COOL-SEASON INSECT CONTROL GUIDE

New application methods and materials will soon result in more effective insect control. Our annual guide helps you time your treatments.

by Harry Niemczyk, Ph.D., Ohio State University

During the past year, the Turfgrass Pesticide Laboratory at the Ohio Agricultural Research and Development Center, Ohio State University, Wooster, Ohio, conducted research that further demonstrated the benefits of turfgrass to our environment.

Researchers found that insecticides applied to turfgrasses with or without thatch showed little or no potential for leaching into the underlying soil.

The studies, based on 1988 and 1989 field applications of the preemergent herbicides pendimethalin, bensulide, benefin, trifluralin and oxadiazon, has shown no residues at the 10-inch soil level.

Excitement is also brewing about methods of placing insect control ma-

SPRING
(April-May)

Chinch bugs and billbugs— As the warm days of spring approach, movement of chinch bug and adult billbugs increases rapidly. Generally, egg laying begins the first week of May, but can begin in mid-April if spring arrives early. Occasionally adult billbugs can be seen on sidewalks on warm April afternoons.

Generally, application of insecticides to prevent infestations of chinch bugs and billbugs should be completed by the first week in May. Applications may begin as early as the last week of March. Such applications must be made before significant numbers of eggs are laid. This time may vary as much as a week or more, depending on spring weather.

Grubs— Overwintered grubs return to the surface and begin feeding on turfgrass roots in April. Increased activity and damage from birds, moles, skunks and raccoons foraging on grubs can also be expected and continues through May.

Treatment should be delayed until the grubs are in the top one inch of soil. Irrigation or rainfall should follow such applications to aid in moving the insecticides to the target grub as soon as possible following application.

Although milky disease products for control of Japanese beetle grubs may be applied any time there is no frost in the soil, spring is a good time for such applications. The soil is open and frequent rains move the disease spores into the soil and thatch.

Milky disease products are primarily effective against Japanese beetle larvae. Ineffectivity against other species is low.

Incidents of large grub infestations (June bug larvae, for example) have been increasing in cool-season areas. Locations of such infestations should be identified because reinfestation is likely every three years.

Eggs are laid in May and June, therefore treatment should be made in late summer, early fall of that year or the next spring while larvae are small. Later applications against full-grown larvae have given inadequate control in past studies.

Black turfgrass ataenius— Adults of the black turfgrass ataenius can be seen "at wing" in April and are often found in clipping catchers after early mowing of golf course greens. These adults begin laying eggs in early May, or about the time *Vanhoutte spirea* first comes into bloom. Dursban applied to a fairway at this time kills adults and prevents summer infestation of larvae. Check with local extension entomologists for the precise time if needed.

A second application, two weeks after the first, may be needed to successfully prevent infestation.

Sod webworms— Overwintered larvae of the sod webworm begin feeding as soon as the grass begins to grow. Usually damage is insignificant but areas that do not green up may be infested. These areas frequently have probe holes from starlings feeding on larvae.

Moth flights begin in May in northern areas. Young larvae are usually present about two weeks after the spring moth flight peaks, so treatment of young larvae can be done in May in some areas.

Cutworms— Moths of cutworms begin laying eggs

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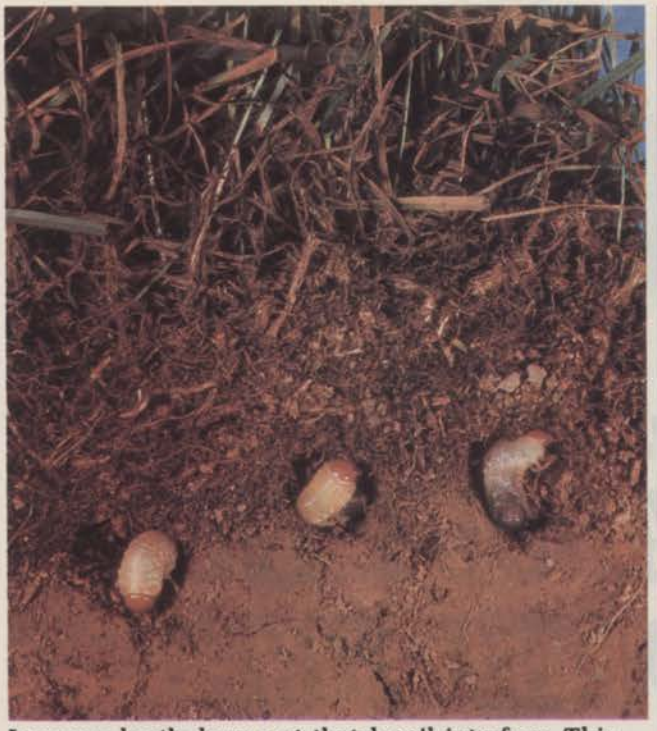

