 1920's with kerosene. Take away 2,4-D and people will use almost anything.

OPINIONS AND COMMENTS

Identification of Turf Diseases More Important for Control

Over the years, we have seen plenty of reasons for proper identification of disease, and, unbelievably, this has become a bigger and more important need. Diseases are no easier to identify and several newly discovered ones have a complicated identity. Most crucial is that we lost mercury, which was fair to excellent on most diseases. Now we have new types of fungicides that give nearly total control over several organisms, but have a narrower spectrum of control. Of course, this makes it more difficult to select the best fungicide for the occasion. All of this adds to Dr. Bruce Clarke's work and makes starting with the correct diagnosis and the best fungicide program important.

Good identification requires special training, a good eye and considerable experience. Dr. Clarke's assignment is such that he could use one or two technicians for diagnosis during the growing season. Of course, we recognize that a turf grower with a good eye and some experience can develop accuracy and diagnostic certainty on some diseases, but with our present fungicides, there is a crucial need to be sure of the disease's identity. The only complete cure for this problem would be a new, surefire fungicide or management program for the whole gamut of diseases. This still remains an item on our wish list.

•REE

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OPINIONS AND COMMENTS

Hydrated Lime for Warm, Wet Weather

Turf growers frequently look for something that will cure the ills of fine turf in hot weather. Hydrated lime has been applied over the years when algae and similar problems appear and seem to be destroying the turf. There is no record of hydrated lime's first use on established turf and there is no formal, published research. On one occasion, I used this treatment with great success in the heavily shaded backyard of my home when black algae (unidentified) became abundant in a continuous warm, wet period. I have suggested its use to many growers. While I have no record of how many have used it, no one has told me it was a waste of time.

Some say using hydrated lime soothes us when we are desperate for an answer. This is an oversimplification.

We cannot overlook hydrated lime's quick effect on the pH at the surface of the turf. Lime and soil pH does influence turf diseases, though we have little research on this subject. On one occasion, I asked a plant pathologist, who did not work with turf, what a lime application could do with disease. He remarked that lime has a drying agent effect. We know hydrated lime can be caustic to plants and lower forms of growth. Thus, concerning control of algae and other forms of "slimy" things that accumulate on the wet surface of turf, hydrated lime might contribute to better water penetration. It is of interest that little consideration has been given to hydrated lime and the black layer.

Since hydrated lime has persisted in limited use for three generations and the only serious threat seems to be the grass burn that might occur at the time of application, this product still merits consideration.

In order to complement turf theory, we look at what growers have improvised. Some examples and recommendations are as follows:

• Robert Dickison, Superintendent of Upper Montclair Country Club has been using 2 lbs per 1000 sq. ft., wet or dry. He prefers a wet application and poles in the next morning.

• Tony Grasso of Metro Milorganite has followed this treatment on a number of courses and he recommends 1 pound per 1000 sq. ft. dry in the later afternoon and watering in the next morning.

In turf texts, we find:

Musser's Turfgrass Management recommends 2 to 5 pounds per 1000 sq. ft.

• Hanson and Juska, in Turfgrass Science, recommended 2 to 3 pounds.

• Beard's Turfgrass Science and Culture recommended 2 to 5 lbs.

None of these authors gave any detail on watering in after treatment. Surely, everyone should develop their own satisfactory rinsing-in to avoid turf injury. Prolonged deep watering scarcely seem necessary to avoid burn.

• The Juska and Hanson text also suggested a zineb or maneb treatment for algae.

Those considering hydrated lime and are manipulating the pH may ask how this treatment will effect the soil pH? — The answer is very little, because of the small amount used. Leave a side by side check strip, if possible. Green World would like to receive interesting comments or results.

•REE

Nothing really significant ever happens in a man's life until he wants something. If it is a compelling want, it will set him dreaming. This is the beginning of creativity.

—Martin

OPINIONS AND COMMENTS

Focus on Some Cancer Fears from Chemicals

Much greater numbers of useful chemicals have come into use during the last 25 to 50 years. Science has special respect for chemicals until they are known and understood. Dr. Bruce Ames, professor of Biochemisty at the University of California, Berkeley, in **Prosource** Vol 8, 1988, questions the assumption that man-made chemicals are more caricinogenic than natural substances. He comments that vegetables often develop 5% toxins to keep off insects. Practically everything in the supermaket has natural carcinogens, when measured in parts per billion.

To great evils we submit; we resent little provocations.

— William Hazlett

Discontent is the first step in the progress of a man or a nation.

Questions and Answers from The Lawn Technician

PLCAA Vol 1:8. 1988.

Is there a cancer epidemic in the U.S.? Not according to the National Cancer Institutes' figures. With the exception of two types of cancer, cancer rates have remained pretty much constant for the last 40 years.

Which two types of cancer are occurring more frequently and why? —Lung cancer and skin cancer. The National Cancer Institute says that 20 or so years ago we began smoking and sunbathing more, and that these two changes in lifestyle have resulted in more lung and skin cancer today.

Benefits of Mowed Laws

¶ Acting like a gigantic sponge, lawns absorb all types of airborne pollutants such as soot, dust and carbon dioxide, as well as noise.

¶ Aesthetically, there can be no argument that a beautiful lawn is immediately pleasing to the eye and relaxing in its appearance. —**Prosource** (PLCAA) Vol 8: 10. 1988.

