Summer disease update

Making take-all patch a "takeless" disease

Bottom line: Increasing soil manganese levels to 30 – 45 ppm (Mehlich III) can help reduce the severity of take-all patch, especially in soils where pHs of over 6.0 occur. For severe symptoms, application of fungicides such as azoxystrobin, pyraclostrobin, propiconazole, thiophanate-methyl or triadimefon may still be necessary, however.

Take-all patch on bentgrass green

The first step to managing take-all patch, a root disease of bentgrass caused by *Gaeumannomyces graminis*, is to check your soil pH and manganese levels. Based upon work conducted at Rutgers University by J.R. Heckman and colleagues, sufficient manganese availability is the key to prevention of take-all patch. We have also observed that courses with take-all patch problems are frequently low in soil manganese.

PACE soil surveys (from good performing greens) indicate that a manganese availability index of 110 is a reasonable target for disease prevention, although Heckman recommends somewhat lower values.

There are two possible ways to increase manganese availability in your soils. First, you can target lower pH, which is still the standard method of suppression of take-all patch. The theory here is that manganese is more available to the plant when soils are acidic (with lower pHs). However, in practice, it is difficult in many locations to lower the soil pH enough to increase manganese availability significantly. We believe that an easier alternative for someone with high soil pH and low manganese availability is to increase Mn levels through the application of appropriate fertilizers (as described below). The relationship between soil pH and manganese availability (MnAI) is illustrated in PACE's soil chemistry guidelines below:

Guidelines for iron and manganese, for soils at a range of different pHs. Note that the desired levels of micronutrients increases as soil pH increases. Maintaining higher levels of manganese and iron helps to overcome their tendency to become bound, and therefore unavailable, to the plant in more basic soils. We have paid special attention to these two micronutrients because plants are more likely to be deficient in iron than any other micronutrient. And higher levels of manganese appear to play a role in suppressing turf diseases caused by *Gaeumannomyces* such as bermudagrass decline, kikuyugrass decline, and take-all patch.

	Desired soil ppm for pH 6 - 8.5 soils						Average range for greens, tees & fairways (across all pHs)
	6	6.5	7	7.5	8	8.5	
Iron (Fe)	80	86	92	98	104	110	157-185
Manganese (Mn)	27	29	31	33	35	37	30-43

The pH/manganese relationship is further detailed in the following equation presented by Heckman et. al.:

M3MnAI = 101.7 - 15.2 (pH) + 3.75 M3Mn
Where M3Mn = Mehlich III extracted Mn in ppm

The pH strategy: If you target the pH strategy, be sure that you have enough manganese in your soil to yield a MnAI of 110 at pH of 6.0 – you should not drop soil pH below the value of 6.0. If you push the numbers through the equation, Mn ppm should exceed 27 ppm at pH 6.0 to yield a MnAI of about 110, as the PACE guidelines indicate.

The manganese strategy: If you take the second strategy and address manganese deficiencies by adding it to the soil, Heckman et. al. recommend applications of at least 0.14 lbs actual Mn/1000 sq ft. This is equivalent to application of 0.5 lbs/1000 sq ft (22 lbs/acre) of an approximately 30% Mn product such as Granusol Mn or manganese sulfate monohydrate. On fairways, superintendents frequently apply as much as 100 – 200 lbs/acre of Granusol Mn or manganese sulfate monohydrate if increases in soil Mn are needed. For greens, superintendents use 1 – 2 lbs/1000 sq ft of the Granusol Mn or manganese

sulfate monohydrate with repeated applications every 14 days as needed to increase soil levels to the desired manganese availability index. We also balance iron and manganese levels to target 3:1 iron to manganese based upon Mehlich III extraction.

Manganese toxicity? Some of you have queried us about the possibility of manganese toxicity. A quick literature review indicates that manganese levels in plant tissues above 300 – 500 ppm and in soils above 1500 ppm can be toxic. In other words, it is possible to overdo manganese applications, so take it easy and monitor your soils closely.

To see how common a problem manganese toxicity is, we took a look at the PACE soil survey database of almost 7,000 soil samples covering greens, tees, and fairways. The good news is that our database does not contain a single sample that reports manganese levels above 315 ppm.

The PACE tissue survey reports a different story. Of the 189 tissue samples from good performing greens, tissue values range from 30 to 1368 ppm. The average is 131 ppm with the true mean falling between 108 and 153 ppm (95% confidence interval). The desired tissue manganese level is 17 – 200 ppm. The high values, above 300 ppm, in the PACE database were few (10 out of 189 samples) and since the samples all come from good performing greens, it is possible that the apparently toxic levels are an artifact (an inaccurate observation, effect, or result, especially one resulting from the technology used in scientific investigation), possibly reflecting residues of a recent application of a manganese containing material such as mancozeb, rather than true tissue accumulation of toxic levels.

