

Pest control information and recommendations for turfgrass

These recommendations have been compiled from several sources that were updated this past year, including cooperative extension publications from Cornell, The Ohio State and North Carolina State Universities. Our thanks to the Green Industry programs at these fine universities. Even so, they are still recommendations and may not apply to your area because of state and local regulations. While they indicate active ingredients that have been proven to be effective against particular pests —when used ac-

ording to label directions and under proper conditions — make sure there are no restrictions on their use in your market. When in doubt, check with Cooperative Extension or with the turfgrass and ornamental experts at your state land grant university.

Always read and follow label directions. When in doubt about a label's intent or the proper or most effective way to use a particular product, contact the manufacturer (use the toll-free number on the label) or visit the manufacturer's Web site.

TURF PEST INSECTS AND CHEMICAL CONTROLS

ARMYWORMS

Treat at first sign of damage. Use a soap flush to disclose populations.

Insecticidal treatment	Chemical class	Lbs. ai/acre
Azadirachtin	biological	0.02-0.43
<i>Bacillusthuringiensis kurstaki</i>	biological	0.67-1.67 qt/acre
<i>Beauveria bassiana</i> JW-1	biological	see label
Beta-cyfluthrin ^c	pyrethroid	0.046-0.07
Bifenthrin ^e	pyrethroid	0.05
Carbaryl	carbamate	2.0-4.0
Chlorpyrifos ^b	organophosphate	1.0
Cyfluthrin ^e	pyrethroid	0.1-0.2
Deltamethrin ^e	pyrethroid	0.08-0.13
Diazinon ^a	organophosphate	2.7-5.5
Halofenozide	growth regulator	1.0
<i>Heterorhabditis bacteriophora</i>	biological	(0.6-1.0 bill./acre)
Lambda-cyhalothrin ^e	pyrethroid	0.027-0.055
Permethrin ^c	pyrethroid	0.44-0.87
Spinosad	spinosyn	0.07 (small larvae), 0.4 (large larvae)
<i>Steinernema carpocapsae</i>	biological	(1.0 bill./acre)

BERMUDAGRASS MITE

Found in southern states

<i>Beauveria bassiana</i> JW-1	biological	see label
Bifenthrin ^e	pyrethroid	0.05-0.1
Deltamethrin ^e	pyrethroid	0.08-0.13
Diazinon ^a	organophosphate	2.7-4.0

BLUEGRASS BILLBUG ADULTS

Control adults when first noticed migrating in spring. Use pitfall traps to monitor adults of observe on warm, sunny days. Adults lay eggs in turf stems as soon as they become active.

<i>Beauveria bassiana</i> JW-1	biological	see label
Beta-cyfluthrin ^c	pyrethroid	0.046-0.07

Bifenthrin ^e	pyrethroid	0.05
Chlorpyrifos ^b	organophosphate	1.0
Cyfluthrin ^e	pyrethroid	0.1-0.2
Deltamethrin ^e	pyrethroid	0.08-0.13
Diazinon ^a	organophosphate	2.7-5.5
<i>Heterorhabditis bacteriophora</i>	biological	see label
Lambda-cyhalothrin ^e	pyrethroid	0.027-0.055
<i>Steinernema carpocapsae</i>	biological	see label

BLUEGRASS BILLBUG LARVAE

Control larvae in late spring. Thatch reduction and good irrigation improve efficacy of products.

