

Warm-season turf insect control

Mole cricket and spittlebug control is getting most of the research. The future looks bright, thanks to nematodes.

The adult two-lined spittlebug is best controlled in the adult stage, usually in June and August in Florida.

Photo by James Castner



Mole cricket control is improving, due to research with nematodes and sub-surface injection.

Photo by James Castner

by Don Short, Ph.D.

Managing turf insects in the South is a never-ending challenge. Mole crickets continue to be the most troublesome insect pest in Florida and several other southeastern states. Spittlebugs have been causing more concern during recent years, primarily in north and northwest Florida. Tropical sod webworms, chinch bugs and fire ants make their presence known yearly.

Mole crickets—The major thrust of turf insect research in Florida is biologically controlling mole crickets with the nematode *Steinernema scapterisci* and the red-eyed Brazilian fly *Ormia depleta*. These natural enemies of mole crickets, imported from South America, are specific parasites of mole crickets and harmless to non-target organisms. The nematodes cause death by bacterial poisoning, the fly by depositing live maggots on or near the mole crickets.

Efforts with these two parasites seem to be paying off. The red-eyed fly, released in 1988, has spread to 30 Florida counties. The nematode now populates 13 Florida counties. Fifty-three percent of golf course super-

intendents in south Florida counties reported in 1991 either the same or less mole cricket damage than in previous years. None reported more mole cricket activity.

Cultural practices—Cultural practices can greatly influence the susceptibility of turfgrasses to insects and related pests. Here are some tips:

1) Do not over-apply water-soluble inorganic nitrogen fertilizers. They force rapid succulent growth that acts as an attractant and substantially increases the chances of insect attack. Pest damage, especially from chinch bugs and sod webworms, can be greatly reduced by using slow-release nitrogen fertilizers in combination with other nutrients.

2) Mow, water and fertilize properly to prevent thatch, which is an excellent habitat for chinch bugs and turf caterpillars and chemically ties up insecticides, thus reducing their effectiveness.

Proper mowing can make the grass more tolerant to pests and greatly reduce thatch build-up. Proper mowing heights:

St. Augustinegrass..... 3 to 3-1/2 inches
St. Augustine (shaded)..... 4 inches

centipede grass..... 1-1/2 to 2 inches
common bermudagrass..... 1/2 to 2 inches
hybrid bermudagrass..... 1/4 to 3/4 inch
bahia grass..... 3 to 4 inches

Sharpen the mower blade frequently. To minimize stress on the grass and reduce thatch problems, mow often enough so that no more than one-third of the grass blade is removed at each mowing.

3) Do not routinely collect clippings. The only two instances when they should be removed: to prevent the spread of a disease or weed problem, and when the grass has grown excessively tall. Never mow when the grass is wet since this can disperse disease.

4) Do not irrigate until the grass begins to wilt or turns a blue-green color, or footprints on the grass remain compressed for more than a few seconds. Irrigate with 3/4 to 1 inch of water and do not irrigate again until the above symptoms reappear. This encourages a deep, vigorous root system.

Soil injection—Injection or sub-surface placement of both liquid and granular insecticides, is becoming more popular for control

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when sodding or seeding, p. 56**

