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HERBICIDE

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## RONSTAR SPREAD THE WORD.

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# INSECT CONTROL GUIDE

early April. Moth flights begin in April in southernmost areas and during May in more 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.

When necessary, a wide range of insecticides including diazinon, Proxol®, Aspon®, Sevin®, and others applied at labelled rates 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. 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.

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.

Generally the insecticides effective against sod webworm are also effective against cutworms. The principle of controlling these pests is to apply the insecticide late in the afternoon and allow night-feeding cutworms to contact the treated foliage. Irrigation following liquid application is therefore not advisable.

**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 home lawns 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.

If treatment is necessary, liquid diazinon or Dursban® will provide control.

**Clover mite**—Incidents of visible damage to home lawns has been seen in April in several Ohio cities and Denver, CO. Usually a nuisance pest in and around homes, the clover mite appeared in large numbers (5,000 per sq. ft.) 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 was often 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 distinguishes the clover mite from the winter grain mite.

Treatment with liquid diazinon (2.5 lb. AI/acre) or Dursban® (1 lb. AI/acre) readily provides control.

**Fire ants**—Fire ants are spreading across much of the South causing serious and painful injury to man and animals. 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 foraging for food.

Mound treatments include diazinon granules or drenches, various Dursban® formulations, Oftanol®, or MC-96® (trichloroethane). Read the label for specific directions for mound treatment. Do not disturb the mound before or during treatment.

Where mound treatment is impractical, the turf can be treated with Amdro® fire ant bait (no more than 1.5 lb. AI/acre). All the bait should be used within three days of opening. Retreatment during the fall is usually necessary.

## SUMMER (June-August)

**Chinchbugs**—In northern cool-season turf chinchbug eggs continue to hatch into June. Bright red nymphs appear. The number of chinchbugs increases rapidly in June and peaks in July when northern lawns can receive severe damage. This damage is often masked by summer dormancy of turf caused by drought.

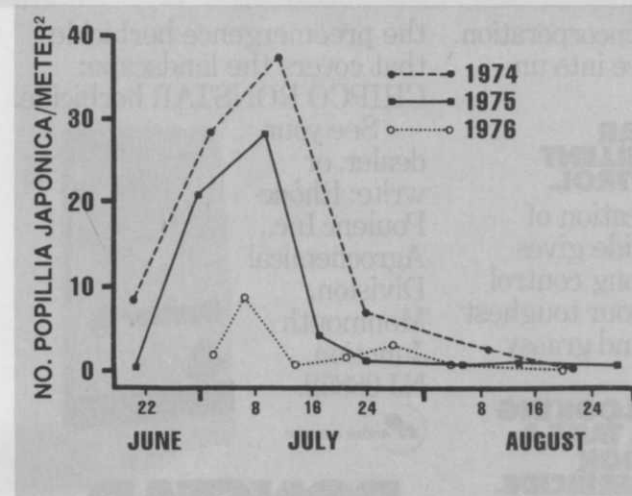
During August the nymphs molt into adults that mate, lay eggs, and produce a second generation. Some northern areas have only one generation per year.

Southern chinchbugs are not usually a problem in well-irrigated turf or during summers when rainfall is plentiful. Southern chinchbug-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.

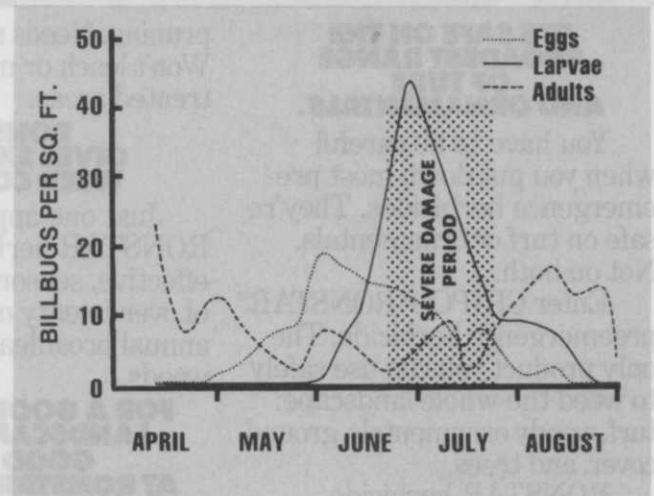
A wide range of insecticides may be used at label rates to control existing infestations. They include Dursban®, diazinon, Aspon®, and Sevin®. Treatments should be made before injury is severe, otherwise, damaged areas may not recover.