<i>Beauveria bassiana</i> JW-1	biological	see label
Carbaryl	carbamate	2.0-4.0
Diazinon ^a	organophosphate	2.7-5.5
Halofenozide	growth regulator	1.0
<i>Heterorhabditis bacteriophora</i>	biological	see label
Imidacloprid	chloronicotinyl	0.3-0.4
<i>Steinernema carpocapsae</i>	biological	see label

CHINCH BUGS

Acephate	organophosphate	2.4-5.0
<i>Beauveria bassiana</i> JW-1	biological	see label
Beta-cyfluthrin ^c	pyrethroid	0.046-0.07
Bifenthrin ^e	pyrethroid	0.05
Carbaryl	carbamate	2.0-4.0
Chlorpyrifos ^b	organophosphate	1.0
Cyfluthrin ^e	pyrethroid	0.1-0.2
Deltamethrin ^e	pyrethroid	0.08-0.13
Diazinon ^a	organophosphate	2.7-5.5
<i>Heterorhabditis bacteriophora</i>	biological	see label
Imidacloprid	chloronicotinyl	0.40 (suppression only)
Lambda-cyhalothrin ^e	pyrethroid	0.027-0.055
Permethrin ^e	pyrethroid	0.44-0.87
<i>Steinernema carpocapsae</i>	biological	see label

■ CLOVER MITE

Insecticidal treatment	Chemical class	Lbs. ai/acre
Bifenthrin ^e	pyrethroid	0.05
Chlorpyrifos ^b	organophosphate	1.0
Deltamethrin ^e	pyrethroid	0.08-0.13
Diazinon ^a	organophosphate	2.7-5.5
Dicofol	organochlorine	0.46-0.92
Lambda-cyhalothrin ^e	pyrethroid	0.027-0.055

■ EUROPEAN CRANE FLY LARVAE

Carbaryl	carbamate	8.0
Chlorpyrifos ^b	organophosphate	1.0
Diazinon	organophosphate	2.7

■ GENERAL CRANE FLY LARVAE

Bifenthrin ^e	pyrethroid	0.05-0.1
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■ CUTWORMS

Acephate	organophosphate	2.4-5.0
Azadirachtin	biological	see label
Beta-cyfluthrin ^c	pyrethroid	0.046-0.07
Bifenthrin ^e	pyrethroid	0.05
Carbaryl	carbamate	2.0-4.0
Chlorpyrifos ^b	organophosphate	1.0
Cyfluthrin ^e	pyrethroid	0.1-0.2
Deltamethrin ^e	pyrethroid	0.08-0.13
Diazinon ^a	organophosphate	2.7-5.5
Halofenozide	growth regulator	1.0
<i>Heterorhabditis bacteriophora</i>	biological	see label
Imidacloprid	chloronicotinyl	0.3-0.4 (suppression only)
Lambda-cyhalothrin ^e	pyrethroid	0.027-0.055
Spinosad	spinosad	0.24 (small larvae), 0.4 (large larvae)
<i>Steinernema carpocapsae</i>	biological	see label
Trichlorfon	organophosphate	5.4-8.0

■ FALL ARMYWORM

Acephate	organophosphate	1.0-2.4
Azadirachtin	biological	0.02-0.43
Bifenthrin ^e	pyrethroid	0.05
Carbaryl	carbamate	2.0-4.0
Chlorpyrifos ^b	organophosphate	1.0
Halofenozide	growth regulator	1.0
Lambda-cyhalothrin ^e	pyrethroid	0.027-0.055
Spinosad	spinosad	0.07 (small larvae), 0.4 (large larvae)

<i>Steinernema carpocapsae</i>	biological	see label
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■ GREENBUG

Aphids		
Acephate	organophosphate	1.0
Chlorpyrifos ^b	organophosphate	1.0

■ MOLE CRICKETS

Imported mole crickets are pests of southern turf.

Acephate	organophosphate	2.0-4.0
<i>Beauveria bassiana</i> JW-1	biological	see label
Beta-cyfluthrin ^c	pyrethroid	0.046-0.07
Bifenthrin ^e	pyrethroid	0.05
Carbaryl	carbamate	2.0-4.0
Chlorpyrifos ^b	organophosphate	1.0
Cyfluthrin ^e	pyrethroid	0.1-0.2
Deltamethrin ^e	pyrethroid	0.08-0.13
Diazinon ^a	organophosphate	2.7-5.5
Fipronil	phenyl pyrazole	0.0125-0.025 (golf course and commercial grounds only)
Imidacloprid	chloronicotinyl	0.4
Lambda-cyhalothrin ^e	pyrethroid	0.027-0.055
Permethrine	pyrethroid	0.44-0.87
<i>Steinernema riobravus</i>	biological	see label
<i>Steinernema scapterisci</i>	biological	see label

