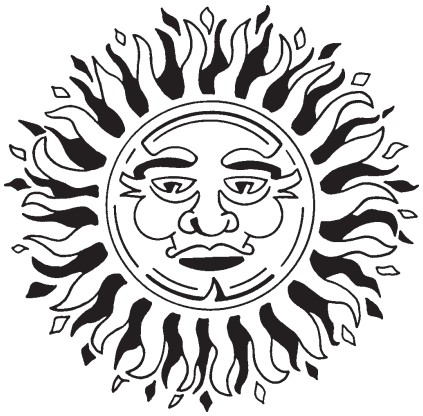
RUTGERS COOPERATIVE EXTENSION AT THE NEW JERSEY AGRICULTURAL EXPERIMENT STATION

PLANT & PEST ADVISORY

LANDSCAPE, NURSERY & TURF EDITION $1.50 AUGUST 27, 1998



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Drought Stress in Ornamental Trees and Shrubs

Ann B. Gould, Ph.D., Plant Pathology

Recent dry weather has resulted in noticeable injury to trees and shrubs throughout the state, particularly to newly planted, younger, or shallow-rooted trees. Plants affected by drought stress lose foliage, grow slowly, and become more susceptible to attack by insects and diseases (Table 1) and to injury by severe winter weather. It can take 5 to 10 years for a plant to recover from the effects of a severe drought.

Causes

Native plants in a given area are adapted to variations in water supply and show symptoms of drought stress only under unusually dry conditions. Planted trees and shrubs, however, can be more susceptible to water deficit.

Water deficit is a normal phenomenon that occurs in plants during the daytime when loss of water from the leaves exceeds water uptake in the roots. This deficit is made up at night and during periods of rain or dew formation. Under dry soil conditions, however, roots fail to extract as much water as has been lost, and physiological stress develops. Under severe drought stress, tissues lose moisture, degenerate, and die.

Water deficit may also occur in dormant plants (especially evergreens) during warm weather in winter or early spring when water evaporates from leaves and stems while the soil is cold or frozen. Roots extract insufficient water from cold soil and none from frozen soil. This is called winter desiccation. Drought stress also predisposes plants to sun scald, frost cracks, winter burn, and dieback.

Plants vary in ability to tolerate moisture stress. Trees such as burning bush, dogwood, hemlock, and Japanese maple can be particularly affected by drought. A number of species tolerant of stress are listed in Table 2. Seedlings are very susceptible to drought stress because their root systems are shallow and undeveloped. Newly transplanted trees are similarly affected because they have lost many absorbing roots during the transplant process. In some situations, highly porous rooting media present within the root ball dries rapidly, so that water shortage occurs even though surrounding soil may contain sufficient water. Mature trees are at risk in poor quality or shallow soils.

Symptoms

Plants affected by drought cope with the stress in various ways.

SEE DROUGHT STRESS ON PAGE 2

DROUGHT STRESS FROM PAGE 1

Stomates may close to prevent moisture loss from leaves; photosynthesis may slow or cease, resulting in the development of yellow leaf color. Green leaves, stems, roots, and fruit may shrink; shrunken sapwood may develop radial cracks. Roots in drying soil become less permeable to water, and root tips may be damaged.

Leaves on drought-stressed plant material may droop, wilt, curl, turn yellow, turn brown at the tips and margins, or drop prematurely. Older leaves usually succumb first. Severe water deficit in pines causes needles to lose moisture and droop near the needle base. Needles then fade and turn brown or remain green and permanently bent. Symptoms may not appear until a year or more after trees have been stressed by drought. Dead tree tops, shortened needles, and sparse foliage indicate a general decline in vigor that becomes evident in the years following severe drought stress.

Management

● Control weeds and grasses in and around stock to reduce competition for water during dry periods.

● If drought persists, irrigate to replace soil moisture in the root zone. This is especially important for young, newly transplanted, or shallow rooted trees, such as dogwoods.

● Remove all dead trees as soon as possible; they may harbor bark beetles.