Areas of southern Florida have pockets of southern chinchbugs resistant to these insecticides. Pydrin®, Pounce®, or Baygon® may be substituted. Floratam St. Augustine, a chinchbug resistant variety, should

*continued on page 66*



Emergence of Japanese beetle, *Popillia Japonica*, adults from fescue sod in northern Georgia.



Life cycle of the bluegrass billbug in Ohio.

# Penncross is part of the tradition

*You won't see the "Penn Pals" listed on the leaderboard, but Penncross and Penneagle are as much a part of practically every major tournament as the leading money winners.*



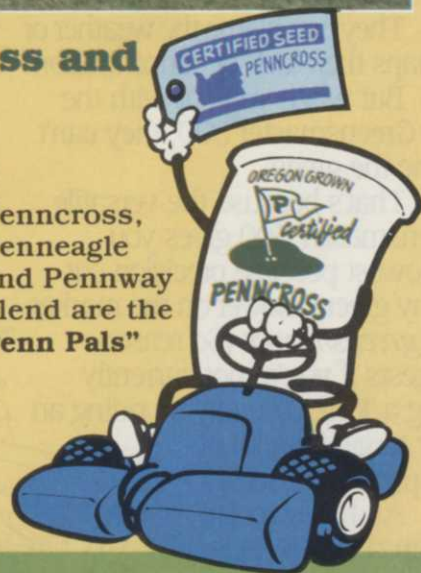
## **Sixteenth fairway overseeded with Penncross and triplex mowed, Oakland Hills C.C., Host of the 1985 U.S. Open, June 13-16.**

### **Birmingham, Michigan**

Ted Woehrle, superintendent at Oakland Hills C.C., has a plan to push out Poa annua on his fairways. In the Spring of 1983 Ted implemented a program of overseeding fairways with Penncross. By mowing with a triplex, and

collecting the clippings, this aggressive creeping bentgrass has been crowding out Poa at an impressive rate. Ted picked Penncross because his course has to look good for the U.S. Open, the Oakland Hills membership, and for Ted Woehrle, superintendent.

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They can blame the ball.  
They can blame the putter.  
They can blame the weather or perhaps their lack of concentration.

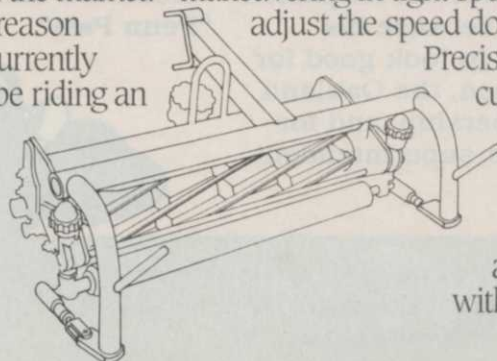
But when you cut with the Toro Greensmaster<sup>®</sup> 300, they can't blame the green.

That's because the versatile Greensmaster 300 gives you the lowest possible precision cut of any greensmower on the market. *Any greensmower.* (So reason suggests if you're not currently using a Toro, you may be riding an easy target for a lot of bad putting excuses.)

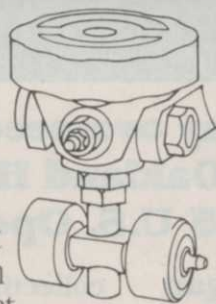
And now recent design changes and a new line of accessories enable you to custom

tailor the Greenmaster 300 to your specific maintenance practices and turf conditions.

To assure an accurate clip, an optional variable speed kit allows you to select a constant ground speed from 0 to 3.5 mph. For a finer clip at low heights of cut, or for easy maneuvering in tight spots, simply adjust the speed downward.



Precision cutting on greens and other formal areas is assured with the new



8 blade cutting unit available with our exclusive single-knob adjustment for maintaining a sharp cutting surface with a minimum of effort. Just a twist of your hand is all it takes.

And it virtually eliminates the need for backlapping.

We added new, heavier Wiehle rollers for greater penetration to maintain an even cut, even over your denser grasses.

