



CONTROLLING INSECTS

Despite the recent controversy, chemical companies are experimenting with new pesticides. But registration may be a long way off.

by Dr. Harry D. Niemczyk, OARDC; and Dr. Patricia Cobb, Auburn University

Controlling damage caused by insects is necessary to achieve the quality green settings most Americans have come to expect for their homes, businesses, recreation areas, sports events, government buildings and cemeteries.

Insecticides still remain the primary means for controlling such damage. However, increased environmental concerns by the U.S. Environmental Protection Agency and the public's perception of pesticides as shaped by recent media coverage of their use on home lawns and golf courses, has heated the "pesticide controversy."

Views range from those who want them completely eliminated to those who are confident they can be used safely, especially by professionals trained to do so.

Registrations in 1987?

In this atmosphere new insecticides such as Ciba-Geigy's CGA-12223 (Triumph) still has not received registration despite being researched for 10 or more years. An Experimental Use Permit may be approved in 1987.

Stauffer Chemical has indicated an interest in registering the organophosphate, fonofos (Dyfonate), for use on select turfgrass insect pests. Research data from 1986 shows it to be a very effective material against grubs and other turf pests.

Two synthetic pyrethroids, one from Mobay and the other from FMC, look good for control of chewing insects such as cutworms and sod webworms. Progress toward registration is expected in 1987.

IGRs

Insect Growth Regulators (IGRs) are compounds which impede the growth and development of insects. Treated adults may lay infertile eggs and immatures stop further development eventually, leading to death.

Ohio tests on one IGR from Mobay



The black turfgrass ataeenius develops in four stages, as is shown here.

and another from Union Carbide look promising for control of pests such as chinch bugs.

Nematodes for grubs

Tests conducted on two species of parasitic nematodes from the Biosis Co. of California have shown promise for control of grubs such as the masked chafer and Japanese beetle. Applied as a single spray in April, one of the species significantly reduced overwintered grubs and remained effective to give control of the succeeding generation in August. This appears to be a new and very promis-

ing form of biological control for grubs.

Life cycle is key

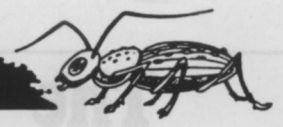
Knowing the life cycle of pests is at least as important as selecting an insecticide for their control. This guide points out the seasonal occurrence of some important cool- and warm-season pests to be alert for in 1987, when their vulnerable stages occur, and some suggested insecticides that may be used to control them. No endorsement of products is intended, nor is criticism implied for those not mentioned.

COOL SEASON

Late Winter (March)

Chinch bugs and billbugs—In northern zones chinch bugs and billbugs both overwinter as adults in thatch or sheltered sites near buildings. They can become active during warm days

in March. Infestations of hairy chinch bug and bluegrass billbug also occur in zoysia, Kentucky bluegrass and fine fescues. Retreatment for chinch bugs in middle to late summer may be necessary if reinfestation from adjacent



untreated areas occurs.

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 who will tear up the turf searching for the grubs. Moles, who feed on grubs and earthworms, also become active at this time.

Treatment at this time kills overwintering chinch bugs and billbugs and reduces infestations of these insects during the summer.

Black turfgrass ataeenius—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.

Spring (April - May) Chinch bugs and billbugs

As warm days of spring approach, movement of chinch bug and billbug adults increases rapidly. Generally, egg laying begins the first week of May. Occasionally adult billbugs can be seen on sidewalks on warm afternoons.

Generally, application of insecticides to prevent infestations of chinch bugs and billbugs should be completed by the first week in May in cool-season areas. Such applications are made before significant numbers of eggs are laid. This time may vary as much as a week or more depending upon the 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. Feeding by birds, mammals and grubs continues through May.

Treatment should be delayed until 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.

Although milky disease products for control of Japanese beetle grubs may be applied anytime 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. It should be noted that only the Japanese beetle grub will be affected by milky spore products.

Incidents of large grub infestations (larvae of June bugs) have been increasing in cool-season areas over the past three years. 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 the larvae are small. Later applications against full-grown larvae have given inadequate control.