● Do not plant shallow-rooted species in areas of low rainfall or on drought-prone sites.

● To increase moisture retention in dry, sandy, or gravely soils, add organic matter when planting. Application of mulch (no more than 3 inches) reduces soil moisture loss and soil temperature. Remove weeds from site before planting.

● To help alleviate winter injury, make sure plants go into the cold winter months with adequate soil moisture.

● Inspect stressed trees of all ages for injury by invading pests during and after periods of drought.

Table 1. Diseases and insects common on plants stressed by drought.

PEST
Armillaria root rot
Borers on birch, oak, and dogwood
Cankers:
Botryosphaeria canker (all trees, especially rhododendron and redbud)
Cytospora canker (*Prunus*, poplar, willow, maple, and spruce and other conifers)
Hypoxylon canker (oak)
Nectria canker (hardwoods)
Thyronectria canker (honeylocust)
Diplodia shoot blight and canker (Austrian pine)
Dogwood anthracnose
Pine wilt nematode
Verticillium wilt on maples

Table 2. Stress tolerant trees and shrubs.

TREES AND SHRUBS		CONIFERS
Amur cork tree	Glossy abelia	Adams needle
Amur privet	Golden raintree	Atlas cedar
Amur maple	Hackberry	Concolor fir
Anthony water spirea	Holly (American, Japanese)	Dense yew
Ash (green, white)	Ironwood	Douglas fir
Barberry (Japanese, Wintergreen)	Japanese pagoda-tree	Eastern red cedar
Bayberry	Japanese tree lilac	Pfitzer juniper
Bearberry	Japanese zelkova	Pine (Japanese white, Japanese black, mugo, Scotch, white)
Birch (gray)	Maple: Red, Tatarian, Trident	Shore juniper
Blackhaw viburnum	Mimosa	Spruce (Norway, Colorado, Colorado blue)
Bush cinquefoil	Oak (pin, red, scarlet, white)	White fir
Chaste tree	Saltspray rose	
Common witchhazel	Shadblow serviceberry	
Crabapple (*Malus* sp., tea, Zumi, Katherine)	Turkish filbert	
Ginkgo		

Sources for Table 2: Hort Notes, University of MA Extension, Landscaping for Water Conservation, T. Shelton and B. Hamilton, Rutgers University

Turf Selection, Establishment and Pest Management Update for Professionals

September 16, 1998 (rain date: Sept. 22nd)
9:00 a.m. - 12:00 noon
Rutgers Cooperative Extension of Camden County, 152 Ohio Ave., Clementon, NJ

Topics:

- Selection of pest tolerant turf and successful establishment
- 1998 pest update and field diagnosis of diseases and weeds
- Observe low maintenance turf research trials

Pesticide recertification credits will be offered. Cost is $10.00 (includes break refreshments and handouts).

For preregistration information call Pat Gray at RCE of Camden County at (609) 566-2907.

Plant Diagnostic Lab Highlights

Richard Buckley, Coordinator, Plant Diagnostic Laboratory

Turfgrass

As the summer wears on, **Anthracnose** continues to be a problem for many golf turf managers. Both the **foliar blight** and the **basal crown rot** phases of the disease have been diagnosed. The disease was identified on several samples sent this period from golf courses in New York City and the surrounding counties. **Brown patch** is also still active at this time with many samples of golf and landscape turf being submitted from Hunterdon, Bergen, Morris, and Ocean Counties, as well as from New York and Pennsylvania.

The big story this week is the emergence of **gray leaf spot**, caused by the fungus *Pyricularia grisea*. This disease has become more common over the past several seasons and can be quite devastating to perennial ryegrass fairways. Earlier in the season, anxiety over the disease resulted in several diagnoses of **leaf spot**, caused by species of *Bipolaris* and *Drechslera*. As those of you who attended the recent Rutgers Turfgrass Field Days can attest to, it takes special conditions for **gray leaf spot** to occur. This disease is poorly understood at this time, but it appears that heat and drought stress are necessary to weaken the grass, and high humidity and cooler night temperatures are needed to stimulate the fungus for the disease to occur. The infection period in our area seems to begin in mid-August and lasts through September. Closely watch your ryegrass for disease symptoms. Gray leaf spots with dark borders may be evident along leaf edges. Often individual leaves twist and discolor like they are drought stressed. Ultimately this leads to a rapid thinning of the turf area. Taller cut turf is most susceptible, so don't ignore rough areas and landscape turf.