The Earth Wobbles

[from AP - February 1989]

Changes in air pressure around the earth cause a slight wobble in the axis of spin. Scientists have long known there has been a wobble cycle of about a year and another of about 433 days that have been linked to the atmosphere. Cycles of two weeks to several months have been discovered by scientists of the U.S. Naval Observatory, the Jet Propulsion Laboratory in Pasadena and the Atmospheric and Environmental Research Corps of Cambridge, Massachusetts. T. Marshal Eurbanks of the Naval Observatory said the wobble phenomenon is like that of a clothes washer with an off-center load. The fast wobble, ranges up to two feet at the earth's poles.

[*This can stimulate a lot of remarks, especially when people leave the bar late at night.*]

I am the grass. Let me work!

—Carl Sandburg

Insecticides
Where Do They Go?

continued from page 1

out that the process of watering in an insecticide may not physically move the material past the thatch to the grubs in the soil, but the grubs will respond to the moisture gradient and move upward into the thatch, where they come in contact with the insecticide.

The behavior of any given insecticide will depend on several characteristics, particularly its solubility in water. Obviously the more soluble a material is, the more readily it will move into surface or groundwater. Another characteristic which must be considered when selecting insecticides is persistence. Years ago turf managers used chlordane to control many insect problems. Of course chlordane was highly persistent, remaining effective for several years in some cases. However, there can be considerable negative "side-effect" from the use of pesticides which persist too long in the environment. Now most materials will remain effective for anywhere between a few days and a few months.

Proxol is highly soluble and can penetrate thatch and move readily into the soil. As a result it is more likely to make its way into the ground water, particularly in sandy soils. Indeed, it is Proxol's ability to penetrate thatch which makes it well suited for use in treating "hot spots" which sometimes appear. This mobility also makes Proxol unsuitable for use on surface or thatch feeders, because the material moves through the thatch before it ever has a chance to kill the chinch bugs or other surface feeders. In any case, turf managers must be aware of the fact that Proxol will move rapidly, and avoid using it in areas which are particularly sensitive to groundwater percolation.

Triumph is another insecticide which must be used with particular care with regard to groundwater contamination. Triumph is somewhat more soluble than some of its cousins and is not to be used on strictly sandy soils or on loamy sand because of its mobility in such soils. In addition, Triumph is extremely toxic to fish so surface runoff to streams or ponds must be avoided at all costs.

Pesticide Breakdown

Remember that any pesticide (insecticides included) will begin to break down immediately after it is applied to the turf or soil. The rate at which this breakdown occurs will depend on many factors, including the chemistry of the material, the soil type and moisture, soil temperature, and rainfall. Sometimes the breakdown products are considered to be more toxic than the original material. The rate of breakdown will also depend on whether the material was applied to open soil, between rows of a row crop, as a floliar spray to an agricultural crop, or to thatch. If the application is made to turf, the movement and breakdown will be effected by the density and thickness of the thatch.

Unfortunately, the equipment needed to study the fate of pesticides in the environment is very expensive and relatively few universities are equipped to study such questions in depth, but several researchers have initiated appropriate studies in the past five years. Perhaps the most sophisticated study in the Northeast is being conducted at Penn State, under the direction of Dr. Tom Watschke. Soil lysimeters have been installed several inches below the soil surface on an area which was then either sodded or seeded to turf. Additional equipment has been set up to collect surface run-off from the plots.

The Penn State group set-up has

— continued on page 6

Insecticides
Where Do They Go?

continued from page 5

been operating for about three years now and tremendous volumes of information are being generated on the movement of some herbicides and Dursban in the soil and as runoff. Interestingly, the researchers found that they could not induce Dursban to runoff the surface without a tremendous input of irrigation — equivalent to three inches per hour. This was not unexpected, because Dursban is more rapidly "tied up" in thatch. Thus, one would not expect it to be subject to surface runoff. (Indeed, this is precisely why Dursban is an excellent insecticide to use on many of the surface feeding insects— it stays put in the thatch.) Nevertheless it was interesting to note that it did not move on the surface, even under torrential rainfall conditions—and was not picked up in detectable quantities in the soil lysimeters directly beneath the treated area.

To further confuse the issue of movement of insecticides in the soil, several insecticides are subject to "microbial degradation." This simply means that the materials are broken down by organisms which occur naturally in some soils. If the organisms are present in a soil and the material is applied to the area, the organisms feed on the material, breaking it down into a non-insecticidal form. The end result is that the insecticide is broken down by the microorganism before it has a chance to work on the target insect.

Some turf managers have made the mistake of applying such a material more frequently or at higher application rates, in the hope of getting enough material in contact with the target insect. In fact, if this microbial degradation is occurring, it is best to avoid using that material and shift to another material instead. There are indications that Oftanol is one turf insecticide which is particularly susceptible to this microbial degradation. Turf managers in the Northeast should not use Oftanol more than once per year under any circumstances and should be particularly alert to the possibility of development of microbial degradation if they have used Oftanol more than three consecutive years. (Note that some soils will not develop the "problem" so use of Oftanol or other degradation-susceptible materials would not experience shortcomings in these soils.)

Turf managers, however, must understand that they are generally the most visible pesticide applicators by the nature of their work. The applications they make to home lawns, golf courses, athletic fields, and other turf areas are viewed as providing the single greatest source of pesticide exposure to the general public. Whether or not this perception is accurate, turf managers must lead the pesticide application industry in using pesticides judiciously and safely to minimize risks of exposure and groundwater contamination.

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