Black turfgrass ataeenius—Adults of the black turfgrass ataeenius 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. Check with local extension entomologists for precise time if needed.

A word of caution: diazinon applications may be toxic to waterfowl such as geese feeding on the treated turf.

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 the 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 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. Aphid numbers are too low to detect.

Winter grain mite—Damage from this mite is often first noted in April when turf areas are receiving spring fertilizer applications. 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, Col. Usually a nuisance pest in and around homes, the clover mite occurs in large numbers (5,000 per sq. ft.) across entire lawns and on turf next to building foundations. Symptoms of injury are 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 are extremely long and protrude well out in front of the mite. The absence of bright red legs distinguished the clover mite from the winter grain mite.

Summer (June-August)

Chinch bugs—Chinch bug eggs continue to hatch into June. Bright red nymphs appear. The number of chinch bugs increases rapidly in June and peaks 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, lay eggs, thus producing a second generation. Some northern areas have only one generation per year.

Billbugs—Bluegrass billbug larvae feed in grass stems during June and move to the plant crowns and roots and rhizomes during July. This feeding 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 in mid-June and continuing through mid-July, the adults

COOL SEASON*	LATE WINTER(March)	SPRING (April-May)	SUMMER (June-Aug.)	FALL(Sept.-Oct.)
CHINCH BUGS	When summer damage is expected preventative application of liquid or granular Dursban (1 lb. Al/acre) or Oftanol (2 lb. Al/acre) may be used as soon as the insects become active.	Preventative applications of insecticides should be completed by the first week in May.	Treat before injury is severe with Dursban (1 lb. Al/acre), diazinon (2.5-5.5 lb. Al/acre), Sevin (6-8 lbs. Al/acre) or other labeled insecticides.	Treat if necessary, but generally, infestation levels are not high enough to warrant using insecticides.
BILLBUGS	Same as for chinch bugs.	Same as for chinch bugs.	Treat infestations at same rates as grubs with diazinon, Turcam, Proxol or Sevin. Irrigate following application.	Treatment is not appropriate at this time.
GRUBS	Application of Oftanol (2 lb. Al/acre) during March provides control of overwintered grubs. This may not control into late summer.	A single application of Oftanol (2 lb. Al/acre) made in April should control overwintered grubs. Can also be controlled in May by spot or general treatment with Turcam (4 lb. Al/acre) or Sevin (8lb. Al/acre). Golf course superintendents can use Mocap (5 lb. Al/acre) or Sevin (6-8 lb. Al/acre) to control green June beetle. Irrigate with application.	Existing infestations found in July or Aug. should be treated with Proxol, Turcam, Oftanol, Sevin or Mocap (commercial turf only) at rates used in spring. Treat green June beetle with Sevin (6-8 lb. Al/acre).	Treatment can be made as late as mid-September. Irrigate first if thatch or soil is dry.
SOD WEBWORMS	Treatment is not appropriate at this time.	When necessary, apply diazinon (5 lb. Al/acre) or Proxol (6-8 lb. Al/acre).	Make application when larvae are present or two weeks after peak moth flight. Use Dursban (1 lb. Al/acre), diazinon (5 lbs. Al/acre), Sevin (6-8 lbs. Al/acre) or Proxol (6-8 lb. Al/acre).	Larvae are small and cause little damage at this time. Treatment in September reduces population for next spring.
GREENBUGS	Treatment is not appropriate at this time.	Aphid numbers are too low to detect.	Use Orthene (1 lb. Al/acre) or Dursban (1 lb. Al/acre) or diazinon (2.5 lb. Al/acre).	Severe infestations may occur as late as December. Use the same insecticides as in the summer.
BLACK TURFGRASS ATAENIUS	An application of Oftanol (2 lbs. Al/acre) in March may prevent summer infestations of larvae, but it's best to wait until April.	Application of Oftanol (2 lbs. Al/acre) during April or May prevents larval infestations during summer. Diazinon (5-6 lbs. Al/acre) applied to fairways in April also prevents infestations.	If preventative applications were not made, spot or generally treat with Proxol (8 lbs. Al/acre), Turcam (2-4 lbs. Al/acre), Sevin (8 lbs. Al/acre) or Mocap (5 lbs. Al/acre), as needed.	Undeveloped larvae die with frost.
CUTWORMS	Treatment is not appropriate at this time.	The insecticides effective against sod webworm are also effective against cutworms. Apply late in the afternoon. Do not irrigate for best control.	Use Dursban (1 lb. Al/acre), Proxol (8 lbs. Al/acre) or Sevin (6-8 lbs. Al/acre). Do not irrigate following liquid applications unless specified on label.	Same as for summer.
COVER MITES	Treatment is not appropriate at this time.	Liquid diazinon (2.5 lb. Al/acre) or Dursban (1 lb. Al/acre) should be used.	Treatment usually is not necessary.	Treat as needed with liquid diazinon (2.5 lbs. Al/acre) or Dursban (1 lb. Al/acre).
WINTER GRAIN MITE	If needed, use spring treatment.	If treatment is necessary, use liquid diazinon (2-3 lbs. Al/acre) or Dursban (1 lb. Al/acre). Avoid repeated use of Sevin.	Treatment is not appropriate, since mite is in egg stage.	Treatment is not appropriate since mite is in egg stage.