■ SOD WEBWORMS

Acephate	organophosphate	2.4-5.0
Azadirachtin	biological	0.02-0.43
<i>Bacillus thuringiensis kurstaki</i>	biological	see label
<i>Beauveria bassiana</i> JW-1	biological	see label
Beta-cyfluthrin ^e	pyrethroid	0.046-0.07
Bifenthrin ^e	pyrethroid	0.05
Carbaryl	carbamate	2.0-4.0
Chlorpyrifos ^b	organophosphate	1.0
Cyfluthrin ^e	pyrethroid	0.1-0.2
Deltamethrin ^e	pyrethroid	0.08-0.13
Diazinon ^a	organophosphate	2.7-5.5
Fluvalinate	pyrethroid	0.05-0.16
Halofenozide	growth regulator	1.0
<i>Heterorhabditis bacteriophora</i>	biological	see label
Lambda-cyhalothrin ^e	pyrethroid	0.027-0.055
Permethrin ^c	pyrethroid	0.44-0.87
Spinosad	spinosad	0.24 (small larvae), 0.4 (large larvae)
<i>Steinernema carpocapsae</i>	biological	see label
Trichlorfon	organophosphate	5.4-8.0

TURF PEST INSECTS AND CHEMICAL CONTROLS (CONTINUED)

■ **WHITE GRUBS**

Japanese beetle, masked chafers, European chafers, Asiatic garden beetle, oriental beetle

<i>Bacillus popilliae</i> Japanese beetle only	biological	see label
<i>Beauveria bassiana</i> JW-1	biological	see label
Bifenthrin ^e	pyrethroid	0.1 (adults only)
Carbaryl	carbamate	8.0
Chlorpyrifos ^b	organophosphate	2.0-4.0
Cyfluthrin ^e	pyrethroid	0.2 (JP adults only)
Deltamethrin ^e	pyrethroid	0.08-0.13 (JP adults only)
Diazinon ^a	organophosphate	4.0-5.5
Halofenozide	grown regulator	1.5-2.0
<i>Heterorhabditis bacteriophora</i>	biological	see label
Imidacloprid	chloronicotinyl	0.3-0.4
Lambda-cyhalothrin ^e	pyrethroid	0.055 (suppression)
Permethrin ^c	pyrethroid	0.44-0.87
<i>Steinernema glaseri</i>	biological	see label
Trichlorfon		8.0

■ **MAY/JUNE BEETLES, PHYLLOPHAGA SPP**

Carbaryl	carbamate	8.0
Halofenozide	growth regulator	1.5
Imidacloprid	chloronicotinyl	0.3
Trichlorfon	organophosphate	8.0

■ **BLACK TURFGRASS ATAENIUS**

Acephate	organophosphate	3.0-4.0
<i>Beauveria bassiana</i> JW-1	biological	see label
Beta-cyfluthrin ^c	pyrethroid	0.07 (adults)
Bifenthrin ^e	pyrethroid	0.05-0.1 (adults)
Chlorpyrifos ^b	organophosphate	2.0-4.0
Halofenozide	growth regulator	1.5
Imidacloprid	chloronicotinyl	0.3-0.4
Lambda-cyhalothrin ^e	pyrethroid	0.055 (adults)
Spinosad	spinosad	0.4 (adults)
Trichlorfon	organophosphate	8.0

■ **GREEN JUNE BEETLE**

<i>Beauveria bassiana</i> JW-1	biological	see label
Carbaryl	carbamate	2.0-4.0
Halofenozide	growth regulator	1.5
Trichlorfon	organophosphate	8.0

^a Not registered for use on golf courses or sod farms.

