***Necrotic ring spot** continued from page 4*

for both summer patch and necrotic ring spot overlap, you can distinquish them by the smell of the dead and dying grass. Turf affected by summer patch has a strong "dry grass" odor. This same odor has not been observed in N.R.S. damaged turf. Drought stressed turf can be distinguished from turf damaged by summer patch and necrotic ring spot, because it does not exhibit the same site damage patterns, and often will exhibit the black fruiting bodies of non-pathogenic fungi.

Conclusion

AN ACCURATE DIAGNOSIS of necrotic ring spot can require a considerable amount of detective work and may require microscopic confirmation. Accurately diagnosing *Leptosphaeria korrae* can be beneficial in many more ways than just preventing the occasional "traditional" frog eye damage. Turf infected by it is harmed in a variety of ways that may be puzzling to explain or remedy, until you correctly detect the underlying presence of a chronic case of necrotic ring spot. When you have a problem that doesn't respond to conventional management practices, think about checking for necrotic ring spot, a patch disease that frequently doesn't form patches. ■

TERMS TO KNOW

aerifying . . . . . A mechanical means of removing cores of turf/soil to increase the aeration to the roots.

chlorosis . . . . . Yellowing of the grass blades.

cortical cells . . . . . Cells forming the central core of a root.

hyphae or mycelium . . . . . The filamentous life stafe of a fungus. Many individual filaments (or hypae) make up a mycelium.

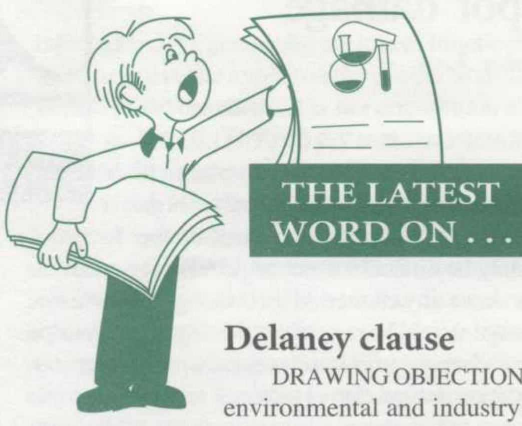
***Leptospirea korreae* . . . . .** The causal agent of necrotic ring spot.

micro-environment . . . . . The miniature local environment that a microorganism encounters.

sclerotia . . . . . Resting structures of some fungal pathogens.

spring dead spot . . . . . A disease of bermudagrass caused by the necrotic ring spot pathogen, *Leptospirea korreae.*

spp. . . . . . An abbreviation for the word "species."



Delaney clause

DRAWING OBJECTIONS from both environmental and industry groups, the Clinton administration has proposed doing away with the Delaney Clause and replacing it with a set of new rules worked out by the Environmental Protection Agency, the Food and Drug Administration, and the Department of Agriculture.

The 35-year old Delaney Clause bars adding any carcinogen to processed foods. It does not apply to fresh foods, where residues are allowed. So, tomatoes have had to met one standard, while products made from tomatoes, theoretically at least, have been held to a higher standard. A recent New York Times editorial pointed out, "in practice, the Delaney Clause has only intermittently been invoked against pesticides."

The issue came to a head, largely because a recent court case requires the government to either enforce the Delaney Clause or change the law. In addition, the new proposal reflects the technological changes that have taken place in the 35 years since Delaney became law—namely advances in the detection of trace amounts of chemicals in foods that have made extremely minute quantities measurable.

In effect, the new proposal would lessen the absolute standard set by Delaney to a standard of "negligible risk," which will be applied to both processed and fresh foods. A somewhat tougher standard will be applied to foods generally produced especially for children. The standard is defined as a million to one chance of causing cancer over a lifetime of use. The New York Times points out that this is "a very tough standard—far tougher than could be met by some existing pesticides, which can pose risks as high as one in 10,000 of developing cancer."

Obviously, the proposed change could affect the availability of some products currently in use by turfgrass managers. But at this point, it is difficult to judge the real implications for frontline turfgrass managers. Obviously, as the debate takes shape, consumer and environmental groups as well as food and chemical industry groups will all provide their views on the facts involved and will try to influence constituencies and legislators alike.