Turf fungicide table

In the last year, we have seen the registration of several new turf fungicides that have changed (for the better) the spectrum of products available for disease control. As a result, we have provided a new fungicide table as an insert with this PACE Insights that takes these changes into account by listing key products and identifying the diseases that they are most effective against. This table can be useful during the complex process of selecting the most efficacious products for the unique spectrum of diseases that you are dealing with. Remember to always consult the resistance management tables provided in your PACE Turf Management Reference Booklet (reference 35) before making a final decision on product selections.

Bermudagrass decline

When the wet summer season kicks in throughout the Southern region, bermudagrass greens begin to succumb to bermudagrass decline (caused by Gaeumannomyces). The tank mix that seems to be working the best according to Dr. Phil Colbaugh of Texas A and M is thiophanate methyl in combination with chlorothalonil.

Bottom line: In addition to the manganese and iron applications described above for take-all patch, severe bermudagrass decline infestations can be knocked down with an application of thiophanate methyl (e.g. 8 oz/1000 sq ft Cleary's 3336) and the low label rate of chlorothalonil (e.g. Daconil WeatherStik 3.2 oz/1000 sq ft). Follow-up applications with Heritage may be necessary in some cases.

We have developed a program that has received positive feedback for its quick knock down activity. It uses a combination of the top of the label rate of thiophanate methyl (e.g. 8 oz/1000 sq ft Cleary's 3336) and the low label rate of chlorothalonil (e.g. Daconil WeatherStik 3.2 oz/1000 sq ft). Apply in 2 gal water/1000 sq ft and lightly water in following application – not more than 2 turns on the heads. To increase control with a systemic product, consider Heritage 0.2 oz/1000 sq ft 7 days after the thiophanate methyl + chlorothalonil application. A second application of Heritage at 0.2 oz/1000 sq ft should be made 14 days after the first Heritage application. To further suppress the disease and to stimulate recovery, apply 2 oz/1000 sq ft of a chelated iron product (e.g. FeEDTA, 30% Fe) and 1 oz/1000 sq ft chelated manganese (e.g. MnEDTA, 30% Mn) weekly for three applications.

Symptoms of decline on bermudagrass green.

Curvularia strikes

Bottom line: When bermudagrass greens are stressed by low light, high rainfall, heavy traffic and other factors, they are much more susceptible to Curvularia blight. The best treatment for this problem is to reduce stress wherever possible, but this can be almost impossible during the summer months. If the disease gets the upper hand, it will require two to three applications of a dicarboximide fungicide (iprodione e.g. Chipco 26 GT at 4 oz/1000 sq ft or vinclozolin e.g. Vorlan, Curalan or Touche 1 oz/1000 sq ft) on a 14 day interval until symptoms clear up.

Curvularia blight has been a controversial pathogen on bermudagrass – akin to anthracnose on poa. Some

university researchers continue to preach that anthracnose is not a "real" disease of poa because it results "only" when turf is stressed. Unfortunately, greens are stressed most of the time, and for this reason, we can't avoid thinking of it as an important disease. The same can be said for curvularia blight on bermudagrass – it is a stress disease of bermuda but if ignored, it can result in significant turf damage. The control practice that has worked in the field (few replicated research trials have been conducted on this pathogen) is two to three applications of a dicarboximide fungicide (iprodione e.g. Chipco 26 GT at 4 oz/1000 sq ft or vinclozolin e.g. Vorlan EG 1 oz/1000 sq ft) on a 14 day interval. The products should not be watered in.

Curvularia blight on bermudagrass green.

One of the few references that report any fungicide results on curvularia blight is a book by Dr. Toshikazu Tani from Japan that was edited by Dr. James Beard for the English edition: (Tani, T. 1997. Color atlas of turfgrass diseases: Disease characteristics and control. Ann Arbor Press. Chelsea, MI. 245 pp.) If you are interested, pages 68 – 71 describe curvularia blight and provides images of control using iprodione. In Japan, curvularia blight is more severe on zosyia than bermuda.

Gray leaf spot is upon us

Bottom line: Gray leaf spot season has begun. Courses that have experienced serious outbreaks in the past should consider preventive applications of either propiconazole plus chlorothalonil OR thiophanate-methyl plus chlorothalonil. These same treatments are effective curatively as well, but recovery is always slower in a curative scenario. Keep soil nitrogen levels below 20 ppm, and avoid aggressive practices such as sand topdressing and aerification during the summer threat period for this disease. If these practices must occur, then treat preventively beforehand, as described above.

With the advent of warm temperatures (average above 68F) and higher than normal relative humidity, the first gray leaf spot samples of the season have begun to arrive from Southern California. So far, our only diagnoses have been on ryegrass fairways and roughs, but it is important to remember that this disease can affect fescue, kikuyugrass and St. Augustinegrass as well. There are a variety of products that are highly active on gray leaf spot, but we have selected the two treatment combinations below for their superior efficacy and resistance management potential.

1) Banner Maxx 1 oz/1000 sq ft in combination with Daconil Ultrex 3.2 oz/1000 sq ft.

OR

2) Cleary's 3336 4 oz/1000 sq ft in combination with Daconil Ultrex 3.2 oz/1000 sq ft.