Even at cuts below 1/8," the Greensmaster 300 delivers a consistent, precise cut due to the new direct suspension frame engineered to transfer additional downward pressure to the front roller.

be the green's fault.

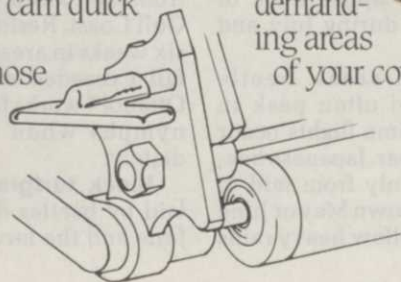


An extra-thin tournament bedknife is available for precision cuts down to 3/32!"

When you feel that backlapping is necessary, an optional kit is available for maintaining the leading edges of bedknives and reels at their sharpest levels.

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It may not put an end to your members' errant putts, but it will challenge some of them to come up with a better excuse.



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## Insect and Mite Resistance in Turf

by Roger H. Ratcliffe, Agricultural Research Service,  
Field Crops Lab, Beltsville, MD

Few turfgrass cultivars have been bred specifically for insect resistance. Experimental lines or cultivars, developed for other traits, have been reported to demonstrate varying levels of resistance or tolerance to insect or mite pests.

In many instances, resistance has been observed under field conditions in limited trials. The data obtained may not provide an adequate measure of the level of resistance or tolerance, since the expression of resistance will vary with the severity of natural infestations.

The response of cultivars bred specifically for insect resistance has been studied more thoroughly, and field performance can be predicted more accurately.

Recently, increased emphasis has been placed on developing turfgrass cultivars with insect resistance, in much the same way as selection for disease resistance has been conducted. This research has involved both laboratory and field evaluation of plants for sources of resistance to pests such as the fall armyworm, the southern chinchbug, hairy chinchbug, bluegrass billbug, greenbug, mole cricket, sod webworm, and several mite species. A summary of the results from this research is provided in Table 1, on page 68.

Two approaches are being taken to develop insect resistant

turfgrass cultivars. The first is selection for genetic sources of resistance within adapted cultivars or experimental materials (i.e. southern chinch bug resistance in 'Floritam' St. Augustinegrass).

A second approach is developing cultivars with induced resistance by infecting them with endophytic fungi. Resistance to sod webworm in 'Repell' perennial ryegrass is an example.

Repell has a high level of infection by the endophytic fungus *Acremonium coenophialum* Morgan-Jones and Gam. The fungus lives within the host plant, but does not injure it. Substances produced either by the fungus, or the plant in response to invasion by the fungus, cause resistance to some insects.

Endophyte-infected perennial ryegrass or tall fescue has demonstrated resistance to sod webworm, several aphid species (including the greenbug), billbug, and a *Hyperoides* species called the Argentine stem weevil. There are also indications from field studies of chinchbug resistance.

With the development of new or improved methods of selecting for insect resistance, greater emphasis will be directed to breeding insect resistant cultivars in the future. Presently, however, insecticides remain the major method for controlling major insect pest species. □

be the primary turf variety grown in more southern coastal areas and Florida where southern chinchbug is a problem.

**Billbugs**—The bluegrass billbug larvae feed in grass stems during June but move to the plant crowns and roots 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. During August the larvae burrow deeper into the soil to pupate and transform into adults.

Infestations discovered during this time may be treated at the same rates used for existing grub infestations with diazinon, Turcam®, and Proxol®. Irrigation or rain following application is needed for optimal results. If larvae are feeding in the root

zone, control may be difficult to achieve. Oftanol® applied during June should control feeding larvae and provide control of late summer grub infestations.

**Grubs**—By June, in cool-season areas, 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 of various species emerge and burrow into the soil to lay eggs. Hatching and appearance of young larvae occur during July and August.

In warm-season areas, beetle flights continue and often peak in June, although the time flights occur varies from year to year. Japanese beetle flights occur mainly from mid 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.

Oftanol® applied in June provides control of developing grubs during August as well as chinchbug and billbug larvae present in the turf at the time of application. Existing infestations of grubs found in August may be treated with Proxol®, Turcam®, Oftanol®, diazinon, or Mocap® (commercial turf only) at standard label rates. Sevin® (2-4 lb. AI/acre) is effective against the green June beetle larvae.

Extreme heat and drought during the summer may cause 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.