The new proposal will face a heated debate in Congress before it can become the law of the land. It also includes strict deadlines for compliance, sets deadlines for a review of pesticides, and authorizes increased government power to remove from the market pesticides that fail the new "negligible risk" standard. It would also ban the export of pesticides that are banned here, and it would encourage farmers and others to dramatically cut pesticide use.

Nitrate ground water contamination

LAWNCARE came out smelling like a rose in a study of sources of nitrate ground water contamination. The study by Dr. M. Petrovic of Cornell University compared the annual nitrate (N) contributions of various land uses over a two year period. The areas studied included forests, lawns, corn fields with and without cover crops, and areas with septic systems.

In the chart below we have assigned a value of one (1.0) to the land uses that contributed the least nitrate—unfertilized forests and lawns. Lawns fertilized with more expensive urea-formaldehyde produced a slightly higher nitrate level, while lawns fertilized with more commonly used urea products produced a significantly higher level of nitrate—but nothing like the levels produced by agricultural uses and septic systems.

While all of the lawn uses tested produced results well below the federal drinking water standard, agricultural use produced contamination levels below the federal standard—but at least fairly close to, while septic system use produced results that exceeded the federal standard by a wide margin.

AVERAGE NITRATE GROUND WATER CONTAMINATION

Land use	Fertilizer	Result
Forest	none	1.0*
Lawn	none	1.0
Lawn	urea-formaldehyde	1.5
Lawn	urea	8.0
Federal drinking water standard		40.0**
Corn	manure	54.5
Corn (cover crop)	urea	58.5
Corn (no cover)	urea	76.5
Septic system	—	340.5

** Lowest contributor = 1.0*

*** 10 ug/L. (ug/L= micro-grams per liter).*

Turf-specific leaching models

AT THE INTERNATIONAL TURFGRASS RESEARCH Conference, Dr. Petrovic also reported on the results of a study of the fate of the herbicide MCPP (Mecoprop) and the fungicide Triamedifon (Bayleton). MCPP is leaf absorbed, and Triamedifon is root-absorbed. Instead of the expected result—of the leaf absorbed material being less prone to leach—Dr. Petrovic found that the Triamedifon was less likely to leach.

One implication of these results is that the predictability of existing forecasting models for chemical leaching in soil has been poor for turfgrass sites, because the models were designed for bare soil agricultural situations. New turf-specific models are needed—particularly since a more thorough testing of turf management products is likely.

The study was conducted on new (4 months after seeding) bentgrass stands on various soil types under different irrigation regimens. The concentration of the two materials in leachette was collected at 15 inches down, and was measured over a 50-60 day period.

In the following table, the results represent the percentage of the total applied material recovered—in short, the amount that leached.

PERCENTAGE OF MATERIAL RECOVERED
(AMOUNT LEACHED)

Material	Irrigation	Sand	Sandy Loam	Silt Loam
MCPP	Medium	35%*	2%	1%
	Heavy	74%*	>1%	1%
Triamedifon	Medium	1%	>1%	>1%
	Heavy	2%	>1%	>1%

* Analysis incomplete

On sandy soil, the recovery rates spiked from day two—with the highest concentrations recovered under both irrigation regimens at 10 - 20 days after application. After that period, about two-thirds of the high rate was recovered for the duration of the study period. On sandy loam soils, the rate of recovery varied from day to day, but was generally low for both irrigation regimes over the test period. Silt loam soils showed results that closely mirrored that of sandy loam soils.

This study, as have others, indicated that some turf management pesticides are subject to dramatic leaching problems on sandy soils under heavy irrigation practices. Sandy soils are most common in coastal areas and bottom lands. In the future, use in these kinds of areas, of materials with high leaching potential may be subject to label restrictions. *–continued on page 15*

Diagnosing leaf and root diseases

by Christopher Sann

ANY DISCUSSION of the diagnostic differences between foliage and root damaging diseases of turfgrass must begin with a simple truism: Forget any of the skills that you, the turfgrass manager, have developed for diagnosing foliar diseases of turf from any distance further than three inches." When it comes to diagnosing root diseases, at best, these skills will be useless and, at worst, they will give you incorrect diagnoses more times than not.

