Turf

Not much going on in turfgrass at this time. I suspect that most of you are still in clean up mode post Irene and hope you are not underwater yet again this week. You were not alone in the power outages last week. The laboratory was without power for a couple days and my own home was without for several. As such I took an impromptu vacation (with the contents of my freezer) to see my family in Delaware. Vacation for me usually means excessive amounts of cycling. Let me tell you that it is pretty easy to see most of Delaware during a week on a bicycle.

The one thing that struck me during my travels was the huge number of fairy rings in the turf. The rains of Irene not only brought flooding, but also stimulated a massive bloom of fungal fruiting bodies. Most of what I saw were type 2 fairy rings - those that cause stimulated rings of turfgrass and produce mushrooms, but do little damage to the grass. Everywhere I looked I saw massive rings or ribbons of slightly greener grass pock-marked with large white mushrooms or puffballs. It is easy to see why someone from the middle ages would attribute the presence of these things to some metaphysical phenomenon! Speaking of metaphysics, please don’t eat wild mushrooms. I remember clearly a laboratory client, who in an attempt to reach a higher level of consciousness ate a large white fairy ring fungus, Lepiota, and wound up with severe gastrointestinal distress. The guy brought the mushroom to the laboratory for identification because he lacked medical insurance. Proper identification of a mushroom is in the realm of an educated guess rather than one with a high degree of certainty. We figured it was a Lepiota and thought he wouldn’t die (he thought he was in the process), but sent him to the emergency room none-the-less. And that’s the point, trained mycologists are never certain about the identity of most wild mushrooms, so a laymen has almost no chance of a proper identification. The risks of sickness and death are real, and I know there are naturalists and outdoors folks who would disagree, but we never recommend picking and eating a wild mushroom. Why risk it when Wegmans has 18 different types of “wild” mushrooms for sale in the produce department?

Plant Diagnostic Laboratory Highlights
Richard J. Buckley, Laboratory Coordinator

Turf

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We also got a sample of fairy ring in the laboratory. The sample came from a turf manager in southeast Pennsylvania who manages bentgrass tennis courts. His fairy ring was a type 1 fairy ring. Type 1 rings are those associated with turf death. One of the ways type 1 fungi kill turf is by creating hydrophobic conditions in the root zone of a turf stand. The grass in the dry spots subsequently wilts and dies. Hard to believe in this weather, but photos of the tennis courts indicated rather large rings of thin turf in the midst of several isolated dry spots. Fairy ring control for the type 1 ring centers on preventing the dry spots with wetting agents and surfactants. Management of a type 2 ring is focused on masking the ring with a little nitrogen or iron. Rake or mow off the ‘shrooms, but please don’t eat them!

Lastly, be aware that even temporary periods of flooding will cause turf to yellow and thin. Also those of you on the coast should not count out salt damage in evaluating poor performing turf areas post tropical storm.

**Landscape**

Samples of landscape plants always seem to pick up at this time of year. Again, submissions are slow in the post-Irene clean up. Lots of transplant failures have been submitted, particularly arborvitae that were replacements for trees killed in 2010. We’ve seen some poorly performing hemlocks that were diagnosed with spider mite damage and/or elongate hemlock scale. Hemlocks don’t do well in the sun and wind, during heat and drought, nor with wet feet, so depending on location the trees have suffered accordingly. By the way, plenty of mushrooms in landscape beds too! A woman called the lab because her planting beds were loaded with stinkhorns and she was embarrassed for her neighbors. Guys, you’ve just got to ride this one out, they will shrivel up and go away as soon as the weather breaks.

**Greenhouse and nursery**

The wet weather brought a severe outbreak of Phytophthora leaf and stem blight to a down state nursery grower. This facility suffered significant damage to Pieris and several other ericaceous species. Scorch-like leaf browning and twig dieback were the primary symptoms. If you manage similar plants in a production situation, it may be prudent to provide some fungicide intervention for Phytophthora to protect valuable plants during the remaining days of summer.
Diseases of Turfgrass
Bruce B. Clarke, Ph.D., Specialist in Turfgrass Pathology

General

Dollar spot, gray leaf spot, and crown rust are all active at this time. Most turf areas are starting to recover from anthracnose, brown patch and summer patch with the return to cool weather. Refer to past issues of this newsletter for additional information about the identification and control of these diseases.