TREATING WARM-SEASON TURF FOR INSECTS

PEST	SUGGESTED PESTICIDE	TIMING	APPLICATION
Mole Crickets	Crusade 5G Mocap 10G* Oftanol 2 Oftanol 5G Orthene turf, tree and ornamental spray Pageant DF Triumph 4E*** Turcam 2.5G Dursban bait	In large turf areas, map and make note of tunnelling (egg-laying) activity during spring months for treatment after nymphs hatch. Middle to late June after most nymphs have hatched and are still small is the optimum time for pesticide application. Spring treatment is optional. Orthene may reduce adult tunnelling somewhat. It is more important to keep damaged areas packed down and grass roots in contact with the soil. Irrigate and fertilize as recommended for grass variety.	Irrigate before treatment if turf is not moist. Treat as late in the afternoon as is practical. Follow label for post-treatment irrigation directions.
Sod webworms	<i>Bacillus thuringiensis</i> Crusade 5G Diazinon 4E** Dursban Pageant DF Proxol Orthene Tempo 2 Triumph 4E*** Turcam	In Florida, the major species is the tropical sod webworm. Populations usually do not build up until June in south Florida, July in central, and August in north Florida.	Delay mowing and irrigation for 24 hours after treatment.
Spittlebugs	Diazinon 4E** Dursban	Control is usually more successful when most of the population is in the adult stage. Usually June and August in Florida. Damage usually begins in shaded areas.	Mow and dispose of clippings before applying a pesticide. Irrigation several hours before treatment will improve control.
Chinch bugs	Crusade 5G Diazinon 4E** Dursban Oftanol Orthene Pageant DF Tempo 2 Triumph 4E***	Replace turf with resistant variety. More of a problem in dry weather. Monitor St. Augustinegrass weekly, concentrating on sunny areas. Treat when damage begins to appear.	Apply additional spray volume if thatch is present. In limited experiments, granules appear to be more effective in heavily-thatched turf.
Grubs	Crusade 5G Diazinon 4E** Proxol Mocap 10G* Oftanol Sevin Triumph 4E*** Turcam 2.5G	Early June is probably the optimum time for most species.	Keep the soil moist for several days before treatment to encourage the grubs to come close to the soil surface. Apply as late in the p.m. as possible and irrigate before the insecticide dries on the grass blades.
Billbugs	Crusade 5G Diazinon 4E** Proxol Mocal 10G* Oftanol Sevin Triumph 4E*** Turcam 2.5G	Most effective control is obtained in late spring or early summer.	Same as for grubs.
Ground pearls	None have been found to be effective.	When approved fertilization, irrigation, mowing and nematode management practices are followed, grass will usually not be obviously affected.	
Fire ants	Amdro bait Logic bait Dursban Orthene	Treat only when soil surface temperatures are between 60-80 degrees F. Do not apply during the heat of the day.	Irrigate before application. Use one bait and follow with Dursban or Orthene in 5-7 days. Be sure baits are fresh.

*Mocap 10G is labelled for commercial turf only (golf courses, sod farms).

**Diazinon is not labeled for use on golf courses or sod farms.

***Triumph 4E is restricted to certain soil types and several application techniques must be followed. It is labeled for use on lawns, sod farms and golf courses (only tees, greens and aprons). A maximum of one application per year is permitted for the higher surface insect rate and a maximum of two applications per year at least 60 days apart for the lower surface insect rate.

Source: Dr. Don Short

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of mole crickets, other soil insects and nematodes in large turf areas.

The benefits are obvious: (1) lower rates; (2) reduced risk to human and animal exposure; (3) less odor; (4) reduced run-off and drift; (5) minimal ultra-violet degradation; (6) less pesticide bound up in thatch; (7) greater exposure to the pests; and (8) longer residual activity.

Liquids are injected at up to 2,000 psi, depending on soil type, as pesticides are forced 1/8 to 1-1/2 inches into the soil. In Florida, we conducted mole cricket field tests on golf courses, injecting at 1,200 psi and getting 1/2- to 3/4-inch penetration on bermudagrass fairways.

Excellent results were obtained with Dursban at 2 lbs. Ai/A compared to poor control at higher rates when surface-applied with a conventional boom sprayer.

On home lawns, we have experimented with the Nemajet, a hand-held injection device that was used several years ago to inject nematocides. Excellent mole cricket control was obtained with only 100 to 150 psi at the nozzle. It is somewhat more time-consuming than a hand gun, but control is much better and the same benefits are realized as with the larger machines. Landscape managers should seriously consider this method of application on small turf areas for control of mole crickets, grubs and billbugs.

Probably the most common equipment for sub-surface granular application on large turf areas is the Dol Overseeder, originally developed for seeding small grain and grass. The seeder puts the insecticide 1/2-inch below the soil surface where the mole crickets are active. There is no dust, and little—if any—odor. Several insecticides now include label directions for sub-surface applications, including Dursban, Turcam and Mocap.