When dealing with most foliar diseases, there are often a group of highly "diagnostic visual symptoms." They range from species specific leaf lesions to whole site patterns of disease activity. A skilled diagnostician can literally diagnose some foliar diseases while driving by at forty miles per hour. Unfortunately, that kind of visual detecting will not work with root diseases. In fact, it often leads to mis-diagnosis, inappropriate applications of control chemicals, and the extra expense of additional control materials and the cost of labor and machinery to reapply.

The days of "seat of the pants" field diagnosis are numbered. If the cost and aggravation of mis-diagnosing turf grass diseases doesn't make us want to change our approach, then the regulators will. One way or the other, we are entering a new age where we have to qualify, quantify and justify why we make every pesticide application. We might as well get used to the idea.

"Diagnostic" symptoms

The problem with trying to transfer the visual skills of pattern recognition and lesion identification —the tell tale signs of foliar turfgrass diseases—to the diagnosis of root diseases is that there are few, if any, truly diagnostic, unique visual symptoms that consistently occur in root disease symptomology.

To be sure, the symptoms of root damaging diseases are often very different from most of the more familiar, "diagnostic" symptoms of foliar diseases, but these different symptoms are so common within this group—and for that matter in the advanced stages of many of the foliar diseases—that they could be caused by any of a dozen pathogens. Historically, with the use of the broad spectrum heavy metal-based fungicides, the fine distinctions between the various pathogens was a moot point. But in today's highly charged regulatory atmosphere, with the increasingly narrow focus of newer fungicides, this distinction has become crucial.

How to look for root disease symptoms

Vision is still the best tool for making correct diagnoses in the field, but, in the case of root diseases, your vision should be augmented with a 8 - 10 X hand lens, a soil probe, a sample cutter (like a sturdy pen knife or a putting green hole cutter), and a major revision of attitude.

We need to reverse the historic approach of starting at the top of the turfgrass plant and working down to the crown and maybe the roots. Root damaging diseases kill roots. Often the infected plant has sustained massive root loss before any symptoms can be seen on the foliage. Additionally, the more opportunistic foliar diseases will colonize turf that is under attack from root pathogens, and simply identifying the"diagnostic symptoms" of these foliar infections will give you a false impression about what is happening and in what order.

This common mistake can be avoided if you start at the bottom and work your way up. Start by taking a sample from the margins of the damaged area, pry it apart, and examine the roots with your hand lens. If the roots looks healthy (i.e., white with abundant root hairs), then examine the crown. If the crown also appears healthy, then finally examine the foliage.

If, after using this bottom up approach, you cannot find enough visual clues to come to a conclusion, then either further examine the sample under a good microscope, using a good reference book like "The Compendium of Turfgrass Diseases," or send a sample to a good diagnostic lab. Most major state universities either have diagnostic labs or can recommend one. ■

***Latest Word** continued from page 7*

Worker exposure study

K.A. HURTO AND R.A. YEARY of Trugreen/Chemlawn measured how pesticide exposure to workers varied by equipment and formulations and how much of the applied pesticide was recoverable over time. Compared to worker exposure from using granular application drop spreaders

- FINE DROPLET SIZED LIQUID application equipment exposed workers to 15 times more pesticide.
- LARGE DROPLET SIZED LIQUID application equipment—10 times more.
- LIQUID BACKPACK SPRAYERS—four times more
- GRANULAR ROTARY SPREADERS—two times more.

The thigh and lower legs received 99% of the exposure during liquid applications, while areas above the waist only received 1% of the exposure.

The residues that could be recovered from turf following a liquid application were 25% of the total amount applied, one hour after the application. This amount decreased, after two hours, to 7%; after 1 day to 6 %; after 7 days to 2%; and after 14 days to <1%. When treated area was irrigated two hours after the application, the amount of pesticide was reduced by an average of 45% for each testing day.

When a liquid application was compared to a granular formulation of the same material, the recoverable residues of the liquid were 20 times that of the granular formulation. ■