RUTGERS COOPERATIVE RESEARCH & EXTENSION AT THE NEW JERSEY AGRICULTURAL EXPERIMENT STATION

PLANT & PEST ADVISORY

LANDSCAPE, NURSERY & TURF EDITION $1.50 AUGUST 24, 2006

INSIDE

Biological Control of White Grubs in Turfgrass

Albrecht M. Koppenhöfer, Ph.D., Specialist in Turfgrass Entomology

Healthy lawns that are not regularly broadcast-treated with broad-spectrum insecticides contain a plethora of organisms that parasitize or prey on or parasitize turfgrass insect pests and thereby reduce the frequency and severity of pest outbreaks. **Predators** of white grubs include ground beetles, rove beetles, ants, and other beneficial insects which prey on eggs and young grubs. Among these, ants are probably the most effective predators of white grub eggs as shown in several studies. Various **parasitoids** or parasitic wasps (e.g., *Tiphia* and *Scolia* species) and flies parasitize the older grubs or the adults (tachinid fly *Istocheta aldrichi*). In addition there are numerous organisms that cause weakening or fatal diseases of white grubs and other turfgrass insect pest including entomopathogenic nematodes, fungi, bacteria, and protozoans. Most of these natural enemies are not commercially available (except some of the microorganisms discussed below).

Conserving natural enemies is the most practical form of biological control in turfgrass. The Most effective way of conserving them is to applying insecticides only when and where necessary and using insecticides with a reduced impact on these natural enemies (biological and biorational control agents). Neonicotinoids (Merit, Arena) and insect growth regulators (halofenozide) have a much smaller and more transient effect on these predators, but their use should also be restricted to high-risk areas as their indiscriminate broadcast use is likely to reduce natural enemies by depriving them of prey or hosts.

Proper timing of insecticide applications can help reduce negative effects on natural enemies during critical periods. Applications of imidacloprid during May can reduce parasitism of Japanese beetle larvae by the spring-active parasitic wasp *Tiphia vernalis*. If applications are withheld until June or July the wasp can be conserved in nearby untreated areas. Habitat modifications can increase the densities of some natural enemies. Raising mowing heights where possible may provide refuges for predators as observed for black turfgrass ataenius natural enemies. Providing nectar sources (various flowering plants) for the adult wasps near areas with a history of white grub infestation should encourage their parasitic activity.

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Insect-pathogenic (entomopathogenic) fungi produce spores that attach to the cuticle of an insect host. The spores germinate under adequate (high humidity) conditions and their germination tube penetrates through the cuticle into the host's body cavity. The fungus grows in the body cavity and produces toxins that kill the insect. After consuming the host's body, the fungus' mycelium produces new spores on the host's body surface. A product based on the fungus *Beauveria bassiana* (Naturalis-H&G) is available for turf insect control and also has white grubs on the label. However, application of fungus-based products against white grubs is unlikely to be effective because the fungal spores do not move on their own and are difficult to irrigate through the thatch and soil to the feeding-zone of the grubs. These pathogens may be effective only if the material can be worked into the soil.

BT (*Bacillus thuringiensis*) is a naturally-occurring soil bacterium that during spore formation produces a parasporal body containing crystallized insecticidal proteins. If the spore is ingested by a susceptible host, the host's gut enzyme activates the toxin that binds to specific receptors on the host's midgut epithelium, causing death by gut paralysis or septicemia. Presently no BT-based products are available that are effective against white grubs. In the 1990s a novel isolate, *B. thuringiensis* subspecies *japonensis* Buibui strain, showed promise against several white grub species in the USA including Japanese beetle and oriental beetle. However, due to competition from new reduced-risk synthetic insecticides and problems with formulation, the product has not been made available. New strains of BT are presently being tested and show some promise for white grub management. However, before any BT product can be successful, a better way of delivering an effective dose into the root-zone needs to be developed.