* See accompanying text for details; always follow label directions.





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 advisable.

Black turfgrass atenius—Eggs laid by beetles during May hatch in June and the larvae immediately begin feeding on the 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 states such as Ohio. The second generation larvae are capable of damaging turf.

Sod webworms—Damage from sod webworm larvae occurs occasionally in most of the cool-season turf region. Injury is more common in mid-western states and is usually seen in July and August. Older sod fields and heavily thatched turfs are good candidates for infestation. There are generally one or two generations per year, depending upon 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 greenbug can occur from June through August. Populations and incidents of damage frequently vary from area to area even within a city.

Symptoms of injury include turf under the dripline of trees and in open areas having a burnt orange color. When symptoms are seen, 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.

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 spp.*) usually provide sufficient control.

Billbugs—During September billbug adults that developed from summer larvae are often seen wandering about on sidewalks, driveways or

other paved surfaces. Before winter, these adults seek shelter in thatch, along sidewalk edges or near foundations and overwinter there. Many, if not most, overwinter in turf.

In some areas (Cincinnati, Ohio) a partial second generation may occur. Larvae of this generation have been known 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. Severely cold winters have little effect on survival.

Black turfgrass atenius—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 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 the fall. Heavily infested turf will not survive through winter.

WARM SEASON

Late Winter (March)

Chinch bugs and billbugs—In southern Florida, the southern chinch bug is active throughout the year. In other southern areas, chinch bugs and billbugs become active during warm days in late winter. Most varieties of St. Augustinegrass and some bermudagrass are more likely to be infested by chinch bugs. Zoysia and bermudagrasses may be attacked by the hunting billbug.

When summer damage from chinch bugs and/or billbugs is expected, treatment controls adults before eggs are laid. If spring is early, these applications may be needed as early as mid-March. During a late spring, applications may need to be delayed until the last week of March.

However, in most cases, treatment

can be delayed until damage signs first appear in June. Retreatment for chinch bugs in middle to late summer may be necessary if reinfestation from adjacent untreated areas occurs.

Preventative treatments may not be successful in southern Florida where the southern chinch bug has multiple generations and is resistant to most organophosphate insecticides in some areas. Replacing susceptible turf with Floratam St. Augustinegrass, a variety resistant to the southern chinch bug, or non-host grasses, will usually provide excellent natural control in Florida. However, reports of chinch bugs feeding on Floratam continue to increase in south Florida.

Grubs—The larvae of this group of pests normally overwinter six inches

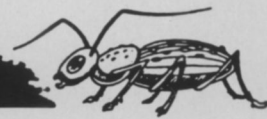
or deeper in the soil. If spring comes early, grub activity can be expected along with skunks and raccoons who will tear up the turf searching for the grubs. Moles, who feed on grubs and earthworms, also become active at this time.