Japanese beetle larvae at thatch-soil interface. This year's early spring will bring grub to the surface earlier. Watch for skunks and raccoons, which can damage turf when searching for them.

SPRING *from page 44*

on golf course greens and other turf areas in the spring. These eggs hatch, producing larvae that feed on grass blades during the night. The black cutworm is the most common species on cool-season turf.

While visible damage is uncommon on home lawns, damage can be significant on golf course greens in late May.

Greenbug— Greenbug eggs begin hatching as early as April, but significant infestations do not develop until later in the year.

Greenbugs are also brought into the region from the south on upper air winds. Aphid numbers are too low to detect in lawns at this time.

Winter grain mite— Damage from this mite is often first noted in March or April when turf areas are receiving spring fertilizer applications. Winter grain mites are identifiable by eight bright red legs and a dark body.

By late May, the mites will have laid their eggs and died. Mites do not appear again until the eggs hatch in October.

Clover mites— Incidents of visible damage to home lawns are often seen in April in several Ohio cities and Denver. Usually a nuisance pest in and around homes, the clover mite occurs in large numbers (5,000 per square foot) across entire lawns and on turf next to building foundations. Symptoms of injury were the same as the winter grain mite. Turf next to foundations may be killed.

The clover mite has a slightly pink body and eight pale-colored legs. The first pair of legs is extremely long and protrude well out in front of the mite. The absence of bright red legs distinguishes the clover mite from the winter grain mite.

SUMMER
(June-July)

Chinch bugs— Chinch bug eggs continue to hatch into June. Bright red nymphs with a center white band appear. The number of chinch bugs increases rapidly in June. Their populations peak in July and August, when northern lawns can receive severe damage. This damage is often masked by summer dormancy of turf caused by drought. Hot, dry conditions are ideal for chinch bugs.

During August the nymphs molt into adults that mate and lay eggs, thus producing a second generation. Some northern areas have only one generation per year.

Billbugs— Bluegrass billbug larvae feed on grass stems during June and move to the plant crowns, roots and rhizomes during July. This feeding pattern causes brown spots that frequently resemble the symptoms of some fungus diseases. Symptoms are also often masked when the turf is dormant from drought.

The larvae usually move deeper into the soil under dry soil conditions. During late July and August the larvae burrow deeper into the soil to pupate and transform into adults.

Grubs— By June, grubs have stopped feeding and are in the pupal stage, three to four inches in the soil. Beginning mid-June and continuing through mid-July, the adults of various species emerge and burrow into the soil to lay eggs. Hatching and appearance of young larvae occur during July and August.

Extreme heat and drought during the summer may cause some grubs to move deeper in the soil. Under such conditions, irrigation several hours before treatment and a thorough soaking afterward is adviseable.

Black turfgrass ataenius— Eggs laid by beetles during May hatch in June and the larvae immediately begin feeding on turf roots and thatch.

From late June to mid-July, symptoms of injury include wilting in spite of irrigation. In July, larvae move deep into the soil, pupate and emerge as adults. These adults lay eggs during August, producing a second generation in some states. The second generation larvae are capable of damaging turf. States farther north have only one generation.

Sod webworms— Damage from sod webworm larvae occurs occasionally in most of the cool-season turf region. Injury is more common in Midwestern states, usually in July and August. Older sod fields or areas with heavy thatch are good candidates for infestation. There are generally one or two generations per year, depending on the species.