Crown Rust

This disease is prevalent on perennial ryegrass lawns at this time. Affected turf prematurely yellows and orange pustules called uredia (reproductive structures) appear on the leaf blades. To control crown rust, maintain adequate fertility and soil moisture, and mow turf frequently to ensure that infested leaf tissue is cut off before uredia mature. Where infestations are severe and fungicides are required, apply Armada, Banner, Bayleton, chlorothalonil, Compass, Disarm, Eagle, Headway, Heritage, Insignia, mancozeb, Tartan, thiophanate-methyl, Tourney, Trinity, or Triton, per manufacturer’s recommendations. In most cases, adequate fertilization and frequent mowing is all that is required to keep this disease in check.

Gray Leaf Spot

We have seen outbreaks of Gray leaf spot recently on new perennial ryegrass seedings, particularly where people have used unimproved (susceptible) varieties. Extensive foliar blighting will continue as long as the daytime temperatures stay within the 70 to 85°F range and the nights do not fall below 60°F. Symptoms first appear as tiny, brown leaf and stem lesions within a 1 to 2 inch area. As gray leaf spot progresses, the leaves twist and curl into a “J-shape” and lesions may extend the entire width of the leaf blade. Affected areas will eventually coalesce into large patches (1 to 2 ft diameter) of blighted turf. The pathogen, Pyricularia oryzae, can produce abundant one to two celled, pear-shaped spores (conidia) during warm, moist weather. Newly established seedings (4-5 weeks post emergence) are more susceptible to infection than mature plantings, so be sure to use a mixture of perennial ryegrass Cultivars with improved resistance to gray leaf spot such as: 1G2, 1G2, All*Star 3, Apple GL, Charismatic II GLSR, Dart, Derby Xtreme, DP-1, Exacta II GLSR, Fiesta 4, GL-2, Harrier, Manhattan 5 GLR, Palace, Palmer IV, Palmer V, Panther GLS, Paragon GLR, Prelude GLS, Primary, Protégé GLR, Regal 5, Repell GLS, Revenge GLX, Secretariat II GLSR, SR 4600 and Stellar GL. Refer to www.turf.rutgers.edu (the research section) for a detailed gray leaf spot fact sheet and other Rutgers Cooperative Extension Publications. To control current infections, avoid high rates of nitrogen (i.e., do not apply more than 0.25 lb of water soluble N per 1,000 sq ft at one time) and avoid extended periods of leaf wetness (i.e., do not water between 6 PM and midnight), and spray affected areas with a good gray leaf spot fungicide. Armada, Compass, ConSyst, Disarm, Headway, Heritage, Insignia, Spectro, Tartan, and thiophanate-methyl are most effective when applied on a preventive basis every 14 to 28 days from mid-July to late-September. Chlorothalonil (e.g., Daconil) and the DMI (sterol-inhibiting) fungicides (e.g., Banner or Bayleton) may provide effective control when disease pressure is moderate. Isolates of P. oryzae resistant to the QoI (Strobilurin) fungicides and strains with reduced sensitivity to the DMI’s have been reported in New Jersey, so alternate or tank mix with different fungicide chemistries whenever possible to reduce the potential for fungicide resistance.

Turfgrass Expo

This year’s Turfgrass Expo will be held at the Trump Taj Mahal Casino/Resort on December 6-8, 2011. This is a great opportunity to receive the latest turf management information from nationally renowned speakers. For additional information, please contact Cece Peabody (973) 812-6467, e-mail execdirector@njturfgrass.org or Anne Diglio (732) 932-9400 ext. 339, e-mail diglio@aesop.rutgers.edu.
The Relationship of Plant Stress to Plant Disease
Ann B. Gould, Ph.D., Specialist in Plant Pathology

Recent weather extremes in New Jersey placed undue stress on materials planted in the landscape. Environmental factors have a direct impact on the ability of plants to cope with disease organisms. How does this occur?

The pathogen-host relationship

A plant disease is really a relationship, or “dance,” between a host plant and an organism that causes disease. Genes in both the pathogen and the host determine whether or not the microorganism becomes pathogenic to a particular plant. These genes also determine how a given host reacts to a given microorganism. These reactions are called immunity, susceptibility, and resistance. Plants can defend themselves in many different ways, and these mechanisms may be in place before the pathogen attacks (constitutive defense) or may be “turned on” afterward (induced defense) (Table 1).