Poison baits have been 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 often must be repeated one or more times.

Bait formulations available include: 2% Baygon® (.5 lb./1,000 sq. ft.), 20% Sevin® (5-10 lb. bait/acre), 5% Dursban® (150 lb./acre or two applications of 75 lb./acre three weeks apart), and 2% malathion (100 lb./acre or two applications of 50 lb./acre three weeks apart).

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 2-3 days thereafter.

Residual control of mole crickets with Oftanol® (2 lb. AI/acre) may vary with location and amount of rainfall. Applications of Oftanol® have given up to 12 weeks control from the Florida panhandle along the Gulf Coast. Residual control was only six weeks in areas where August rainfall exceeded eight inches weekly. Oftanol® works faster on mole cricket nymphs when watered in immediately.

**Black turfgrass ateniuss**—Eggs laid by beetles during May hatch in June and the larvae begin feeding on



Insecticide-Nematicide

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CHIPCO MOCAP starts killing grubs as soon as you water it in. Other products take hours or days to work.

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For best results, apply CHIPCO MOCAP before grubs start to feed—usually in August or early September. But if grubs get the jump on you, you can still take control quickly and effectively with fast-acting CHIPCO MOCAP.

And fast action is just part of the story. CHIPCO MOCAP gives effective control of a broad spectrum of grubs.

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CHIPCO MOCAP knocks out a broad range of surface insects, including chinchbug and sod webworm. And if nematodes or mole crickets are destroying your turf, you can destroy them, too, with CHIPCO MOCAP.

For the fastest, most effective control of grubs and other turf pests, include CHIPCO MOCAP in your turfgrass management program. CHIPCO



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For more information write to Rhône-Poulenc, CHIPCO Department, P.O. Box 125, Monmouth Junction, NJ 08852



# CHIPCO® MOCAP® RUBS OUT GRUBS.

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# INSECT CONTROL GUIDE

**TABLE 1**  
**Summary of Insect and Mite Resistance in Turfgrasses**

Insect/Mite	Grass
<b>Bluegrass Billbug</b>	<i>Kentucky Bluegrass</i> - No resistant cultivars released. Lower larval counts and/or less injury reported on 'Aquila', 'Arista', 'Arboretum', 'Delta', 'Geary', 'NuDwarf', 'Nebraska Common', 'S-21', 'South Dakota Common', and 'Windsor'. <i>Perennial ryegrass</i> - Endophyte-induced resistance in 'Pennant' and 'Repell'. 'Repell' is the only cultivar developed specifically with endophyte-induced resistance to billbugs.
<b>Fall Armyworm</b>	<i>Bermudagrass</i> - Cultivars 'Tifton 44' and 'Tifton 292' show moderate and high resistance, respectively. Research is underway to incorporate resistance into good turf types.
<b>Hairy Chinch Bug</b>	<i>Kentucky Bluegrass</i> - No resistant cultivars released. In laboratory tests 'Baron' and 'Newport' demonstrated higher levels of tolerance to adult feeding. <i>Fine-leaf fescues</i> - No resistant cultivars released. In field trials 76G1-322, FL-1, MomFrr 25, MomFrr 33, FRT 3, and 'Silvana' were least damaged. <i>Perennial ryegrass</i> - In field trials 'Manhattan', 'Pennfine' and 'Score' were least damaged.
<b>Southern Chinch Bug</b>	<i>St. Augustinegrass</i> - 'Floritam' and 'Floralawn' are resistant cultivars. 'Floralawn' is a new cultivar soon to be released by the Florida Agricultural Experiment Station. A third cultivar, 'Floratine' demonstrates a moderate level of tolerance.
<b>Greenbug</b>	<i>Kentucky Bluegrass</i> - No resistant cultivars released. Good progress has been made in selecting for resistance in adapted cultivars. Resistant germplasm is under development.
<b>Sod Webworm</b>	<i>Kentucky Bluegrass</i> - No resistant cultivars released. Kentucky-grown 'Kentucky Common' reported to be less damaged by <i>Crambus</i> species. <i>Bermudagrass</i> - No resistant cultivars released. Differences in response of tropical sod webworm ( <i>Herpetogramma phaeopteralis</i> Guenee) and grass webworm ( <i>H. licarsialis</i> Walker) reported on strains and some cultivars. 'Common' and 'Tifway' showed the least feeding damage by grass webworm. 'Common' and FB-119 showed more tolerance to tropical sod webworm than 'Tifway' and 'Tifgreen'. <i>St. Augustinegrass</i> - 'Roselawn' reported as less preferred by tropical sod webworm than 'Bitter Blue', 'Scotts 1081', 'Florida Common' and three Florida accessions. <i>Perennial ryegrass</i> - Endophyte-induced resistance to complex of <i>Crambus</i> species in 'Pennant' and 'Repell'.
<b>Mole Crickets</b>	<i>Bermudagrass</i> and <i>Bahiagrass</i> - No resistant cultivars released. Some genotypes have shown little reduction in root and shoot growth after several months of exposure to mole crickets which severely damaged 'Tifway' and 'Tifgreen'.
<b>Banks Grass Mite</b>	<i>Zoysiagrass</i> - No resistant cultivars. A genotype of <i>Zoysia tenuifolia</i> was reported as highly resistant.
<b>Bermudagrass Stunt Mite</b>	<i>Bermudagrass</i> - FB-119 (Franklin), a medium-to-coarse textured bermudagrass cultivar, is highly resistant.