—The author is professor and extension entomologist for the Department of Entomology and Nematology, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, Fla.

New insecticides

■ At least two new insecticides are hitting your distributor's shelves this year: Merit from Miles, Inc., and Mainstay 2G from Lesco, Inc.

Merit (test code NTN-33893) features totally new chemistry, according to Jim Dotson, Miles' turf and ornamental research product manager. Its common name is imidacloprid, a member of the chloronicotinyl group of chemicals. Merit, which will carry a label for soil insects, has shown to be very effective against white grub species. According to Dotson, it may also have "outstanding potential for mole cricket control."

When Merit's label becomes EPA approved, it will be available on a limited basis.

Mainstay is a 2% formulation of fonofos, which is also the active ingredient in Crusade. It is labelled for use on mole crickets, grubs, chinch bugs, billbugs, sod webworms, fire ants and other turf pests. Lesco is now taking orders for Mainstay.

New formulations of other insecticides include a Dylox 6.2 from Miles and a dry flowable (DF) formulation of DowElanco's Pageant.

—Jerry Roche

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Cool-season turf insect control

The wet summer of '92 suppressed much pest activity. But a normal weather pattern in July and August this year will bring the grubs back.



Billbug adult populations are reduced by *Beauvaria* spp., an entomopathogenic fungus.



The entomopathogenic fungus *Beauvaria*, was also effective against chinch bugs in the summer of 1992.

by Harry Niemczyk, Ph.D.

■ The summer of 1992 in the North Central states was the coolest, cloudiest, and—in some areas—the wettest on record. These weather factors had a major influence on suppressing damage from chinch bugs, billbugs and grubs.

The entomopathogenic fungus *Beauvaria*, which is especially ineffective under moist conditions, killed many chinch bugs. The cool temperatures and cloudy skies of July created a less-than-optimal condition for Japanese beetles to lay their eggs. Some egg laying did occur later in the summer, and caused infestations to appear in late September and October. In general, however, grub infestations and damage was down from previous years.

What effect will this have on damage potentials for 1993? If we have a normal summer, especially during July and August, do not expect much relief from grubs. Billbugs are ever present. Chinch bugs may be slow to recover after 1992, but keep in mind they have two generations each year to recover in most of the cool-season region.

What's new—Interest in and consumer demand for non-chemical controls

for insects remains high. While field evaluation of various agents continues, the results are not exactly "exciting." It is unlikely that any single agent will control damage from turfgrass insect pests as well as chemical insecticides do. It is more likely that their role, either singly or collectively, will be to act as suppressing agents to hold population levels below a threshold which would require the use of insecticides.

Insecticides: Miles, Inc. (formerly Mobay), has applied for conditional registration of a new insecticide, Merit (imidacloprid), a new, low-toxic, broad spectrum, systemic insecticide for control of grubs and some sucking insects. The results of field evaluations over the past three years have shown this material to be very effective against a broad range of grub species. If full registration is obtained as expected in the first half of 1993, full-scale marketing is expected in 1994.

O.M. Scott & Sons has announced registration of Turplex bio-insecticide to be sold to golf and other selected professional markets for control of cutworm, armyworm and sod webworm in turfgrasses. The active ingredient, azadirachtin, interferes with the normal development of the

insect (insect growth regulator—IGR) and is extracted from the seed of the neem tree, which originated in India and Burma. Test results at Ohio State University and other locations have shown that target pests die in three to 15 days after application, but that feeding usually ceases before mortality occurs.

IPM the one constant: Knowledge about the lifecycle of pests in any specific area and determining the need for treatment based on evaluation of populations at vulnerable periods during the insect's lifecycle, remains the key to successful control. The concept of IPM—intelligent plant management—depends upon this principle.

Seasonal occurrences of some of the cool-season insect pests in this region and some of the insecticides that may be effective in reducing damage from them are listed on page 52. No endorsement of products is intended, nor is criticism implied of those not mentioned here.