Milky disease is a fatal disease of white grubs caused by the spore-forming bacterium *Paenibacillus popilliae*. Many different species of white grubs are affected by milky disease, however, each by a different strain that is specific to that grub species. The milky disease spores occur naturally in the soil where they remain viable for many years. The infection process is started when spores are ingested along with soil as white grubs feed on plant roots. The spores germinate in the grub's midgut, and the bacteria penetrate through the midgut wall into the grub's body cavity, where they multiply and eventually sporulate. The high concentration of spores during the final stages of infection gives the grub's body fluid the milky-white color. When the infected grub dies, typically after several weeks or even months, several billion spores may be released into the soil from the disintegrating cadaver.

The only product presently available is Milky Spore (St. Gabriel Laboratories). The formulation is made by grinding diseased Japanese beetle grubs and mixing with talc. Products made from infected grubs are expensive because the grubs have to be field-collected and infected in the laboratory. The formulation is applied by placing a level teaspoonful every 4 ft in a grid pattern (10 lb/acre). The spores are leached into the root-zone with irrigation and rainwater. Only directly under the application spot, spore concentrations in the soil can be high enough to cause infections of Japanese beetle grubs feeding in that spot. The grub gets infected and dies, releasing billions of new spores into the soil. Under the right conditions the disease can thus spread through an entire lawn.

Optimal conditions for milky disease establishment comprise soil temperatures ³ 70°F for several months per year and high larval densities (³ 30/ft²). Under these conditions and over a period of 1-3 years, milky disease can establish and thereafter provide lasting control in a release site. However, overall results have been highly variable with no dose response and a generally weak pattern of establishment. Since the commercially available strain of milky disease is ineffective against white grubs other than the Japanese beetle, applicators who are interested in using milky disease products should first make sure that their grubs are actually Japanese beetle grubs.

Insect-pathogenic (entomopathogenic) nematodes are the most widely available and effective biocontrol agents in turfgrass. For information on nematodes look for my article 'Nematodes for Biological control of White Grubs' in the previous issue of this newsletter. For more details on white grub biology, sampling, and management check out my fact sheet *An Integrated Approach to Insect Management in Turfgrass: White Grubs* (FS1009) available on the web at: http://www.rcre.rutgers.edu/pubs/publication.asp?pid=FS1009 or through your county Rutgers Cooperative Extension office. ❑

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ning in late-July. Chlorothalonil (e.g., Daconil) and the DMI (sterol-inhibiting) fungicides such as propiconazole (e.g., Banner) may also provide effective control when disease pressure is moderate.

Yellow Tuft

This disease, caused by the fungus, *Sclerophthora macrospora*, is present on greens and irrigated landscape turf at this time. **Yellow tuft** (=Downy Mildew) occurs on almost all cool-season turfgrasses; however, it is usually only a serious problem on turf maintained at a low cutting height. Poorly drained or heavily irrigated sites are often associated with disease development. Infected turf appears stunted, off color (yellow to light green), and may exhibit slightly broadened leaf blades and dense clusters of shoots. Patches ranges in size from 0.25 to 1 inch in diameter for bentgrass and red fescue turfs, and 0.5 to 3 inches for bluegrass and perennial ryegrass areas. Tufts are easily removed from the soil due to the absence of adventitious roots. To control, improve drainage, avoid over watering, mow only when the grass is dry, apply iron sulfate to mask symptom expression, and spray turf with Chipco, Signature, Insignia, Prodigy, or Subdue MAXX, now and then next year on a preventive basis in late March to early June. ❑

Diseases of Turfgrass

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

General

Dollar spot has developed once again throughout the tri-state region with the return to cooler (i.e., below 90^{0}F) weather. Expect this disease to continue to be a problem through October. **Red thread**, **copper spot**, **summer patch**, and **anthracnose** are also active at this time. **Pythium** and **brown patch** can still be troublesome if the hot, humid weather returns, so maintain preventive sprays. Refer to recent issues of this newsletter for further disease control information.

Fairy Ring

This disease, caused by a group of fungi known as *basidiomycetes,* is visible on many golf greens and home lawns at this time. Symptoms typically appear as continuous or interrupted rings of dark-green turf. Mushrooms, which are often associated with fairy ring, usually develop in the spring and fall. Although fungicides are not effective against all species of the fungi that cause fairy ring, Prostar, Headway, Heritage and Insignia have provided good control in many university tests. For best results, maintain adequate soil moisture and fertility to mask symptom expression. Spike affected turf prior to irrigation and the application of fungicides to enhance water movement into the soil profile. The use of surfactants may enhance fungicide efficacy and aid in symptom suppression.