the turf roots immediately.

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.

If preventative applications of insecticide were not made, existing infestations may be spot or generally treated with Proxol, Turcam, diazinon, or Mocap at label rates.

**Sod webworms**—Damage from sod webworm larvae occurs occasionally in most of the cool-season turf region. Injury is more common in midwestern 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.

In warm season areas 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 flight.

Formulations of Dursban, diazinon, Sevin, Proxol, or Aspon applied at labelled rates provide control. Retreatment may be necessary depending upon the location and number of generations.

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

Cutworm larvae can be controlled with a wide range of insecticides at label rates; including Dursban, Proxol, Aspon, Sevin, and others. Irrigation following liquid applications is generally not advisable.

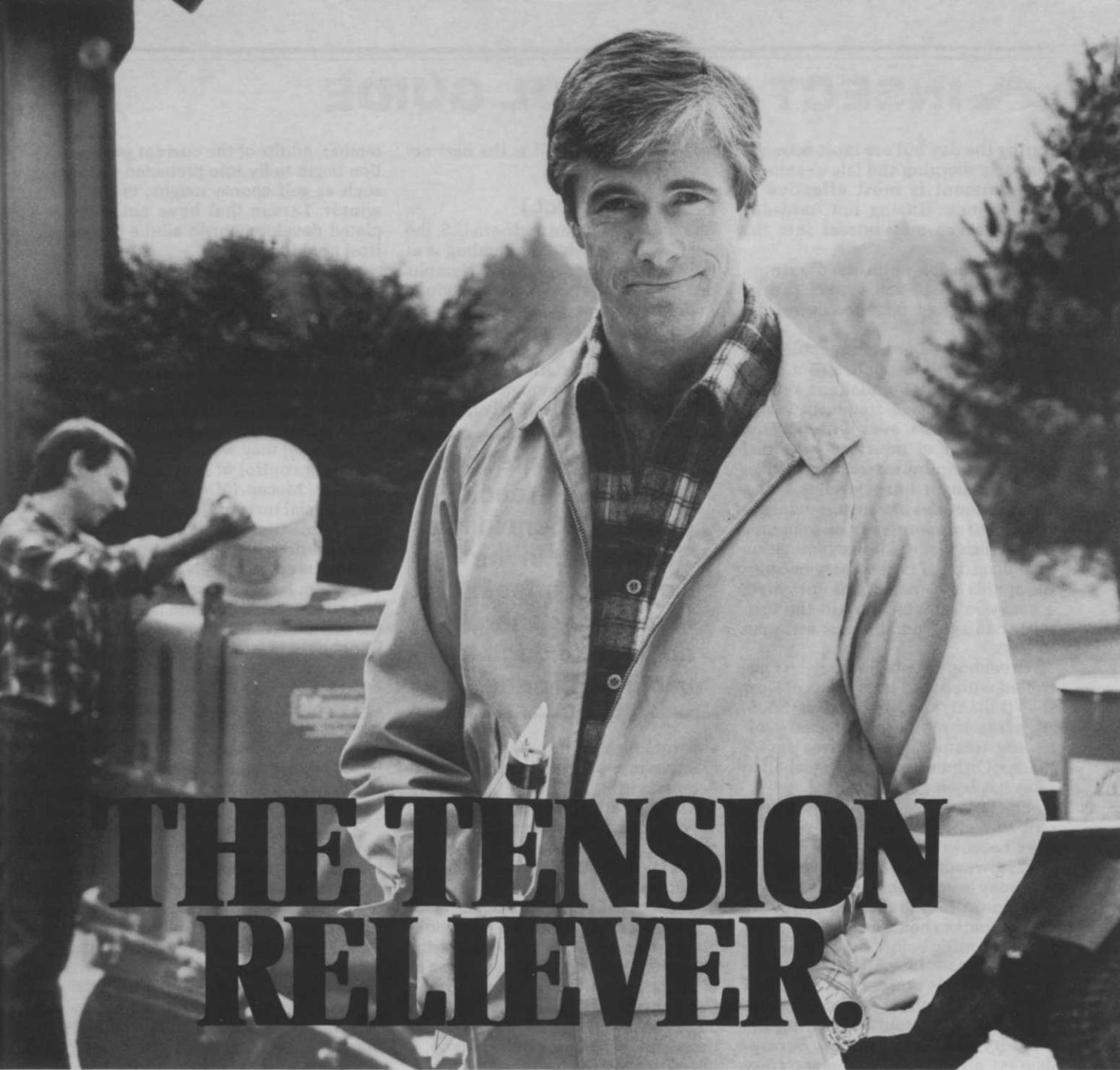
**Fall armyworm**—The fall armyworm is seldom a problem of cool-season turf.