—Dr. Niemczyk is Professor Emeritus and Turfgrass Insect Research Coordinator at The Ohio State University's Agricultural Research & Development Center in Wooster, Ohio.

Cool-season insect control strategies

Pest	Spring April-May	Summer June-August	Fall-early winter Sept.-December
Chinch bugs	When summer damage expected, preventive application of liquid or granular Dursban (1 lb. ai/A); Triumph ¹ (1 lb. ai/A) may be used as soon as bugs are active. Complete applications of insecticides by first week in May.	Treat before severe injury with Dursban (1 lb. ai/A); diazinon ^{**} (2.5-5.5 lbs. ai/A); Crusade ² (3-4 lb. ai/A) or other labeled insecticides.	Treat if needed. Generally, infestation not high enough to warrant insecticides.
Billbugs	Same as for chinch bugs.	Treat at grub rates with Triumph ¹ , diazinon ^{**} , Turcam, Mocap or Sevimol. App. in mid-late June most effective. Irrigate following application.	Treatment usually not appropriate at this time.
Sod webworms	Overwintered larvae can cause damage in April or May. When necessary, apply diazinon ^{**} (5 lb. ai/A); Triumph ¹ (1 lb. ai/A); Dylox or Proxol (6-8 lb. ai/A). Crusade ² (3-4 lbs. ai/A) Use flush of water/liquid detergent to scout for infestation level.	Apply when damage is seen, or larvae are present. Use Dursban (1 lb. ai/A), Triumph ¹ (1 lb. ai/A) diazinon ^{**} (5 lbs. ai/A); Sevin-Sevimol (6-8 lbs. ai/A); Proxol-Dylox (6-8 lbs. ai/A); Crusade ² (3-4 lbs. ai/A) or other labeled products.	Larvae cause little damage at this time. Treat in Sept. to reduce spring population.
Cutworms	Use insecticides that are effective against sod webworms. Apply late in the afternoon. Do not irrigate after liquid applications. Irrigate granular applications.	Use Orthene (1-3 lbs. ai/A); Dursban (1 lb. ai/A); Triumph ¹ (1 lb. ai/A); Proxol-Dylox (8 lbs. ai/A); Crusade ² (3-4 lbs. ai/A) Do not irrigate after liquid applications. Irrigate granular applications.	Same as for summer.
Greenbug aphid	Aphid numbers too low to detect.	Orthene (1 lb. ai/A); Dursban (1 lb. ai/A); diazinon ^{**} (2.5 lbs. ai/A)	Severe infestations may occur as late as Dec. Use same insecticides as in summer.
Grain mites	If treatment is needed, use liquid diazinon ^{**} (2-3 lbs. ai/A) or Dursban (1 lb. ai/A). Avoid repeated use of Sevin-Sevimol.	If needed, use spring treatment.	If infestations develop in December, use summer treatment.
Grubs	If treatment of overwintered grubs is needed, apply when all grubs are in the first two inches of surface soil. General or spot treatment with Triumph ¹ (2 lbs. ai/A); Oftanol, Sevin-Sevimol or Mocap (5 lbs. ai/A) or Turcam (2-4 lbs. ai/A) may be used. Crusade ² (4 lbs. ai/A). Irrigate as soon as possible after application. Green June beetle larvae are difficult to control at this time. Sevimol (2-4 lbs. ai/A) may be effective.	Existing grubs found in July or August may be treated with Triumph ¹ , Dylox, Proxol, Turcam, Oftanol, Sevin-Sevimol or Mocap. Apply at label rates. Crusade ² 4 lbs. ai/A. If soil and/or thatch is dry, irrigate thoroughly before and as soon as possible after app. Treat green June beetle with Sevin (2-4 lbs. ai/A)	Treatment can be made as late as mid-late Sept. as long as grubs stay in first inch of surface soil. Triumph ¹ , Mocap, Dylox-Proxol at label rates may be effective
Black turfgrass ateniaus	Dursban (1-2 lbs. ai/A) applied to fairways in April for control of overwintered, egg-laying adults, reduces potential for summer larval infestations. Retreatment after two weeks will provide best control.	If preventive applications were not made, spot or generally treat with Triumph ¹ (2 lbs. ai/A); Proxol Dylox (8 lbs. ai/A); Turcam (2-4 lbs. ai/A); Crusade ² (4 lbs. ai/A); or Mocap (5 lbs. ai/A) as needed.	Undeveloped larvae die with development of ground frost.