^b Not to be used on residential turf.

^c For home lawns only.

^d Actual formulation

^e Different trade names exist for golf course, sod farms and other turf areas

SOURCE: "2002 MANAGEMENT OF TURFGRASS PESTS," OHIO STATE UNIVERSITY EXTENSION

Grub identification tips

BY PAT VITNUM, PH.D.

Two factors in determining how to control grubs in your turf are: 1. identifying which grubs are attacking your turfgrass, and 2. figuring out how many there are.

To identify grub species, inspect the shape of the anal slit and the pattern of hairs on its posterior. Use a hand lens; it makes the job a lot easier. Next, figure out what the threshold is that grubs must cross before they seriously damage the turf.

The following are some identifying characteristics of each grub species and ac-

tion thresholds for each. Use this information strictly as a guide. It serves as a way to compare damage potential between species.

Japanese beetles

Identifier: Transverse anal slit and a v-shaped row of spines just in front of the slit, pointing toward the head.

Range: Found east of the Mississippi River and north of central Georgia. They're also beginning to show up in parts of Minnesota and some of the Central Plains.

Action threshold: Six to 15 grubs per sq. ft. in moderately maintained turfgrass.

European chafers

Identifier: Branched anal slit and two almost parallel rows of spines that look like an opening zipper.

Range: Eastern third of Massachusetts, Rhode Island and along the Erie Canal in New York, southern New Hampshire and southern Maine. Other areas of infestation include the shores of the Great Lakes and parts of southern Michigan.

Action threshold: five to 10 grubs per sq. ft.

Oriental beetles

Identifier: A transverse anal slit (like the Japanese beetle) and two almost parallel rows of spines

Range: Coastal New England (including most of Rhode Island and Connecticut), Long Island, eastern New Jersey and parts of Pennsylvania, with populations also reported along the Connecticut River and perhaps into southern Vermont and New Hampshire. Other locations will probably be confirmed through pheromone trapping.

Action threshold: Six to 15 grubs per sq. ft.

Asiatic garden beetles

Identifier: Branched anal slit with a distinct semicircle of spines just in front of the slit.

Range: Throughout the Northeast and Midwest.

Action threshold: 10 to 20 grubs per sq. ft.

Northern and southern masked chafers

Identifier: Transverse anal slit. Spines are scattered with no obvious pattern.

Range: Throughout the Northeast and Midwest but are more common in the Midwest and Plains states.

Action threshold: Eight to 20 grubs per sq. ft.

Green June beetles

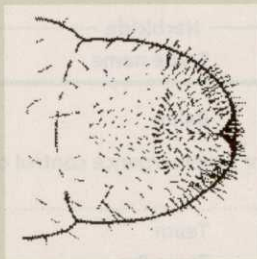
Identifier: Transverse anal slit and two fairly compact parallel rows of spines. These grubs have short legs that aren't used for locomotion.

Range: Eastern U.S., from southeastern New York to Florida and westward to Texas and Kansas.

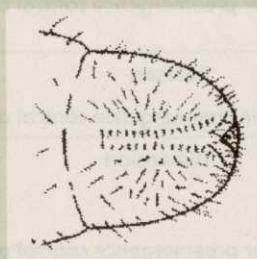
Action threshold: Because the grubs feed more in the thatch and not as much on the roots, thresholds are usually higher than for the direct root-feeding species like the Japanese beetle.

— From the November 2002 issue of *Turfgrass Trends*. Visit www.turfgrasstrends.com

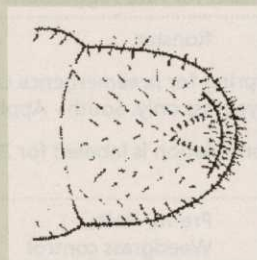
The raster patterns for common turfgrass grubs:



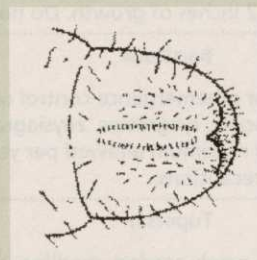
Asiatic garden beetles: Action thresholds are higher than for Japanese beetles (at 10 to 20 grubs per square foot) because they're significantly smaller.