Mole crickets—Mole crickets have extended their range from Florida and eastern Georgia into southern Louisiana, eastern Texas and up the East Coast into the Carolinas. Timing of treatments is critical and varies from one area to another.

The tawny and southern mole crickets are the primary pest species. Except for southern Florida, both have one generation per year. Mole crickets become active in March from north central Florida throughout their range in the Gulf States after overwin-



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tering in the ground as adults or nymphs. Tunneling damage takes place at night in moist soil and increases as mole crickets become more active. Both mole cricket species begin spring mating flights in late March. In most areas, March treatment is seldom required.

In years when tunneling of overwintered mole crickets resumes earlier than normal, treatment has been used with some success. Generally, such applications are better made later in the year when young nymphs are present. Rolling, fertilizing as recommended, and irrigation help keep grass roots in contact with the soils and growing in areas where tunneling damage is observed.

Spring (April-May)

Chinch bugs and billbugs—As warm days of spring approach, movement of chinch bug and billbug adults increases rapidly. Generally, egg laying begins the first week of April on warm-season turf. Occasionally adult billbugs can be seen wandering about sidewalks on warm afternoons.

Generally, application of insecticides to prevent buildup of chinch bug and billbug populations should be completed by mid-April in the South. Such applications are made before significant numbers of eggs are laid. This time may vary as much as a week or more depending upon the spring weather. When this approach is not used and southern chinch bugs are detected in May, treatment provides control. In areas with three to five chinch bug generations, turf surrounded by infested, untreated host plants may require one or two retreatments at six week intervals.

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

Infestations of such grubs can also be controlled during early April by spot or general treatment. Treatment should be delayed until grubs are in the top one-inch of soil. Irrigation or rainfall should follow such applications. Although milky spore disease products for control of Japanese beetle grubs may be applied anytime there is no frost in the soil, spring is a good time for such applications in areas where Japanese beetle grubs are nu-

merous. The soil is open and frequent rains move the disease spores into the soil and thatch. It should be noted that only the Japanese beetle grub will be affected by milky spore.

Mole crickets—Damage increases in April from north central Florida throughout the southern areas of the Gulf States. Mating and dispersal flights continue as egg laying and hatching begin.

Early spring treatment may be necessary in areas that were severely damaged last fall, if overwintered mole crickets are still present. Small damaged areas can be rolled or otherwise packed down so that the turf roots are reconnected with the soil. Early spring damage is due primarily to tunneling. Mole cricket feeding at this time is minimal.

To determine cricket presence, pour soapy water (2 oz. liquid dishwashing detergent in one gallon of water) on turf areas where infestation is suspected. Crickets will usually surface in three to 15 minutes (longer in cool weather).

Infested areas should be monitored weekly by soap flushes to determine the presence and abundance of newly hatched mole cricket nymphs. Nymphs usually hatch in central Florida during April and May. Farther north and west hatching begins in May and continues through June. Residual treatments and treatments with toxic baits should be made when nymphs are present.

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 the larvae.

In warm-season areas webworm larvae pupate during late March and early April. Moth flights begin in April in southernmost 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.

Damage from the burrowing sod webworm may be evident in late May in the South. Rubbing a hand over turf suspected of being infested exposes larval burrows that are covered with a web flap and grass clippings.

When necessary, a wide range of insecticides may be used to achieve control.

Cutworms—Moths of cutworms begin laying eggs on golf course

greens and other turf areas in the spring. These eggs hatch producing larvae that feed on grass blades during the night.

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

Black, granulate and variegated cutworm moths become active in March and April in the South. Larvae are present on turf, especially on golf greens and tees. Damage can become evident as early as mid-April. By May, the larvae are large enough to cause severe damage.

The principle of controlling these pests is to apply an insecticide late in the afternoon and allow night feeding cutworms to contact and feed on the treated foliage. Irrigation following liquid application is therefore not advisable unless specified on the product label.