Cutworms— Cutworm larvae continue to cause damage to golf course greens from June through August. These larvae pupate in the soil or thatch and emerge as moths that lay eggs for additional generations.

Fall armyworm— The fall armyworm is seldom a problem of cool-season turf.

Greenbug—Damaging populations of greenbugs can occur from June through August. Populations and incidents of damage frequently vary from area to area, even within the same city.

Symptoms of injury include turf under the dripline of trees and in open areas having a burnt orange color. When symptoms are apparent, numerous aphids (40 or more) may be seen on a single grass blade. Close examination of damaged turf is necessary because the aphids are small. If left untreated, a heavy infestation can kill the turf.

terials, such as insecticides or nematicides, biological control agents, entomogenous nematodes, insect growth regulators (IGRs), milky disease and others, right where the pest is, without leaving residues on the surface. This approach will reduce the application rate necessary for control since placement is directly in the zone of pest habitation. Another significant advantage of this method is that the potential for pesticide runoff will be significantly reduced, if not eliminated.

The equipment needed for subsurface placement of granular products on golf courses is already available and will be tested in 1990. Equipment now used for subsurface placement of liquid polymers has adapted for application of liquid

FALL
(Sept.-Oct.)

Chinch bugs—In the northern U.S. the second generation of chinch bug is at peak numbers in September. Nymphs complete their development to adults in late October. Most chinch bugs overwinter in the turf, but some move to protected areas before winter.

Generally, infestation levels at this time are not high enough to warrant the use of insecticides. Early fall rains and infection by a parasitic fungus (*Beauveria app.*) usually provide sufficient control.

Billbugs— During September, billbug adults that developed from summer larvae are often seen on sidewalks, driveways, or other paved surfaces. Before winter, these adults seek shelter in thatch, along sidewalk edges or near foundations and overwinter. Many, if not most, overwinter in turf.

In some areas a partial second generation may occur. Larvae of this generation have been know to cause visible damage in September and October.

Grubs— Most species of grubs are in the third of their three stages of development and are feeding actively. When soil temperatures decrease in late October, the larvae burrow deeper into the soil to overwinter. If soil temperatures remain warm, larvae stay at the surface and continue feeding. Severely cold winters have little effect on survival.

Black turfgrass ataenius— By September, adults of the current generation begin to fly into protected areas, such as golf course roughs, to overwinter. Larvae that have not completed development to adults before the first frost are killed.

Sod webworm— Northern sod webworm larvae are small and cause little if any damage in the fall. Late in the fall the larvae construct a cocoon-like shelter in which they overwinter.

Greenbug— Severe infestations of greenbug have been known to occur as late as the first week of December. Areas having a history of infestation should be re-examined when mild temperatures extend late into fall. Heavily-infested turf will not survive through winter.

Japanese beetle larvae infected with milky disease (top), and a healthy grub. Subsurface placement of milky disease products should significantly increase their effectiveness (*Photo courtesy Dr. M. Klein, USDA-ARS*).

LATE WINTER
(Nov.-Dec.)

Chinch bugs and billbugs— In northern zones, chinch bugs and billbugs overwinter as adults in thatch or sheltered sites near buildings. They can become active during warm days in March. Infestations of hairy chinch bugs and bluegrass billbugs also occur in zoysia, Kentucky bluegrass and fine fescues.

Grubs—The larvae of this group of pests normally overwinter six inches or deeper in the soil. If spring comes early, grub activity can be expected along with skunks and raccoons, which tear up the turf in search of them. Moles, which feed on grubs and earthworms, also become active at this time.

Black turfgrass ataenius—This golf course pest overwinters as an adult in the soil under debris in roughs or other protected areas. A few may be seen flying about on warm afternoons in early March. Usually this activity begins when crocus starts blooming and intensifies as the bloom of red bud appears.

Greenbug— The only stage of the greenbug known to overwinter in northern states is the egg. Shiny black eggs deposited the previous fall may be found adhering to grass blades, fallen tree leaves or other debris.

Sod webworms— The most common sod webworm species overwinter as larvae in the thatch or upper inch of soil. Feeding does not resume until hibernation (dipause) is broken by early spring warmth. **LM**

and biological control materials. More walk-behind units for both liquid and granular products are being manufactured or are on the engineer's drawing board.