Most species of higher plants are immune to the vast majority of microbes with which they come in contact. This type of immunity is called “non-host” because the pathogen does not recognize the plant as a source of food. In susceptible and resistant relationships, however, the pathogenic organism does recognize the plant as a food source. During the attack process, the pathogen excretes enzymes and toxins which start to degrade plant cell walls. Small molecules released as a result of this early infection serve as “signals” to both the pathogen and the host plant: the pathogen produces more enzymes and toxins, and the host plant may or may not respond by turning on its host defense response.

Impact of the environment

The plant-pathogen “dance” is strongly influenced by the environment. Environmental conditions can either promote or interfere with the entry process (or invasion) of a microorganism into plant tissues. Environmental conditions can also impact the well-being of host itself.

Since plant defense is a biological process, the stress from the environment can affect the manner in which a host plant reacts to a given disease agent.

Many environmental factors serve to predispose a

See Plant Stress and Disease on page 5

Table 1. How plants defend themselves.

<table>
<thead>
<tr>
<th>I. Constitutive (passive) plant defenses</th>
</tr>
</thead>
<tbody>
<tr>
<td>✦ Structural</td>
</tr>
<tr>
<td>❖ bark</td>
</tr>
<tr>
<td>❖ bud scales</td>
</tr>
<tr>
<td>❖ collenchyma/sclerenchyma (protect vascular bundles)</td>
</tr>
<tr>
<td>❖ defense trichomes (hairs)</td>
</tr>
<tr>
<td>❖ position, size, and shape of stomata on lower leaf surface</td>
</tr>
<tr>
<td>❖ the suberized outer layers of bulbs, corms, and tubers</td>
</tr>
<tr>
<td>❖ waxy cuticle</td>
</tr>
<tr>
<td>❖ suberin (similar to waxy cuticle) on primary roots (however, root hairs and root apical meristems are extremely vulnerable to attack)</td>
</tr>
<tr>
<td>✦ Chemical (these are secondary metabolites, which are not necessary for growth of the plant)</td>
</tr>
<tr>
<td>❖ cyanogenic glucosides (cyanide bound to sugar molecules)</td>
</tr>
<tr>
<td>❖ phenolic glucosides (phenols bound to sugar molecules)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>II. Induced (active) plant defenses</th>
</tr>
</thead>
<tbody>
<tr>
<td>✦ Structural</td>
</tr>
<tr>
<td>❖ abscission layers (infected portions of leaves drop out and block further invasion of the pathogen)</td>
</tr>
<tr>
<td>❖ cork layers (block further invasion of the pathogen)</td>
</tr>
<tr>
<td>❖ gums or resins (create barriers against invading pathogens in wounds or vascular tissue)</td>
</tr>
<tr>
<td>❖ papillae of callose (thickenings that prevent entry of a pathogen into a cell)</td>
</tr>
<tr>
<td>❖ thickening or lignification of cell walls</td>
</tr>
<tr>
<td>❖ tyloses</td>
</tr>
<tr>
<td>✦ Chemical</td>
</tr>
<tr>
<td>❖ pathogenesis-related (PR) proteins (enzymes and other proteins produced as defense compounds)</td>
</tr>
<tr>
<td>❖ phytoalexins (defense compounds toxic specifically to the pathogens of the host plant)</td>
</tr>
</tbody>
</table>
plant to disease. **Predisposition** is defined as the tendency of external, non-genetic factors (such as the environment), acting prior to infection, to affect the susceptibility or resistance of a plant to a disease agent.

So what are the most common environmental factors that predispose plants to disease? The list includes drought, excess moisture, temperature extremes, nutrient imbalance, wounding, and chemicals such as weed killers and pollutants.

**Temperature.** Plants grow best from 1 to 40°C (optimum at 15 to 30°C). This optimum varies with plant species, stage of growth and plant part. It is very common for plants to be exposed to temperatures outside their normal range. Low temperature stress (freezing or chilling) interferes with cellular processes and can cause frost damage. Fluctuation in temperature can impact plant acclimation to cold temperatures. High temperature stress, which most often occurs in an artificial environment, affects the action of enzymes and can denature proteins.

**Moisture.** Both insufficient moisture and excess moisture can harm plants. Drought stress occurs when water loss from the leaves exceeds water uptake in the roots. This stress is the most damaging to plants and is responsible for more plant troubles than any other environmental factor. Drought can do both short-term and long-term damage to plants by reducing photosynthesis, shrinking tissues, impacting water transport (which results in wilt and scorch), and impairing root function. In the long-term, plants stressed by drought are predisposed to attack by many organisms that cause plant disease. Drought stress combined with temperature stress can cause summer drying or winter burn.