Landscape and Nursery

Root and crown rots continue to cause problems in nurseries and urban landscapes at this time. **Phytophthora root and crown rot** was diagnosed on rhododendron and andromeda from Mercer County and on juniper from a Union County landscape. **Rhizoctonia root and crown rot** was a problem for gardeners in Cape May and Bergen Counties. Vinca was the host of the *Rhizoctonia* with these samples. **Pythium root rot** caused problems for a daisy grower in Monmouth County. Several samples of white pine were submitted to the laboratory with **pine bark beetle** infestations. **Pine bark beetles** normally attack trees that have been stressed in some manner. Transplant stress, environmental extremes, or site-related problems are always implicated as predisposing factors for beetle attack. **Oak leaf scorch**, caused by the bacterium *Xylella fastidiosa*, was confirmed in samples of oak from Burlington County. Several other samples from southern and central counties are currently in the laboratory with suspect symptoms. ❑

Diseases of Turfgrass

Bruce B. Clarke, Ph.D., Turfgrass Pathology

General

Fairy ring, summer patch, **rust**, and **yellow ring** are quite apparent on turf throughout the State. **Dollar spot** and **red thread** have also intensified on golf and landscape turf during the past few weeks. Symptoms associated with **brown patch** and **pythium blight** have not subsided yet due to the continued hot, humid weather. Please refer to recent issues of this newsletter for complete disease control information.

Gray Leaf Spot

Gray leaf spot has been identified on perennial ryegrass samples from New Jersey and Southeastern Pennsylvania. This disease devastated perennial ryegrass and tall fescue plantings throughout the Mid-Atlantic states during the late-summer and early fall months in 1995. Due to similar environmental conditions this year, we may see a resurgence of this disease during the next few weeks. Symptoms start as tiny, brown leaf and stem lesions that enlarge into oblong spots. In severe cases, the leaves curl and lesions may extend the entire width of the blade. Extensive foliar blighting can occur during warm (75-85°F), wet weather. Newly established seedlings are more susceptible to infection than mature plantings. When conditions are conducive to infection, the causal agent (*Pyricularia grisea*) produces abundant one to two-celled, pear-shaped spores (conidia). For best results, avoid over-fertilization and extended periods of leaf wetness (i.e. water in the early morning hours). Fungicide efficacy studies conducted in Georgia, Maryland, and Kentucky have shown that Heritage (0.2 to 0.4 oz/1000 ft^2) and Cleary 3336 50W (6 to 8 oz/1000 ft^2) were most effective when applied on a preventive basis every 14 to 21 days beginning in mid to late-July. DMI (sterol-inhibiting) fungicides, such as Banner, have also provided effective control in most studies.

Stem and Crown Rust

These diseases are very evident on susceptible Kentucky bluegrass and perennial ryegrass cultivars, respectively, at this time. As **rust** intensifies, turf prematurely yellows and orange pustules called uredia (reproductive structures) appear on affected blades. To control both stem and crown rust, maintain adequate fertility and apply Banner, Bayleton, Daconil, Eagle, mancozeb, Manicure, Sentinel, or Thalonil per manufacturer's recommendations. ❑

Nematodes and Merit: Perfect Together

Edited by Deborah Smith-Fiola, Ocean County Agricultural Agent

The use of beneficial entomopathogenic nematodes for management of white grubs in turfgrass is an IPM biological control strategy, yet results have been inconsistent. Beneficial nematodes are live animals with environmental restrictions on the label, which limits their ease of commercial use. Different species of these nematodes are adapted to kill soil-dwelling pests at different levels in the soil. Thus, the choice of the best nematode for the job is crucial to management success. On top of this, beneficial nematode suppliers have not met the demand, resulting in the majority of nematodes on the market supplied by mail-order insectuaries.