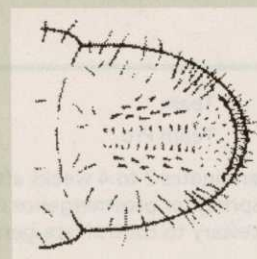
Europe chafers: Action thresholds usually are slightly lower than those for Japanese beetles, at five to 10 grubs per square foot.



Japanese beetles: Action thresholds typically range from six to 15 grubs per square foot in moderately maintained turfgrass.



Green June beetles: Action thresholds are usually a bit higher than for the direct root-feeding species, like the Japanese beetle.



Oriental beetles: Action thresholds typically range from six to 15 grubs per square foot in moderately maintained turfgrass.

CHEMICAL CONTROL OF TURFGRASS WEEDS

■ **ANNUAL GRASSY WEEDS: PREEMERGENCE CONTROL**

Weed	Herbicide			AI/A
	Common name	Trade name	Formulation	
Crabgrass, barnyardgrass, foxtails, panicum	benefin	Balan	25G	2 lb.
	Apply in early spring for preemergence control on mature turfgrass only. May injure bentgrass.			
	benefin + trifluralin	Team	2G	2 lb.
	benefin + trifluralin	Team Pro	0.86G	1.5-3.0 lb.
	Apply in early spring for preemergence control on mature turfgrass only.			
	bensulide	Betasan	4E	7.5-1.0 lb.
	Apply in early spring for preemergence control on mature turfgrass only.			
	*dithiopyr	Dimension	1EC, granular w/fertilizer (several formulations)	0.25-0.5 lb.
	Apply in early spring for preemergence control on established turfgrasses. Tolerant turfgrasses include bluegrasses, fescues, ryegrasses, zoysiagrass, and creeping bentgrass. Length of control is rate dependent. See label for rate suggestions and precautions.			
	oxadiazon 2G	Ronstar	2G, 50WP	2-4 lb.
North - Apply in early spring for preemergence control on mature Kentucky bluegrass, tall fescue, and perennial ryegrass only. South - Apply 2-3 weeks before greenup.				
NOTE: Ronstar 50WP formulation is labeled for Zoysia turf but has injured other cool-season turfgrasses.				
pendimethalin	Pre-M, Halts, Weedgrass control	65DG	1.5-2.0 lb.	
Apply in early spring for preemergence control on mature turfgrass. May also be used on seedling turf with 1 to 2 inches of growth. Do not use on closely cut bentgrass.				
*proflumicet	Barricade	65WG	0.65-0.75 lb.	
Apply in early spring for preemergence control on established turfgrasses. Tolerant turfgrasses include bluegrasses, fescues, ryegrasses, zoysiagrass and creeping bentgrass. Maximum dose for any application and maximum allowed per year vary with turf type. See label for detailed rate suggestions and precautions.				
siduron	Tupersan	4.6%, 50WP	6-12 lb.	
Apply in early spring to newly seeded, seedling, or mature turfgrass for preemergence control. Also effective on young crabgrass seedlings. Use reduced rate, 6 lb./A, on newly seeded turfgrass.				
Goosegrass	benefin + trifluralin	Team	2G	3 lb.
	benefin + trifluralin	Team Pro	0.86G	3 lb.
	Goosegrass generally germinates 2 to 4 weeks after crabgrass. Treat later than for crabgrass. Apply in spring for preemergence control on mature turfgrass only. Split applications may be necessary to control late-germinating goosegrass.			

*Restricted-use pesticide; may be purchased and used only by certified applicators.