Gray Leaf Spot

Gray leaf spot, caused by the fungus *Pyricularia grisea,* has been reported in the region since mid-July. This disease has devastated several perennial ryegrass and tall fescue plantings throughout the Mid-Atlantic States in the past, and environmental conditions appear to be excellent for a major outbreak this summer. Symptoms start as tiny, brown leaf and stem lesions within a 3 to 4 inch patch. In severe cases, the leaves curl and lesions may extend the entire width of the blade. As the disease progresses, patches coalesce into large (one to two feet in diameter) areas of blighted turf. Extensive foliar blighting may occur during warm (i.e., 75-85^{0}F days and 60-75^o F nights), wet weather. Newly established seedlings are more susceptible to infection than mature plantings. When conditions are conducive to disease development, the pathogen produces abundant one to two-celled, pear-shaped spores (conidia). For best results, avoid high rates of nitrogen during July and August and extended periods of leaf wetness (i.e. water in the early morning hours). Armada, Compass, ConSyst, Headway, Heritage, Insignia, Spectro, Tartan, thiophanate-methyl, and Zyban are most effective when applied on a preventive basis every 14 to 28 days begin-

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Deer Fence Installation Demonstration Using Hi-Tensile Woven Wire

Tuesday, September 12, 2006
9 AM to 12:00 Noon
Rutgers NJAES Cream Ridge Research Farm
283 County Route 539, Cream Ridge, NJ 08514 (Monmouth County)

Landowners, landscapers, farmers, their employees and others who are considering installing their own deer fencing are invited to attend this free workshop. There are many alternative fencing options for landowners to construct for non-lethal exclusion of problem deer from their land. This brief workshop demonstrates hi-tensile woven wire wildlife exclusion fence as the strongest, longest lived, and most durable fencing method for farming operations. Topics covered include proper corner bracing, straight line bracing, safety, tensioning, entry points construction, necessary tools and hardware, post height and burial options, all directed to establishing a durable, effective, long-lived fence.

We will also demonstrate erecting a portable electric fencing option for seasonal protection of small fields. Fact Sheet information will be provided on other temporary and permanent fence alternatives.

For directions call Cream Ridge Research Farm at 609-758-7311.

Landowners are also invited to visit anytime our deer fencing methods demonstration site at the Rutgers NJAES Snyder Farm in Pittstown (Hunterdon County). It is a self-guided demonstration, with six fencing alternatives constructed for comparison and to view how they appear in a landscape. The fencing demonstration is located at the corner of Locust Grove Road and Pittstown Roads adjacent to the Rutgers NJAES Snyder Farm at 140 Locust Grove Road, Pittstown, NJ 08867. For directions, visit our website at: http://www.snyderfarm.rutgers.edu/. ❑

Plant Diagnostic Laboratory Highlights

Richard J. Buckley, Laboratory Coordinator

Turf

I don't know what else to say, so I will say it again - *Extremes in temperature and moisture hammer golf turf!* We had over 350 samples of dead putting greens since the Rutgers turfgrass field day on August 3rd. Several days of near 100°F temperatures in the region during late-July knocked off stands of *Poa annua* on an unprecedented scale. Everybody talked about last year being tough, but this summer might have been worse.

Disease samples were found among the golf course carnage. **Anthracnose**, **pythium blight** and **pythium root dysfunction**, **brown patch**, **summer patch**, **take all**, **dollar spot**, and **fairy ring** continued to be diagnosed on turf samples during the last two weeks. Samples were submitted from golf courses in Connecticut, Delaware, Illinois, Maryland, New York, Pennsylvania, and Virginia, as well as all New Jersey counties. Of particular note are the numbers of **summer patch** and **anthracnose** samples at this time. It appears that even if the grass survived the heat and heavy rain in July, all of that stress contributed to break downs in good cultural and chemical control programs.