At OARDC, excitement is mounting about the materials we have to evaluate in 1990.

Being able to track a pests' life cycle is still at least as important as selecting an insecticide for their control. This guide points out the seasonal occurence of some important cool-season pests to be on the lookout for this year. Best control will come when you apply insecticides during the pest's most vulnerable stages, which are outlined here. No endorsement of products is intended, nor is criticism implied of those not mentioned.

HOW'S YOUR KNOWLEDGE OF TURF INSECTS?

Test Yourself or Your Crew

1. Bluegrass billbugs overwinter as _____.

adults	pupae
larvae	eggs

2. A pesticide with an LD_{50} of 75 is safer than one with an LD_{50} of 1000.

_____ True
_____ False

3. Sod webworms generally overwinter as _____.

adults	pupae
larvae	eggs

4. _____ percent of all insects are considered pests.

Less than 1%	5%
1%	10%

5. The reason for poor grub control with pesticides is _____.

resistance
too much rain
insecticide did not reach pest
UV breakdown

6. The Japanese beetle overwinters as _____.

egg	pupae
larvae	adults

7. Grubs eat _____.

thatch	soil
grass roots	thatch, soil and roots

8. Dursban is an _____.

organophosphate	pyrethroid
carbamate	chlorinated hydrocarbon

9. Masked chafer adults fly _____.

during the daytime	at mid-day
early morning	at night

10. Match these raster drawings with the following insects:

a. Black Turfgrass Ataenius
b. European Chafer
c. Masked Chafer
d. May-June Beetle
e. Japanese Beetle

11. _____ 12. _____ 13. _____

14. _____ 15. _____

If you got:

14 right - SHARP!
13 right - WELL DONE!
12 right - not bad
11 right - OK, but ...
10 or less right - more training needed

1. adults
2. False
3. larvae
4. Less than 1 percent
5. insecticide did not reach pest
6. larvae
7. thatch, soil and roots
8. organophosphate
9. at night
11. e
12. c
13. a
14. d
15. b

DISEASE CONTROL FOR ORNAMENTALS

When conditions are right, ornamentals are easily susceptible to disease. Effective disease control begins with prevention.

by Douglas Chapman, Dow Gardens

Disease control strategies for use on ornamentals are varied. They include the use of resistant cultivars, planting in the correct ecological niche, proper sanitation, plant diversity and health, and the use of fungicides.

To understand disease control, the conditions favorable for infection must first be understood. If one of these four conditions is not met, then infection of the plant does not occur.

The main conditions needed for infection are: (1) the presence of a pathogen, (2) free water, (3) temperature favorable to infection, and (4) a suitable host.

Don't let water linger

Any conditions or practices that either reduce the amount of time moisture is on the foliage or impacts the roots lessens the opportunity for disease infection. This can mean watering plants in the morning so they have time to dry before evening, removing dew by "poling greens," or setting up conditions for good soil drainage.

Conditions for good drainage can mean a well-drained medium for a pot crop, or surface sloping and drainage tiles for landscape plants in areas where the soil is slow to drain.

Temperature adjustment in the landscape is all but impossible. But if correct temperatures exist for disease infection to occur, one can either delay watering (if possible), or be aware of when conditions are right for fungicide application. For example: anthracnose becomes a problem

Cedar apple rust covers leaves of a Hawthorn tree.

DISEASE-RESISTANT CRAB APPLE VARIETIES

The following crab apple tree varieties are resistant to applescab, fireblight, and several minor foliar diseases. It should be stressed that these trees are for the upper Great Lakes region of the U.S. Resistance will vary in other parts of the country.

Adams
Beverly
Bob White
Candied Apple
Centurian
Christmas Holly
David
Donald Wyman
floribunda
Halliana parkmanii
Harvest Gold
hupehensis
Indian Magic
Indian Summer
Jewelberry
Liset
Mary Potter
Molten Lava
Ormiston Roy
Prairiefire
Professor Sprenger
Profusion
Red Baron
Red Jewel
Red Splendor
Royalty
Ruby Luster
Sentinel
Silver Moon
Snowdrift
Strawberry Parfait
Sugar Tyme
tschonoskii
White Angel
White Cascade
Winter Gold

—*Dr. Chapman*□

The Hopa crab apple tree on the right is in full bloom after treatment the previous year for applescab disease. The control tree is on the left. (All photos by Dr. D.L. Caldwell, The Davey Tree Company. Used by permission.)

when temperatures reach the high 40s during late spring.