When excessive soil moisture occurs in the root zone, oxygen is reduced in soil pores. Fibrous roots die-off, which leads to symptoms of water stress. Such roots are invaded by pathogens in soil. In addition, populations of anaerobic organisms increase in soil, which leads to a buildup of toxins (organic acids, methane, and alcohols). Denitrifying bacteria convert nitrates in soil to $N_2$, causing nitrogen deficiency in plants.

**Wounding, mechanical injury, and human activities** can impact plant growth and predispose plants to disease. Many opportunistic organisms, such as those that cause cankers in plants, require wounds to invade plant tissues. Human activities, such as poor planting practices as well as improper placement are all predisposing factors for plant disease.

**Nutrients.** All plants require 20 essential nutrients for growth and reproduction. $C$ and $O_2$ are supplied in the air, the rest are supplied in water or in soil. **Macronutrients** ($N, P, K, Ca, Mg, S$) are required in large quantities as part of plant structure or in regulatory functions. **Micronutrients** ($B, Cl, Cu, Fe, Mn, Mo, Zn$) are required in small quantities as part of plant structure or in enzyme complexes. Symptoms due to extremes in soil nutrients depend on the functions of a particular element within a plant. Extremes in nitrogen predispose plants to many diseases.

**Chemicals.** These include pollutants (ozone, sulfur dioxide, nitrogen oxide, fluoride, or ethylene), herbicides, salts, and other agricultural or household compounds.
Fall Continuing Education Course Offerings

The Rutgers NJAES Office of Continuing Professional Education develops programs to meet the educational demands of New Jersey's professionals and communities. Topic areas include management of golf turf, landscape and grounds, parks and athletic fields, and public grounds and public works. Some courses of interest:

Emergency Pesticide Recertification Seminar
October 20, 2011. 9:00 am - 3:45 pm
$245 before 10/06/11; $275 after

You can take this one-day class to earn last-minute pesticide credits in CORE, 3A and 3B before New Jersey's Oct. 31st deadline. With handheld remote controls, you and your classmates will help set the pace, direction and content of the day.

You’ll learn and you’ll earn:
- identification and control of diseases, insects and weeds
- updates on pesticide safety regulations from the NJDEP
- 2 credits in 3A
- 6 credits in 3B & PP2
- 3 credits in 6B
- 3 credits in CORE

Emergency Pesticide 1/2 Day Classes in 3A & 3B
October 26, 2011
9:00 am - noon for 3A credits
1:00 - 4:00 pm for 3B credits
$175 before 10/12/11; $195 after; or take both sessions for $295

These two three-hour classes provide more 3A and 3B credits in time for the license renewal deadline in New Jersey. You will earn six 3A credits in the morning session and six 3B credits in the afternoon session. Join us for a pizza lunch and pest trivia games if you are attending both sessions.

Introduction to Plant Identification
November 10 and 11, 2011. 9:00 am - 3:30 pm
$395 before 10/27/11; $445 after

In this two-day course, Ted Szczawinski shares his easy-to-remember tips to identify ornamental plants and remember their Latin names. With fun, informative, hands-on activities, Ted helps you naturally understand how plants are grouped, identified, and nurtured. You’ll learn how to use a Dichotomous Key and more. Ted will cover these plant identification topics and more:
- Deciphering the Classification System (Kingdom, Phylum, etc.)
- The Binomial System (Genus, Species, Cultivars, and Varieties)
- Deciduous Plants: (Young, Established, and Mature)
- Conifers and Evergreens

Hazardous Tree Identification
November 29, 2011. 9:00 am - 3:30 pm
$245 before 11/15/11; $275 after

Hazardous trees pose a double danger and legal liability. They are tough to recognize and they can be costly - even deadly - if not managed before an avoidable accident happens. In this one-day course, Certified Tree Experts Ted Szczawinski and Steve Chisholm walk you through the step-by-step process of identifying a hazard, dealing with the hazard, and properly documenting your findings and any work performed. The class will include hands-on field instruction and provide a better understanding of key concepts, including the tree rating system. CPWM, ISA, and Community Forestry credits are available. Please call 732-932-9271 x625 for updated credit information.