¹ For use only by commercial lawn pest control personnel, and only on golf course tees, greens and aprons, and on sod farms. See soil restrictions.

² For use in professional turf areas such as golf courses and commercial sod.

^{**} Diazinon may not be used on golf courses of sod farms.

Source: Dr. Niemczyk

Sodding vs. seeding: what's the best bet?

by Ronald C. Smith, Ph.D.

■ A healthy stand of turfgrass controls soil erosion, reduced dust, controls soil temperature, recharges groundwater, and reduces noise levels. In addition, it simply looks great, setting off a well-designed and installed landscape planting.

The four ways in which turfgrass is established are: seeding, sprigging, stolozing and sodding. But no matter how you intend to establish turfgrass, proper soil preparation goes a long way to assuring success (see sidebar).

Seeding—To establish by seeding, here are some helpful hints:

● **Buy quality seed.** Purchase seed based on purity (the percentage of pure seed of the species being planted) and germination (the percentage of that species that can be expected to germinate). The higher these percentages are, the better; and the lower the "inert matter," "weed seed" and "other crop" that shows up on the label, the better. This is not the place to cut corners.

● **Apply the seed at the proper rate** for the species: Kentucky bluegrass at 1 lb./1000 sq.ft.; tall fescue or perennial ryegrass at 7 lbs./1000 sq.ft.; fine fescues at

3.5 lbs./1000sq.ft. In the contracting business, the tendency is to go heavier when in doubt, pushing the seed count to 25 to 30 seeds per square inch. This results in an excellent flush of dense growth, but creates problems with maturation of the stand, leading to possible die-out from diseases.

The methods of seed application vary widely—from a simple drop spreader, to a cultipacker, or to a hydroseeder (see chart).

Sodding—All four types of sod—mineral or upland grown sod, peat sod, washed sod, and biosod—result in an "instant lawn" which provides immediate soil stabilization.

Sodded turfs, like those that are being established from seed, need irrigation for successful establishment. With mature, properly harvested and handled sod, less overall water is needed than the seeded sites. This requires controller adjustments on the part of the contractor, or educational efforts directed at the property owner, to reduce watering frequency once the sod has rooted in.

Sod that is originally weed-free is a commonplace expectation from quality sod growers, thanks to good management practices and intelligent use of herbicides

Smith: Buy seed based on purity, germination



on their part. This virtual elimination of weeds for at least a year, if not indefinitely, is in stark contrast to the landowner needing repeat applications of herbicides for anywhere from one to three years before satisfactory control is achieved.

The professional sod grower has the seeding rate down to a science, resulting in a quickly matured sod that efficiently uses fertilizer and water, competitively crowds out many weeds, and has essentially no disease problems.

Modern sod harvesting equipment carefully cuts at a uniform thickness—as thin as possible to allow for quicker establishment—so the end user has a smooth, finished surface, even before rooting takes place.

Growers like Harley's Sod of North Branch, Minn., track results from turfgrass researchers at regional universities. This allows them to continually improve their seed blends and mixes, selecting grass cultivars that have proven to have the most enduring qualities for their

Preparing the seedbed

■ Since the landscape contractor often inherits a property where construction rubble is buried a couple of inches below the soil surface, here are the proper steps in soil preparation:

1) Deep till any compacted soil or, if the soil is too heavy, use a chisel plow. Follow this with a rough disking or harrowing, leaving the surface rough to allow for a more gradual transition between the topsoil and subsoil. This rough grading establishes the surface drainage patterns for the turf's final grade.

2) Uniformly spread topsoil over the subsoil at a depth of four to six inches—the deeper the better.