At this point, it appears that budding **gray leaf spot** epidemics have been suppressed by the period of dry weather in August. There have been sporadic sightings of the disease in the Northeast, so be aware that the possibility for gray leaf spot epidemics exists for the next several weeks. If you choose to renovate or seed with perennial ryegrass during this time, be sure to pick varieties with gray leaf spot resistance. A blend of these newer varieties might be your best bet. On high value turf sites, I would also consider fungicide protection for the new seedlings. A strobilurin or thiophanate-methyl fungicide would provide adequate protection.

On home lawns, **summer patch** and **dollar spot** are the main problems on irrigated sites. In unirrigated turf, the dry weather in August has contributed strongly to the nice brown patina seen on many residential sites. Finally my lawn went dormant….don't worry; some rain and a little nitrogen and all will be well again!

Ornamentals

Sample submissions of ornamental plants tend to start picking up again at this time of year. We had a couple of oak samples from central and southern New Jersey with damage from **bacterial leaf scorch**. Two maple samples from Monmouth County had **Nectria canker** and **Cytospora canker**. **Botryosphaeria canker** was found on a magnolia from Monmouth County and on a maple from Union County. We have also seen lots of borers. Assorted **ambrosia beetles** have been submitted to the laboratory including; *Euwallaceae validis* from maples in Morris County; *Monarthrum mali* and *Monarthrum fasciatum* from a dogwood in Hunterdon County; and *Xylosandrus crassiusculus* from maple and dogwood in Hunterdon. *Xylosandrus crassiusculus* is known as the **Asian ambrosia beetle**. This beetle is new to our region. It is not a regulated pest, but is a pest of concern because of their destructive potential to relatively healthy trees. In general, ambrosia beetles will attack plant material stressed in some manner. The new beetles really hammer healthy trees. Asian ambrosia beetle infestations are easy to identify, because the adult beetles seal their entry and exit holes with "tooth-picks" or "noodles" of frass. Seriously, it looks like short spaghettis hanging from the trunk of the tree. Please call us if you see these in the landscape. There is still a lot to learn about the biology of this critter in New Jersey. ❑

Weather Summary for the Week Ending 8 AM Monday 8/21/ 6

	RAINFALL			TEMPERATURE				GDD BASE50		MON
WEATHER STATIONS	WEEK	TOTAL	DEP	MX	MN	AVG	DEP	TOT	DEP	%FC
CANOE BROOK	.34	20.81	-3.17	90	59	75.	5	2574	558	72
CHARLOTTEBURG	.45	21.33	-2.87	85	56	72.	5	2185	592	67
FLEMINGTON	.16	26.89	3.76	88	57	73.	2	2452	384	77
NEWTON*	1.24	22.77	.44	86	52	71.	3	1949	116	86
FREEHOLD	.00	20.20	-2.33	91	59	75.	3	2511	307	66
LONG BRANCH	.21	20.18	-2.54	91	60	73.	1	2430	305	55
NEW BRUNSWICK	.03	20.17	-2.51	91	61	76.	3	2617	325	65
TOMS RIVER	.00	16.86	-6.41	91	56	74.	3	2520	412	35
TRENTON	.03	21.33	-.24	90	58	76.	3	2664	268	38
CAPE MAY COURT HOUSE	.00	13.19	-6.90	90	63	76.	2	2560	486	37
DOWNSTOWN	.00	16.90	-4.35	89	59	75.	2	2420	19	39
GLASSBORO	.02	17.58	-4.63	90	66	78.	5	2845	466	35
HAMMONTON	.00	16.12	-6.11	94	60	76.	3	2749	367	31
POMONA	.00	17.70	-2.73	94	60	76.	4	2624	402	31
SEABROOK	.00	23.69	3.32	93	63	79.	6	3021	607	36
SOUTH HARRISON	.00	21.69	.91	90	63	77	NA	2799	NA	NA

WES KLINE — GDD BASE 40 PINEY HOLLOW LAST WEEK 229 (Ending 8/14/06) THIS WEEK 248 (Ending 8/21/06)

* SOME CUMLATIVE VALUES ESTIMATED DUE TO EARLIER MISSING DATA

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Pesticide User Responsibility: Use pesticides safely and follow instructions on labels. The pesticide user is reponsible 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 RCRE in your County.

Use of Trade Names: No discrimination or endorsement is intended in the use of trade names in this publication. In some instances a compound may be sold under different trade names and may vary as to label clearances.

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