Chemical insecticides remain the #1 choice of turfgrass managers for grub control, particularly because of the availability and excellent control obtained with imidacloprid (Merit). Merit has low vertebrate toxicity, low application rates, long systemic persistence in plants combined with relatively fast soil degradation. However, Merit has one major limitation: its killing action dramatically declines as grubs get larger. It does a great job on the first stage (first instar) of newly hatched grubs. The third and last grub stage (instar), which is the one causing the majority of visible turf damage, on the other hand, is *extremely* resistant. Even when exposed to the recommended rates of Merit, the majority of the third stage grubs survive.

Japanese beetle and masked chafer adults have the habit of feeding and laying eggs throughout the summer months, so at any one time in any turf area, a variety of different sized grubs - from newly hatched to mature - may be present. To use Merit preventatively, the entire lawn area is usually treated, which is expensive and some areas may be treated unnecessarily if no grubs are present. Merit also cannot be used as a spot treatment in IPM programs once summer grubs are noticed, because of the lag time required for control.

Researchers in California noted that Merit has been used to enhance the entomopathogenic fungi *Metarhizium anisopliae* and *Beauveria bassiana* in controlling various insects. Could it act to stress the late stage grubs enough to increase their susceptibility to beneficial nematodes?

Late stage masked chafer grubs were collected from a golf course and brought into the laboratory and the greenhouse in 1 liter pots of perennial ryegrass. Merit was applied either immediately or 2 weeks after grubs established at rates of 200, 100, 50, 25, or 0 grams (a.i.)/ha (the recommended rate is 400 g/ha) along with combinations of *Heterohabditis bacteriophora* (the H.b. nematode) for each rate, as well as a nematode alone and control treatment. All treatments had 4-5 replicates. In the lab experiment, Merit + nematodes were tank mixed and applied together. Samples were dissected after 4 days.

Results showed that in *all* combination treatments of nematodes and Merit, grub death was higher than any other treatment alone or the untreated control. The most significant treatment was the H.b. application applied 2 weeks after the Merit: in rates of 100 g[a.i.]/A or more, over 95% control was achieved. Even at the 50 g[a.i.]/A rate, 90% control was achieved. Neither Merit alone nor the nematodes alone had any significant effect on the 3rd stage grubs.

When the nematodes and Merit were applied simultaneously and analyzed 2 weeks later, control ranged between 76% and 83%, suggesting significant synergistic effects between the two products applied together. Grub mortality was significantly higher in the combination treatments than in the single treatments alone or the untreated control. The tank mixture of Merit + nematodes was agitated together for 24 hours, and showed that nematodes were not significantly affected by the insecticide.

How could this nematode:Merit combination be used practically? It could be applied as a curative control against large, late stage grubs. This is feasible for low maintenance turf in residential or commercial sites, or where the grub population has fed unnoticed until damage is apparent. If Merit had been applied earlier in the year and enough grubs survived the preventative treatment, a combination treatment would be feasible since damage would occur. In this case, the nematodes could also reduce any potential resistance development of the surviving grubs through elimination of surviving grubs that become less susceptible to Merit. Because of its long persistence in the soil, Merit may still interact with nematodes applied at a later time. Additionally, the synergistic action between nematodes and Merit may be attained using lower rates of Merit than the recommended field rate of 400 g[a.i.]/A. Lower rates improve the economic feasibility of this approach and could also reduce any potential negative effects of Merit on beneficial organisms. There is no evidence of pest insects becoming resistant to beneficial nematodes.

This study may expand the use of beneficial nematodes because of this synergism with a common insecticide. Additionally, grub species currently thought to be relatively resistant to nematode infection (such as May or June beetles) may be managed by this method.

(Ref: Koppenhofer and Kaya, J.Econ. Entm 91:3, 1998)

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Note: This will be the last biweekly issue for the '98 season. The remaining issues will be monthly from Sept. - Nov.

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