To figure out how much topsoil is needed for an area, calculate it on the basis of about 3.5 cu.yds. needed for every 1000 sq.ft. and 1 inch of depth. For example, a 10,000 sq.ft. area, requiring topsoil six inches deep would need about 210 cu.yds. of soil ($3.5 \times 10 \times 6 = 210$).

3) Check the topsoil for pH, phosphorus, potassium and organic matter content. If organic matter is not 3 percent or more, add some in the form of peat or humus, to bring it to between 3 and 5 percent.

4) Remove any rhizomes that may be visible as the topsoil is being graded. These could be the residue of quackgrass

or Canadian thistle and could cause a considerable problem in trying to get a quality turf established. Certainly, any rock or debris should be removed as well. The final surface should be firm, granular and slightly moist to assure good contact between the applied seed or sod.

5) Work in any necessary fertilizer materials, based on soil test results.

It has all too often been noted that this phase of turf establishment is an effort to save money or to win the bid. Suffice it to say that cutting corners here will simply result in compounded problems later.

—R.C.S.



Slit-seeding results in minimum soil disturbance, greatly reducing potential for off-site pollution and weed problems.

after installation, the watering frequency should be reduced to match the weather conditions and site exposure. This generally

means that most sodded turf areas can

look pretty good on about 1 to 1-1/2 inches of water per week. On a 10,000 sq.ft. lawn, this amounts to between 6,000 and 9,000 gallons of water per week.

● **Shallow perched water tables** where sod is to be laid on heavy clay soil can be avoided by developing a "transition zone." Work about 1/2-inch of peat moss into the top inch or two of soil so that the change between soil types is not so abrupt.

Conclusion—The choice of turf establishment is often a budget-driven process. Seeding may cost one-fifth to one-eighth that of sodding, but I have never known a client who was unhappy with a proper sod job. Neither have I known anyone who

region. Most growers use certified seed which assures genetic purity of the cultivars. Many northern growers use such dependable cultivars as Touchdown, Adelphi, Glade, Rugby, Trenton, Ram I and many others.

Some sodding failures are a possibility, most stemming from poor seedbed preparation (see sidebar). Other problems:

● **Bad edges** that are not firmed enough to make good contact with the soil, resulting in edge drying and weed invasion. This is eliminated by light rolling as the sod is laid.

● **Over-applying water.** Ten to 14 days

look pretty good on about 1 to 1-1/2 inches

Table 1. Methods of seeding

Method	Advantages	Disadvantages
spreaders	lowest initial investment best for homeowner situations	wind can carry seed seed needs dragging and mulching
cultipacker	excellent seed-to-soil contact best in commercial, flat areas leaves neat finished seedbed	seed needs mulching
hydroseeder	fastest method best in difficult-to-reach areas	leaves seed on top of soil

Source: the author



Some tools require a lot of time and manpower ...

Table 2. Preferred methods of establishment

Situation	Seed, spread	Seed, hydro	Seed, cultipacker	Sod
urban construction site				●
shaded construction site		●		
athletic fields	●	●	●	●
mixed-use parks	●	●	●	●
home lawn renovation	● (shaded)			● (open)
highway, right-of-way		●		● (edging)

Source: the author

wanted to withhold final payment until full turf coverage was complete. Payment

decisions are often based on emotional judgment: a positive one results in faster payment than a negative one. Sod usually wins out in this circumstance.

Sod growers are able to produce weed-free sod in a short time, then harvest it efficiently with modern machinery.



Logically, where water is not readily available for establishment, then seeding would work well. Many a site has been hydroseeded initially, then watered until emergence with that hydroseeder—yielding a good stand of

grass for the purpose of that site.

—The author is an extension horticulturist and turfgrass specialist with North Dakota State University, Fargo.

Correction

- The chart accompanying our February spring fertilization article incorrectly listed O.M. Scott & Sons' Poly-S fertilizer as containing methylene urea. Poly-S does not contain methylene urea. It is a polymer encapsulated urea, SCU.

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..... **Some don't.**