■ ANNUAL GRASSY WEEDS: PREEMERGENCE CONTROL (CONTINUED)

Weed	Herbicide			AI/A
	Common name	Trade name	Formulation	
Goosegrass (continued)	oxadiazon 2G	Ronstar	2G, 50WP	4 lb.
	Apply in spring for preemergence control on mature Kentucky bluegrass, tall fescue, and perennial ryegrass only.			
	<i>NOTE:</i> Ronstar 50WP formulation is labeled for zoysia turf but has injured other cool-season turfgrasses.			
	Bensulide + oxadiazon	Scott's Goosegrass/ Crabgrass Control	4E+50WP	6.5+1.5 lb.
Goosegrass (continued)	*Dithiopyr	Dimension	1EC	0.5 lb.
	Apply in spring for preemergence control on established turfgrasses. Tolerant turfgrasses include bluegrasses, fescues, ryegrasses, zoysiagrass, and creepingbentgrass.			
	Pendimethalin	Pre-M, Halts, Weedgrass Control	60DG 60WP	2 lb. 2 lb.
Apply in spring for preemergence control on mature turfgrass only. Do not use on closely cut bentgrass. Second application may be necessary to control late-germinating goosegrass.				
Goosegrass (continued)	*Proflam	Barricade	65WDG	0.75 lb.
	Apply in early spring for preemergence control on established turfgrasses. Tolerant turfgrasses include bluegrasses, fescues, ryegrasses and zoysiagrass. More consistent control is obtained by sequential applications of 0.75 lb. followed six weeks later by 0.25 lb. This higher rate required to control goosegrass is not safe on bentgrass. Maximum dose for any application and maximum allowed per year vary with turf type.			

■ ANNUAL GRASSY WEEDS: POSTEMERGENCE CONTROL

Crabgrass, goosegrass, foxtail, barnyardgrass, other summer annual grasses	*dithiopyr	Dimension	1EC	0.38-0.5 lb.
	Postemergent control of young seedling (pretillering) crabgrass but not goosegrass. Addition of 0.25% (by volume) of a nonionic surfactant may improve control. To control tillered crabgrass, dithiopyr may be mixed with Acclaim or MSMA.			
	Fenoxaprop	Acclaim Extra	0.57EC	1/8-3/8 lb.
Apply to actively growing grassy weeds. Use higher rates for larger weeds. Do not tank mix with broadleaf herbicides. See label for other restrictions. Addition of a surfactant is not generally recommended.				
Crabgrass, goosegrass, foxtail, barnyardgrass, other summer annual grasses	Methanearsonates	MSMA	6.0L, 6.6L, 55WG	2 lb.
	Apply after crabgrass has emerged but before it is large enough to be competitive with desirable turfgrass. Repeat application may be necessary. Does not control goosegrass effectively. May discolor turfgrass. DSMA is also labeled but is used at higher rates.			

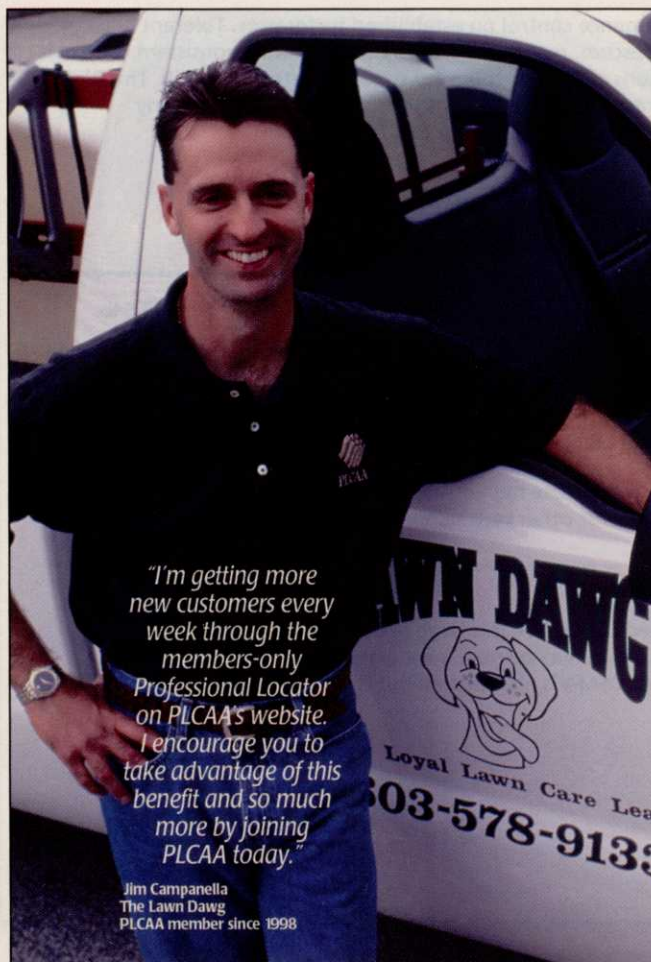
*Restricted-use pesticide; may be purchased and used only by certified applicators.