Crab apple trees resistant

A suitable host is one area that can frequently be adjusted as a disease control strategy. This can mean planting disease-resistant varieties.

One of the classic strategies used in the contemporary landscape is using disease-resistant crab apple trees. By selecting a resistant cultivar, one can all but eliminate the need for multiple pest control applications, while keeping healthy, well-foliated crab apples (see chart).

Diversity is another strategy that can be used to reduce the impact of any one disease. In designing a landscape, use many different plant types. All landscape managers know that

Apple scab lesions infect this crab apple leaf.

monoculture, be it turfgrasss (Merion bluegrass), shrubs (Andorra juniper) or trees (elm) can lead to problems. As we increase the variety of plants in a landscape, the opportunities for infection decrease and catastrophic plant death is reduced.

Isolate infected plants

Sanitation is one way to reduce the source of pathogens. If a plant becomes infected by a disease, the infected parts or the entire plant should be removed and destroyed.

During the early stages of fireblight infection, many canker diseases can be slowed or eliminated by removing the branch below visible signs of infection.

Plants in the correct ecological niche help many from becoming infected. Junipers grow best in full sun and infertile, well-drained soils. Generally speaking, junipers grown in the shade thin and die out. Further, junipers growing in landscapes composed of fertile soil that are frequently irrigated get a disease called *Phomopsis juniperovora*.

If growing is necessary under these conditions, apply fungicides regularly or grow restricted lists of resistant cultivars such as *Juniperus chinensis* (Ames), Armstrongil, Fairview, Hetzii, Keteleeri, Mountbatten, *Pfitzeriana compacta, sargentii and procumbens, Juniperus horizontalis (Douglasii)*, Emerald Spreader, *Wiltoni, Juniperus sabina* (Acadia), Broadmoor, and Von Ehron.

When the above strategies aren't economically feasible, fungicide application should be considered. Identify the cause of the disease prior to chemical application.

Preventing plant diseases remains the cornerstone of a good ornamental disease control program. **LM**

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The chart on page 66 of fungicides for use on ornamentals shows examples of fungicides that can be used to control diseases. Since approved chemicals may vary from state to state, check the label and local cooperative extension service for specific recommendations in your area.

FUNGICIDES FOR ORNAMENTALS

Chemical Common Name	Brand Name	Mode of Action	Disease Controlled
Propiconazole	Banner	Systemic	Rusts, foliar diseases (many ascomycetes)
Ethazol + Thiophanate Methyl	Banrot	Soil fungicide	Phytophythora, pythium, rhizoctonia
Triadimefon	Bayleton	Systemic	Powdery mildew, rusts
Benomyl	Benlate	Systemic	Apple scab, powdery mildew, botrytis, rhizoctonia (damping off)
Bordeaux	Bordeaux	Protectant fungicide	Powdery mildew, diplodia tip blight of pines, fire blight
Iprodione	Chipco 26019	Contact	Botrytis, sclerotinia, rhizoctonia
Chlorothalonil	Daconil 2787		Apple scab, botrytis, rusts, powdery mildew
Maneb	Maneb	Foliar treatment	Rusts, leaf spots
Mancozeb	Manzate, Fore		Rusts (cedar apple rust), phytophthora, anthracnose, needle case (Lophodermium pinastri)
Vinclozolin	Ornalin		Botrytis, sclerotinia, turf (dollar spot, helminthosporium)
Metalaxyl	Subdue	Systemic	Pythium, phytophthora (rhododendrons)
Sulfur	Sulfur		Powdery mildew, black spot
Quintozene	Terraclor	Soil fungicide	Root rots, botrytis
Triforine	Triforine	Eradicant	Powdery mildew, rusts, apple scab
Zineb	Zineb	Foliar treatment	Leaf spots, rusts (cedar apple)