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DISEASES

Is that a nematode eating my turf?

If you have been managing turf for some time, chances are that someone has told at some point you that your poor turf performance is due to nematodes. And sure enough, when you've had a test done, you've received a report showing that hundreds, if not thousands of nematodes are infesting the root systems of your turf plants.

Figure 1. The stem gall nematode is one of the few turf nematodes that consistently causes serious damage. Note the bulbous galls at the base of leaf stems.



Cause for panic? Not necessarily. In fact, in most cases, nematodes are NOT the cause of turf damage, even when they are present in relatively high numbers. With the exception of two truly horrific nematodes -- **the sting nematode** (*Belonolaimus*) and the **stem gall nematode** (*Anguina pacifica*) -- we have found that most turf plants can sustain high numbers of most other nematodes with little or no problem. In fact, plants with healthy root systems sometimes have higher nematode counts than stressed plants because the more extensive root systems of healthy plants can afford to house and feed more nematodes without detracting from the job they need to do to keep the plant healthy. This is why nematode counts alone can be misleading.

So how can you tell whether turf damage is being caused by nematodes or not? Here are some pointers on dealing with this sometimes counter-intuitive problem:

- If parasitic nematodes are found in damaged turf, don't automatically assume they're responsible for the damage.
- If you are uncertain whether nematodes are the culprit, think about doing a quick test where you treat a small strip (about 10 feet long) of the damaged turf with fenamiphos (Nemacur) following label instructions. If the turf doesn't begin to recover in 7 to 14 days, nematodes are probably NOT the source of the damage.
- Get input from a trained diagnostician to determine which factors are responsible for the damage.
- If either sting or stem gall nematodes are identified, control procedures should be implemented immediately. These are the only two turf nematodes about which there is no controversy. If they are there, even at very low numbers, you have a problem.
- Avoid nematode damage by keeping turf healthy with adequate fertility, aeration, traffic management, light and water.
- For more information, read the **PACE Insights on Nematodes and Turfgrass Health** (2001, Volume 7, No. 2)

Getting rid of persistent anthracnose

If you are having difficulty getting rid of anthracnose, it's time to take a second look at the products you are using for control. If thiophanate-methyl (Cleary's 3336) or any of the QoI fungicides (Heritage [azoxystrobin], Compass [trifloxystrobin], Insignia [pyraclostrobin]) have been used recently with little or no success, it is possible that the fungus that causes anthracnose, *Colletotrichum cereale*, has developed resistance to these fungicides. When resistance develops, this means that the fungus has changed, or evolved, so that it can survive applications of fungicides that it used to be susceptible to. And unfortunately, anthracnose resistance to these four products appears to be spreading to many locations.

If there is a possibility that you are dealing with a resistant population of anthracnose, there are three things you should do:

1. Stop using the thiophanate-methyl or QoI fungicide that you suspect is no longer effective
2. Switch to one of the combinations below. Use on a 14 day schedule until turf is recovered. Products should not be watered in:
 - chlorothalonil (e.g. Daconil Ultrex at 3.2 oz/1000 sq ft) PLUS propiconazole (e.g. Banner Maxx, at 1 oz/1000 sq ft)
 - chlorothalonil (e.g. Daconil Ultrex at 3.2 oz/1000 sq ft) PLUS Endorse 4 oz/1000 sq ft

- chlorothalonil (e.g. Daconil Ultrex at 3.2 oz/1000 sq ft) PLUS Medallion 0.25 oz/1000 sq ft
 - chlorothalonil (e.g. Daconil Ultrex at 3.2 oz/1000 sq ft) PLUS Chipco Signature 4 oz/1000 sq ft
3. Maintain adequate moisture
 4. Increase nitrogen to 0.2 lbs N/1000 sq ft per week using a complete foliar spray such as a 20-20-20 product.
 5. Raise mowing height as high as is tolerable.
 6. Avoid aggressive vertical mowing, aeration or sand topdressing until the turf has fully recovered.

Gray leaf spot hits

Thanks to the efforts of the Turf Disease Working Group (an internet listserv community of turf diagnosticians), we have a fairly comprehensive look at the timing of this year's first gray leaf spot epidemics in the U.S. The table below summarizes the information we have so far received.

This information allows to see how well the Wong gray leaf spot index has been at predicting the appearance of this disease. (The index is calculated by adding together the high air temperature and the low relative humidity for any given day. An index of 140 or higher indicates optimal conditions for GLS.)