For more course offerings, see the Rutgers Office of Continuing Professional Education website at: http://www.cpe.rutgers.edu.

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Laundry List from page 5

- Launder pesticide contaminated clothing the same day to avoid having it sit around where family members could come into contact with it.
- Wash contaminated clothing separately from the rest of the family laundry.
- Use hot water.
- Use heavy-duty liquid detergent to remove oil-based pesticides. (Emulsifiable concentrates are oil-based.)
- Do not overfill the washing machine. Wash only a few garments at a time.
- Double rinse the load.
- Re-wash the contaminated clothing two or three times if necessary.
- Clean the machine after you wash the load by running one complete cycle on empty, using hot water and detergent.
- Line-dry the clothing to avoid contaminating the clothes dryer.
Weekly Weather Summary
Keith Arnesen, Ph.D., Agricultural Meteorologist

Note: Some data continues missing as a combined result of Hurricane Irene and the recent Verizon strike.

Temperatures averaged above normal, averaging 70 degrees North, 71 degrees central, and 71 degrees south. Extremes were 88 degrees at Freehold on the 27th and 51 degrees at Belvidere on the 31st. Weekly rainfall averaged 0.07 inches north, 0.00 inches Central, and 0.00 inches south. The heaviest 24 hour total reported was 0.28 inches at Belvidere on the 4th to 5th. Estimated soil moisture, in percent of field capacity, this past week averaged 89 percent north, 81 percent central and 77 percent south. Four inch soil temperatures averaged 67 degrees north, 73 degrees central and 74 degrees south.

<table>
<thead>
<tr>
<th>WEATHER STATIONS</th>
<th>RAINFALL WEEK TOTAL DEP MX MN AVG DEP</th>
<th>TEMPERATURE</th>
<th>GDD BASE50 TOT DEP</th>
<th>MON %FC</th>
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</thead>
<tbody>
<tr>
<td>BELVIDERE BRIDGE</td>
<td>.28 36.53 11.45 82 51 69. 3 2301 29 83</td>
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<tr>
<td>CANOE BROOK</td>
<td>.00 40.84 14.55 85 54 72. 5 2783 491 79</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHARLOTTEBURG</td>
<td>MISSING</td>
<td></td>
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<td></td>
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<tr>
<td>FLEMINGTON</td>
<td>00 35.61 10.34 85 52 71. 4 2743 391 85</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NEWTON</td>
<td>00 42.17 17.65 82 52 68. 4 2624 553 80</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>FREEHOLD</td>
<td>00 41.46 16.83 88 55 71. 3 3030 545 76</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>LONG BRANCH</td>
<td>00 43.33 18.35 84 51 69. 0 2806 379 63</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NEW BRUNSWICK</td>
<td>00 39.15 14.24 87 54 72. 2 3041 422 83</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOMS RIVER</td>
<td>00 26.95 1.44 85 55 71. 1 2856 440 55</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRENTON</td>
<td>00 35.25 11.63 87 56 72. 2 3316 600 61</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAPE MAY COURT HOUSE</td>
<td>MISSING</td>
<td></td>
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<tr>
<td>DOWNTOWN</td>
<td>00 26.79 3.49 86 54 70. 0 2704 -18 66</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HAMMONTON</td>
<td>MISSING</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>POMONA</td>
<td>00 28.83 6.46 85 56 70. 2 3321 800 60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SEABROOK</td>
<td>00 42.85 20.55 86 58 73. 3 3399 662 58</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Belvidere appears to be having extreme thermometer problems. Temperatures are way too low. Problem fixed as of July 14th, but earlier bad numbers have affected cumulative values for temperature.
** SOUTH HARRISON RAIN GAUGE HAS BEEN DOWN FOR NUMEROUS WEEKS.
*** CAPE MAY COURTHOUSE IS BACK WITH DATA AFTER SEVERAL MONTHS, BUT CUMULATIVE VALUES WILL BE WAY OFF.

WES KLINE -- GDD BASE 40 PINEY HOLLOW
LAST WEEK M (ENDING 8/15/11)
THIS WEEK M (Ending 8/22/11)
Pesticide User Responsibility: Use pesticides safely and follow instructions on labels. The pesticide user is responsible for proper use, storage and disposal, residues on crops, and damage caused by drift. For specific labels, special local-needs label 24(c) registration, or section 18 exemption, contact RCE in your County.

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