Fire ants—Fire ants are spreading across much of the South. These ants inflict painful stings to man and animals, making them more a "people problem" than a grass problem. They begin establishing new mounds during warm, wet days of spring. During this time, ants are active near the surface of mounds and workers are actively foraging for food.

New mounds may not be visible above the turf surface at this time. Areas heavily infested with old mounds and the less-visible new mounds can be treated broadcast. Individual mound treatments can be made in less infested areas or in areas that are re-infested as the season progresses.

Read the label for specific directions for mound treatment. Do not disturb the mound before or during treatment.

Summer (June-August)

Chinch bugs and billbugs—Southern chinch bugs are not usually a problem in well-irrigated turf or during summers when rainfall is plentiful. Southern chinch bug-damage first appears during the dry periods of June and July. Damage may continue throughout the summer and into the fall because of overlapping generations.

A wide range of insecticides may be used at label rates to control existing infestations. Floratam St. Augustine, a chinch bug resistant variety, has been a primary turf variety grown in more southern coastal areas and Florida where southern chinch bug is a problem. However,



The development of a mole cricket from nymph to adult.

reports indicate that chinch bug feeding has occurred on Floratam in some locations in south Florida.

Billbug grubs are usually large enough to be found in the soil by late June and July. Areas of turf where adult billbug activity has been observed earlier should be examined routinely. Zoysia and bermudagrasses are especially susceptible to infestation. Turf that does not hold together, does not respond to fertilization normally or appears to be drought-stressed in spite of irrigation may be infested. If drought conditions exist, water prior to treatment as well as afterwards.

Grubs—Beetle flights continue and often peak in June, although the time flights occur varies from year to year. Japanese beetle flights occur mainly from middle to late May and June. Brown May or June beetle flights often follow heavy rains in late May and June. New generation grubs of most southern species can be found by mid-August.

Infestations of new generation grubs are present in late July or 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 advisable.

Mole crickets—Egg laying diminishes in late June, and newly-hatched nymphs of both species feed voraciously. Tunneling damage suddenly becomes obvious in July as the nymphs grow larger. Because of the potential for sudden damage at this time, turf areas should be inspected several times a week during this period.

Bait formulations are effective in controlling mole cricket nymphs from June through August in the area from central Florida north and west

through the gulf states. Baits work best in eastern Georgia during spring and fall. Bait applications usually must be repeated one or more times.

Mole crickets are more active at night in moist soil. Turf should be irrigated several hours before baits are applied. Delay application until later in the day, and do not irrigate for two to three days thereafter.

Residual control of mole crickets may vary with location, irrigation and amount of rainfall. In some cases, Oftanol has not performed as effectively as expected, nor as consistently as it once did in these same locations. Oftanol and other residual controls work most effectively on younger mole cricket nymphs when treatments are watered immediately. Fewer residual treatments can be used as outbreaks occur, but usually have to be repeated several times.

Sod webworms—Most sod webworms complete at least three generations a year with overlapping generations toward the end of the season.

Damage is most severe from late June through August. In southern Florida where the tropical sod webworm is active throughout the year, damage is most severe in late summer and fall.

Hybrid bermudagrasses are favored by sod webworms, but damage occurs on other warm season grasses. Webworm damage to bermudagrass often superficially resembles symptoms of some diseases. Flushes of soapy water can be used to determine the presence of sod webworm larvae.

Insecticide applications should be made when larvae are present and/or one to two weeks after peak moth flights from infested turf.

Retreatment may be necessary depending upon the location and number of generations.

Fall armyworm—In the South, summer always means the arrival of the moths of this migratory pest. Although in mild winters fall armyworms may overwinter along the Gulf Coast, it is generally believed that the moths are blown in on winds from Central and South America. Several generations occur each season, one about every five weeks. Generations overlap in the fall.

Lush, green bermudagrasses are preferred. By late June, fall armyworm damage to turf has usually been reported along the Gulf Coast. Damage is seldom permanent, unless drought and/or heat stress follow.