First reports of gray leaf spot for 2007. A GLS index of 140 or above indicates optimal conditions for disease development. However, disease may occur even below the index level of 140 (see Stockton, CA below)

LOCATION	TURF TYPE	1 st REPORT	GLS INDEX*
Louisiana	St. Augustine	6/15/07	143
Mississippi	St. Augustine	July	ND
Tampa, FL	Pennisetum	7/17/007	145
Stockton, CA	Perennial rye	7/10/07	124
Lebanon, PA	Unknown	7/12/07	146
Ardmore, PA	Unknown	7/18/07	159
Dillsburg, PA	Unknown	7/18/07	145
Delaware	Perennial rye	7/17/07	160
Dallas, TX	St. Augustine	6/6/07	150

* 1 week earlier than 1st report; ND = not determined because exact dates not available

Is it possible that the model places too heavy of an emphasis on relative humidity, and not enough on high temperatures as a trigger for GLS? We ask this question because we have observed the disease causing trouble in drought-stressed and heat-stressed situations in the past. In the Stockton, CA situation, the host turf was perennial ryegrass, and the air temperatures got up to 106F (41C), which is very stressful to cool-season varieties such as rye. It is possible that hot and dry conditions stressed the ryegrass enough to make it more susceptible to GLS than it normally would be.

For the most part, the model has done a very good forecasting job indeed. The only location where the model did not match up to reality was Stockton, CA, where the disease occurred despite dry conditions (low humidities in the 'teens) that kept the GLS index below the 140 threshold.

Figure 2. Dry soils trigger gray leaf spot infection. Kikuyugrass fairway, Southern California. Disease occurred in dry areas where irrigation distribution was poor. Moist areas near irrigation heads were not affected.



Although we need more data to confirm our suspicion, it does raise a flag. If you have had GLS in the past, you shouldn't relax your guard just because humidities are low, as we have occasionally seen the disease hit even under very dry conditions, especially if temperatures are high and soil moisture is low. In other words, don't wait until the color coded Wong GLS index in the **PACE Weather Update** for your location is red. Start paying attention to symptoms, and get ready to treat when the color code at your location is yellow.

APS turf tour

On July 27, 2007, PACE hosted a turf tour for plant pathologists who were in town for the American Phytopathological Society meetings. The participants, who came from all over the U.S., were able to view a cornucopia of turf types and turf uses — from the paspalum fairways of Fairbanks Ranch CC, to the GN-1 bermudagrass at the Del Mar Thoroughbred Club, to the kikuyugrass fairways at Torrey Pines GC, the poa/bent greens at Mission Bay GC and the overseeded Bullseye bermudagrass at Petco Park.

The all-day tour was a great success, thanks to the superintendents listed below who so graciously hosted us. We want to take this opportunity to thank them here for their time, their insights, and their generosity in sharing their experiences with all of us.

- Candice Combs, CGCS, Superintendent: Torrey Pines Golf Course
- Brian Darrock, Superintendent: Fairbanks Ranch Country Club

- Gerald Dearie, Superintendent: Mission Bay Golf Course
Leif Dickinson, Superintendent: Del Mar Thoroughbred Club
- Mark Woodward, CGCS, Director of Golf Course Operations: Torrey Pines Golf Course
- Luke Yoder, Superintendent: Petco Park

APS 2007 Turf Tour participants.



SOILS

Diagnosing low nitrogen

We frequently point out the dangers of too much nitrogen in turfgrass health, but there are equal warnings to take heed of on the damage that low nitrogen can do. We occasionally receive samples in the lab where a disease is suspected, but where the diagnosis turns out to be low nitrogen. In addition to causing a shift from green to yellow turf color and slowing turf growth and recovery, low N is also implicated in diseases such as anthracnose, red thread and dollar spot. It is also associated with the appearance of nitrogen-fixing weeds such as clover.

Nitrate/nitrite water test strips from Hach (www.hach.com; cat. No. Cat. 27454-25) can be used to get a rough idea of soil nitrate levels. Follow the simple instructions in article "Quick test for soil nitrate" on the PACE website (www.paceturf.org).



What are some warning signs that you may be low in nitrogen?

- A recent soil test shows less than 3 parts per million (ppm) nitrogen in the soil
- On mixed poa/bent greens, the bentgrass looks very dark green, while the poa looks lime green or yellowish. The bent, with its deeper root system, is able to scavenge more N from a low nitrogen soil, which is why it's green. But the poor poa, with its

shallower root system has no where to go once all of the nitrogen has been depleted from the top two inches of soil.

- You are using one of the low rate foliar feed fertilizers as your main source of nutrition on greens
- You have recently had heavy rainfall or a leaching event
- Using PACE's quick test for soil nitrate, the test strip is beige to very pale pink, indicating less than 3 ppm nitrate.

What should you do once you realize that you are suffering from low N?