Applications should be made in 2 gal water/1000 sq ft for best performance using flat fan nozzles. Under severe pressure, applications may need to be repeated every 14 days. Use of equivalent generic products should provide equivalent control but we recommend that you evaluate new products before widespread use. Generic products frequently offer a significant price savings and are worth evaluating.

Gray leaf spot in ryegrass roughs. Note that the bermudagrass fairways are unaffected.

Anthracnose rescue program

Bottom line: We are now in the thick of the anthracnose season, and some courses are in the unenviable position of trying to cure this obnoxious disease. While prevention is the rule for a disease this nasty, you may occasionally find yourself with an anthracnose rampage that requires a rescue program of the sort outlined below.

There is one thing NOT to do when attacking anthracnose, and that is to limit water. You simply cannot cure this disease by reducing irrigation, despite many urban legends to the contrary. It's really just common sense — moisture stress is one of the most serious stressors for turfgrass, and anthracnose is a stress related disease. Anything that you do to weaken the turf (such as withholding water) will only

give the anthracnose a leg up. For this reason, we suggest that you maintain adequate moisture and at the same time consider these steps:

- Apply Banner Maxx at 2 oz/1000 sq ft plus Daconil Ultrex at 3.2 oz/1000 sq ft every 14 days until turf is fully recovered (generic products based on propiconazole and chlorothalonil should be effective as well, but it is worthwhile to test a new product before widespread use).
- Stop Primo applications until turf is recovered
- Increase nitrogen to 0.2 lbs N/1000 sq ft per week using a complete foliar spray such as a 20-20-20 product.
- Raise mowing height as high as is tolerable.
- Avoid aggressive vertical mowing and aeration until the turf has fully recovered.

The wetting fork and fairy ring management

Localized dry spots are caused by a variety of factors, including fairy ring infestations. One of the end results are hydrophobic (water-resistant) soils that are difficult, if not impossible to re-wet. Various wetting agents can help address this problem, as can the use of a tool known as a water fork or a wetting fork. While this tool does not actually control fairy ring, it addresses one of the most troublesome of the symptoms that this disease produces. The water fork can be ordered from a variety of sources. Eagle One (phone: 800 448 4409) sells one for about $375.00 (catalogue number I016)

Spray nozzle selection for improved pest control

Spray nozzle type can play a large role in the effectiveness of pesticides — especially fungicides and insecticides that are used to control foliar pests. Foliar diseases include algae, anthracnose, leaf spot, brown/yellow patch, dollar spot, pink snow mold, gray leaf spot and rapid blight. Insect foliar pests include black cutworms, sod webworms, armyworms and chinch bugs. For these pests, flat fan nozzles usually provide the best results because of their ability to provide good spray coverage on the foliage. Post-emergence herbicides and fertilizer sprays fall into this grouping as well.

Why are foliar pests of particular importance with regards to nozzle type? There are three answers to this question. Firstly, there is coverage. And then there is 2) coverage. And finally, 3) coverage. In trying to defeat pests that attack foliage, we mostly rely on pesticides that work when they come into contact with the pest. It is therefore critical that the leaf surface (of the turf plant or the weed) is evenly coated with the pesticide, so that the contact between pest and pesticide is maximized. Otherwise, these pests are good at finding the blank spots on the foliage and attacking there.

In contrast, pests that attack roots are usually controlled with systemic pesticides that are taken up inside the plant. Pre-emergence herbicides, which act at the soil level, also fall into this grouping. In these cases, the plant assists us in evenly distributing the pesticide within the plant. As a result, good coverage is less important for root feeding or soil pests.

When selecting spray nozzles, there is always a give and take between two opposing needs: to minimize spray drift while at the same time maximizing foliar coverage. To minimize drift, larger spray droplets are desirable. This is because as spray droplets become smaller, they are more likely to evaporate or to be moved by the wind, and are therefore less likely to reach the foliage. However, to maximize foliar coverage, lots of small droplets that are closely spaced on the foliage are optimal; with larger droplets, there are many fewer drops, and they tend to be widely spaced on the foliage (there is a limit to how small is desirable, however; if droplets are too small — less than 200 microns in diameter — they are more likely to evaporate before ever reaching the foliage).

The best technology we currently have that balances these concerns is the flat fan nozzle, which produces relatively small droplets (in the range of 300 – 400 microns), but are also engineered to minimize drift. Nozzles classified as raindrops, floods or cones all produce larger droplet sizes, and are therefore more useful in the application of systemic products and pre-emergence herbicides.

For application of foliar-based products, flat fan nozzles should be used in conjunction with spray volumes of 2 gallons/1000 sq ft (87 gallons/acre). Significantly lower or higher volumes than 2 gallons/1000 will result in decreased spray coverage and therefore less pest control. If volumes are too low, there will not be enough droplets to adequately cover the foliage, and if spray volumes are too high, the pesticide will be too dilute to be effective.

There are many different types of flat fan nozzles available. Always consult the manufacturer's instructions on the proper pressure, spacing, boom height and overlap.