Fall armyworms may feed anytime during the day but are most active in the early morning and late evening.

Treatment is most effective at these times. During hot, mid-day hours, larvae may retreat into the thatch.

Fire ants—Fire ants are more difficult to control during hot, summer days because they are deeper in the soil. However, during rainy periods, they may become active and establish new mounds. Treatments during these months should be applied early in the morning before the heat of the day. Treat mounds as they appear.

Scale insects—Although Rhodegrass scale is present in Gulf Coast areas throughout the year, damage becomes most pronounced during the hot, dry days of summer. Bermudagrass and St. Augustinegrass are preferred hosts, but other grasses are also infested. Repeated treatments are required for control to be effective.

Ground pearls are scale insects that live in the soil throughout the year, sometimes eight to 10 inches deep. In the spring, eggs hatch producing nymphs that feed throughout the summer by piercing turf roots and extracting plant fluids.

Chemical control for ground pearls has not been effective at any time of year. Damage is most severe during summer months when the turf is stressed from heat and drought.

Centipedegrass is especially susceptible to damage, particularly when weakened by over-fertilization or drought. Proper fertilization, disease control and adequate irrigation to maintain healthy turf is the best defense.

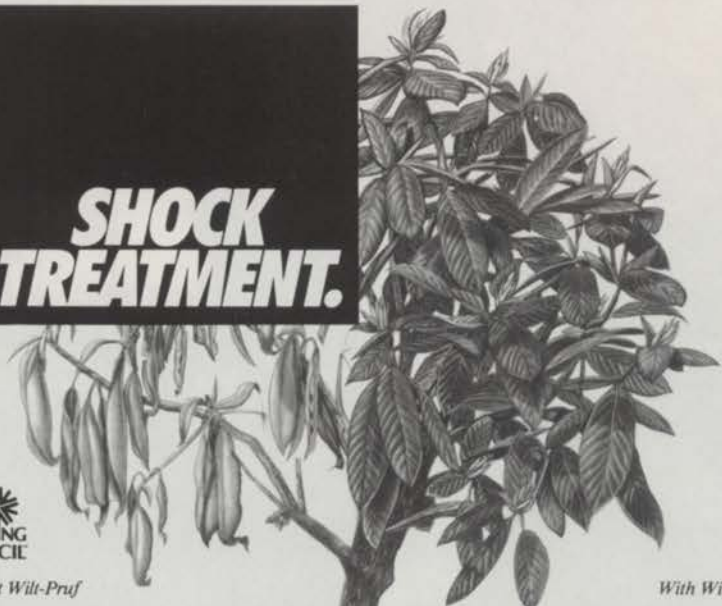
Fall (Sept.-Oct.)

Chinch bugs—Damage by the southern chinch bug may continue in untreated areas. Late summer appli-





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cations of insecticide usually make fall treatment unnecessary.

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 and November, the larvae burrow deeper into the soil to overwinter. Severely cold winters have little effect on survival.

Treatments of existing grub infestations can be accomplished as late as mid-October, using standard grub insecticides. Treatment after this time may or may not kill the grubs before they move deeper into the soil to overwinter.

If the soil is dry, irrigation before treatment is advisable. Whenever treatment is applied, the grubs should be in the top one to two inches of soil.

Mole crickets—Mole crickets fly again in the fall, but no egg laying is known to occur at this time. The crickets are large and difficult to control in the fall. Damage becomes more severe as turf growth slows and cricket size increases. Some insecticides may work too slowly for adequate control of large crickets in October. Mocap granules, if not used earlier, can be used effectively at this time to provide up to four weeks residual control. Oftanol, if not used earlier, can be used in September, but works slowly and appears to be less dependable than when used on younger crickets.

Sod webworm—Except for the most southern areas where development is continuous, sod webworm larvae present in September will overwinter. Areas treated earlier in the season may be reinfested by this time. Treatment in early September reduces the population for next season.

Fall armyworm—Fall attacks on newly established turf from mid-September through October may result in damage that will not recover with fall fertilization. This forces the turf to enter winter in a stressed condition. Such damage can contribute to winter turf mortality.