But 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





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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.

Insecticides such as diazinon, Sevin, Dursban, and Proxol can be used at labelled rates to control fall armyworm.

**Greenbug**—Damaging populations of greenbug can occur from June through August. Populations and incidents of damage frequently varies 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. Little damage from this pest was seen in 1983.

Greenbug infestation may be controlled with liquid treatments of Dursban (1 lb. AI/acre) or diazinon (2.5 lb. AI/acre). If reinfestation occurs following treatment with these insecticides, Orthene (acephate) at labelled rates has been effective.

**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 day.

**Scale insects**—Although Rhodgrass 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. Several treatments with diazinon and a wetting agent are required for control to be effective.

Ground pearls are scale insects that live in the soil throughout the year, sometimes 8-10 inches deep. In the spring eggs hatch producing nymphs. The nymphs feed throughout the summer by piercing turf roots and extracting plant fluids.

Chemical control has not been effective for ground pearls 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 overfertilization or drought. Proper fertilization, disease control, and adequate irrigation to

maintain healthy turf is the best defense.

## FALL (Sept.-Oct.)

**Chinchbugs**—In the northern U.S. the second generation of chinchbug is at peak numbers in September. Nymphs complete their development to adults in late October. Most chinchbugs 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

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## Second generation chinchbugs reach peak numbers in late September in the North, but infestation levels are generally not high enough to use insecticides.

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and infection by a parasitic fungus (*Beauveria* spp.) usually provides sufficient control.

Damage by southern chinchbug may continue in untreated areas. Late summer applications of insecticide usually make fall treatment unnecessary.

**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 the turf.

**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.

Treatments of existing grub infestations can be accomplished as late as early to mid-September, using standard grub insecticides and sufficient (1/2-inch or more) irrigation. 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.

**Black turfgrass ataenius**—By Sep-

tember, 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.

**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 at this time. Damage becomes obvious as turf growth slows.

Sprays of diazinon (5-6 lb. AI/acre) or Turcam (2 lb. AI/acre) may have to be repeated several times. Oftanol (2 lb. AI/acre) may work too slowly for adequate control of large crickets in October. Mocap 10G (10 lb. AI/acre, commercial turf only) is usually effective at this time providing up to four weeks residual control.

**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.

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 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. Use diazinon, Sevin, Dursban, or Proxol.

**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 of diazinon, Dursban, Orthene, Amdro® bait or MC-96. Larger infested areas where mound treatment is impractical can be treated with Amedro fire ant bait (1.5 lb./acre).

**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 reexamined when mild temperatures extend late into the fall. Heavily infested turf will not survive through winter.

Late fall infestations may be controlled with the same insecticides used to control the pest during the summer.