- Apply 0.2 lb nitrogen/1000 sq ft, using a quick-release product such as calcium nitrate and lightly water in.
- If you make a nitrogen application and have not made a Primo application in the past 7 days, apply Primo Maxx (trinexepac-ethyl) at 0.125 oz/1000 sq ft. This will help keep poa and bentgrass from undergoing an unpleasant growth spurt
- Use the PACE nitrogen demand forecast to help calculate when and how much nitrogen to apply in the future. To find out what the model-forecasted nitrogen demand will be over the next 7 days at your location, look at the bottom of your site-specific PACE Weather Update. Note that we have calculated nitrogen demand for both warm-season and cool-season turf.

Measure soil moisture, but use the right tools!

During the warm summer months, many suspected disease problems turn out to be drought problems instead. This is not surprising, since the symptoms of drought stress are very similar to the symptoms caused by many turf diseases.

The culprits involved in drought stress range from poor irrigation distribution to localized dry spot to pump failures to contour issues and surface sealing.

It is very important to avoid drought stress -- for both obvious and not-so-obvious reasons. The immediate damage, is of course devastating. That is the obvious part. But the hidden problem is that because soils that dry out are very difficult to re-wet, drought stress can end up being a gift that keeps giving — all throughout the summer, as water-repellent soils refuse to support turf growth and recovery.

To detect drought stress before serious damage occurs, there are several good monitoring tools. Unfortunately, there are also some moisture meters in the marketplace that are not very good, and can therefore provide misleading information. We have described below two tools that we have found to be very effective.

Greens: The TDR 300 soil moisture probe from Spectrum Technologies (www.specmeters.com) is moderately expensive (\$895), but well worth the cost if you are worried about drought damage. On sand-based greens, we target 18-25% volumetric water content for

healthy turf. This meter can also be used on fairways, but readings may be difficult to interpret. This is because fairway soils can vary widely, and the meter needs to be calibrated for each different soil type.

Figure 3. TDR 300 soil moisture probe.



Fairways and roughs: Either a cone penetrometer (shown in photo to right) or a soil compaction rod are effective tools. At less than \$100, the soil compaction rod is particularly affordable, and both tools provide rough, but reliable, indicators of soil moisture. The procedure is simple: just insert the metal probe into the soil using moderate pressure. If the probe can penetrate the soil to a depth of 12 inches or more, the soil is probably moist enough to support growth of either cool-season or warm-season turf. If the probe does not reach a depth of 12 inches, even when significant pressure is exerted by a 180 lb person, then the soil is too dry. Before you start, here are a few points to keep in mind:



- This method is NOT effective on sand-based greens.
- Always check three spots in a given area to confirm your findings.
- Avoid rocks, pipes and other obstructions that can interfere with the probe's movement in the soil.
- The 12-inch guideline above may vary slightly from one location to the next. For example, you may want to target a somewhat deeper depth for cool-season turf, or in very sandy soils that dry out easily.

CULTURAL PRACTICES

Avoid topdressing damaged turf

We are big fans of frequent, light sand topdressing on greens for improved firmness, more even water

movement/infiltration, reduced puffiness and management of organic matter and black layer.

However, there is one situation in which topdressing can hurt more than help the turf. And that is when turf has recently been damaged by pests, traffic, extreme weather or other stresses.

When you suffer some turf loss, there is a strong temptation to apply sand in order to smooth out the surface. But we suggest that you resist that urge. This is because although there are many good things that sand can do, sand can also produce the following negative effects:

- intercept pesticides so that they do not reach the turf
- shade turf plants so that they do not receive enough light to grow and recover
- increase the temperature and the humidity at the green surface, thus creating good conditions for growth of fungal diseases
- abrade the turf, creating an easier entry for foliar diseases such as rapid blight, gray leaf spot, anthracnose, snow mold.

When is it safe to start topdressing again? We suggest that you wait until you see 2 - 3 new leaves on the majority of turf plants. At that point, recovery is well underway, and you can lightly topdress (dust) to smooth the greens out.

PACE PUBLICATIONS

PACE IPM References

As part of our GCSAA funded, two-year project, "Producing an IPM Template", we have begun writing IPM Reference publications on turf diseases, insects and weeds, as well as on soil and water quality guidelines. We will periodically provide these to you for your review.

Useful information includes use guidelines, descriptions and photos, impact on pest populations, predictive models and product listings. Where appropriate, products with reduced risk or other environmentally compatible designations are highlighted.

References recently placed on the PACE Member Edition website include:

- IPM Reference on nitrogen
- IPM Reference on yellow nutsedge
- IPM Reference on purple nutsedge

PACE Highlights features turf management information recently covered in PACE's weekly Updates. For more detailed information and electronic links to background materials, visit the PACE Member Edition website at www.paceturf.org.