If needed, apply controls early in the morning or late in the day when fall armyworms are most active.

Fire ants—Hot, dry periods in September and October may make fire ant control difficult. Once rain begins, fire ants become active and may be effectively controlled with mound treatments. Area treatments may be desirable in heavily infested areas with baits.

WT&T

WARM SEASON*	LATE WINTER (Mar.)	SPRING (Apr.-May)	SUMMER (June-Aug.)	FALL (Sept.-Oct.)
(SOUTHERN) CHINCH BUGS	In southern Fla. where resistance is a problem, use Pydrin, Pounce or Baygon as labeled for Fla. Replace susceptible turf with resistant or non-host varieties to provide natural control. In other areas, over wintered adults can be treated if they become active in March with diazinon (4 lbs. Al/acre), Dursban (1 lb. Al/acre) or Oftanol (2 lbs. Al/acre).	Application to prevent population build-up should be made by mid-April. Diazinon (4 lbs. Al/acre), Dursban (1 lb. Al/acre) or Oftanol (1-2 lb. Al/acre) provide control.	Control existing populations with Dursban (1 lb. Al/acre), diazinon (4 lbs. Al/acre) or Oftanol (1-2 lb. Al/acre) when damage signs appear. Southern chinch bugs are not as severe a problem in well irrigated turf.	Late summer applications usually make fall treatments unnecessary.
BILLBUGS	Treatment at this time can be done if adults are numerous and active. Use diazinon (4 lbs. Al/acre), Dursban (1 lb. Al/acre) or Oftanol (1-2 lb. Al/acre).	Treat when adults are active to prevent population build-up. Diazinon (4 lbs. Al/acre), Dursban (1 lb. Al/acre) provide control.	Treat billbug grubs with Oftanol (2 lbs. Al/acre) if not used in spring; diazinon (5 lbs. Al/acre) Turcam (2 lbs. Al/acre). Irrigate following application; also before if drought exists.	If necessary, treat with diazinon, Turcam, Oftanol or Dylox/Proxol as in summer.
GRUBS	Application of Oftanol (2 lb. Al/acre) during March provides control of over wintered grubs. Control usually does not extend to new generation in July and August.	Infestations can be controlled during early April by spot or general treatment with Turcam (2 lbs. Al/acre), Proxol/Dylox (8 lbs. Al/acre) or diazinon (5 lbs. Al/acre). Mocap granules (5 lbs. Al/acre) can be used on golf courses and sod farms. Sevin (1.5-2 lbs. Al/acre) is effective on green June beetle grubs; Sevin (8 lbs. Al/acre) against other grubs. Irrigate after treatment. Milky spore can be applied in early April for Japanese beetle control in areas where the grubs are numerous.	New generation grubs present in late July or by mid-August can be controlled with proxol/Dylox (8 lbs. Al/acre); Turcam (2 lbs. Al/acre); Oftanol (2 lbs. Al/acre); diazinon (5 lbs. Al/acre); or Mocap granules (commercial turf only at 5 lbs. Al/acre). Sevin SL (8 lbs. Al/acre) is effective against most grubs; (1.5-2 lbs. Al/acre) is effective against green June beetle grubs. Water immediately after treatment, also before treatment during dry summers.	Treatments are effective as late as mid-October. Irrigate first if soil is dry, then again after treatment.
SOD WEBWORMS	Treatment is not appropriate at this time.	Use diazinon (4 lbs. Al/acre), Dylox/Proxol (3.5 lbs. Al/acre), Dursban (1 lb. Al/acre) or Sevin (6-8 lbs. Al/acre) in April when larvae are present. Warm season grasses outgrow moderate damage, so treatments can be delayed until summer.	Make application to infested turf when larvae are present or two weeks after peak moth flight. Use diazinon (4 lbs. Al/acre), Dursban (1 lb. Al/acre), Dylox/Proxol (3.5 lbs. Al/acre) or Sevin (6-8 lbs. Al/acre).	Treatment in early September may reduce population for next season.





INSECT CONTROL GUIDE



CUTWORMS	Treatment usually is not appropriate at this time.	Use Dursban (1 lb. AI/acre), Dylox/Proxol (3-8 lbs. AI/acre) or Sevin (2-4 lbs. AI/acre). Apply late in the afternoon. Do not irrigate unless specified on label.	Although cutworms in the South are usually a spring problem, if summer infestations occur, treat as directed for spring.	Treatment usually is not necessary at this time.
MOLE CRICKETS	Timing of treatments is critical and varies in different areas. In years when activity of overwintered mole crickets resumes early, treatment with Oftanol (2 lbs. AI/acre), diazinon (5 lbs. AI/acre) or Turcam (2 lbs. AI/acre) is sometimes effective. Extensive treatment should be delayed until young nymphs are present. Rolling, fertilizing and irrigating warm season grasses helps tunneled turf to recover.	Monitor infested turf weekly with soap flushes to determine presence and number of young nymphs. For short-residual treatment use Turcam (2 lbs. AI/acre) or diazinon (5 lbs. AI/acre) in late April or May; Orthene 75S (2-3 lbs. AI/acre) on wet turf, unirrigated after late afternoon treatment, provides quick knockdown. Baits are effective in central Florida in May when young nymphs are present.	For residual control, use Oftanol (2 lbs. AI/acre) if not used earlier or Mocap granules (10 lbs. AI/acre on commercial turf only) on young nymphs. Irrigate immediately. Baits are effective from central Florida northward during summer. Baits available are Baygon 2% (1/2 lb./1000 sq. ft.); .5% Dursban (150 lbs./acre or two applications of 75 lbs./acre three weeks apart); malathion 2% (100 lbs./acre or two applications of 50 lbs./acre three weeks apart). Irrigate several hours before bait applications, and do not irrigate afterwards. Orthene 75S (2-3 lbs. AI/acre) can be used during summer, applied on irrigated turf late in the day and unwatered overnight.	Sprays of diazinon (5 lbs. AI/acre), Turcam (2 lbs. AI/acre) or Orthene 75S can be used in areas where outbreaks occur and may have to be repeated several times. Oftanol (2 lbs. AI/acre, may work slowly) or Mocap granules (10 lbs. AI/acre, commercial turf only) may be used, but don't use either more than once per season.
FALL ARMYWORM	Treatment is not appropriate at this time.	Populations usually do not develop until summer	Treatments are most effective in early morning or late afternoon. Use diazinon (4 lbs. AI/acre), Dursban (1 lb. AI/acre), or Proxol/Dylox (1-3 lbs. AI/acre).	Apply as directed for summer. Fall armyworms may be a greater problem in Sept.-Oct. than earlier.
FIRE ANTS	Treatments are less effective when soil temperatures are low.	Area treatments when new mounds being established in heavily infested areas with Amdro bait (1.5 lbs. bait/acre), Pro-Drone bait (.88 lb. bait/acre), Logic bait (1-1.5 lbs. bait/acre) or Oftanol (.05 lb. AI/1000 sq. ft.) are effective. Mound treatments in less infested areas include various diazinon or Dursban formulations; Orthene 75S dust (2 tsp./mound); or MC-96 mound fumigant (2 fl. oz./mound).	Treat mounds as they appear with various formulations of diazinon or Dursban; Orthene 75S dust (2 tsp./mound) or MC-96 (2 fl. oz./mound).	Apply controls to mounds or areas early in the morning or late in the day, as described for spring and summer. Irrigate dry areas or wait until rain before treating if drought conditions exist.
SCALE INSECTS	Treatment is not effective.	Chemical control for ground pearls is not effective at any time of year. Proper fertilization, disease control and adequate irrigation is the best defense.	To control Rhodegrass scale, apply diazinon (5 fl. oz./1000 sq. ft./25 gal. plus wetting agent). Retreatment is usually necessary.	Treat as directed with diazinon for summer.

* See accompanying text for details; always follow label directions.