CHEMICAL CONTROL OF TURFGRASS WEEDS (CONTINUED)

■ **ANNUAL GRASSY WEEDS: POSTMERGENCE CONTROL (CONTINUED)**

Weed	Herbicide			AI/A
	Common name	Trade name	Formulation	
Annual bluegrass in perennial ryegrass	ethofumesate	Prograss	1.5EC	1-2 lb./A (2/3-1 1/3 gal./A)
	North - Apply in late August or early September to control seedling annual bluegrass. Apply follow-up treatment 30 to 60 days later. Do not exceed 4 lb. AI/A per year. On seedling ryegrass, apply only after ryegrass seedlings are 1 inch tall. South - First app. 30-45 days after overseeding with perennial ryegrass. Second 21-28 days later.			
Annual bluegrass in creeping bentgrass	paclobutrizol	Scott's TGR	0.36G	1/3-3/4 lb./A
	For suppression of annual bluegrass and gradual conversion to bentgrass. Use lower rate on sandy soils. Apply in late summer or early fall (no later than October 1 in north) and again in the spring after 100% green-up. Applications when turfgrass vigor is low may result in undesirable levels of discoloration and growth reduction.			

SOURCE: CORNELL COOPERATIVE EXTENSION'S 2001 PEST MANAGEMENT GUIDELINES FOR COMMERCIAL TURFGRASS / NORTH CAROLINA COOPERATIVE EXTENSION SERVICE



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FAMILIES OF FUNGICIDES FOR TURFGRASS

■ CHEMICAL FAMILY: DITHIOCARBAMATES

Common name	Trade names ¹	Mode of action	Placement/mobility	Concern over resistance	Comments
Mancozeb	Fore, Mancozeb, Dithane, T/O, Protect T/O	general	contact	low	Broad-spectrum control; used as protectants
Thiram	Spotrete				

■ CHEMICAL FAMILY: DICARBOXIMIDES

Iprodione	Chipco 26019, Chipco 26GT, Iprodiane Pro	specific	local	moderate to high (not persistent)	Broad-spectrum activity penetrant, developed in mid 1970s
Vinclozolin	Touché, Curalan				

■ CHEMICAL FAMILY: BENZIMIDAZOLES

Thiophanate-methyl	Fungo 50, Cleary's 3336, Cavalier, T methyl Pro	specific	systemic (upward)	high	First popular systemic fungicides, became available in the late 1960s
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■ CHEMICAL FAMILY: STEROL INHIBITORS OR DEMETHYLASE INHIBITORS

Fenarimol	Rubigan	specific	systemic (upward)	high	Broad-spectrum, introduced in the late 1970s
Myclobutanol	Eagle				
Triademefon	Bayleton, Accost				
Propiconazole	Banner MAXX				

■ CHEMICAL FAMILY: STROBILURINS

Azoxystrobin	Heritage	specific	systemic (upward)	moderate to high	Broad-spectrum, first product made available in 1997. Chemical structures found in various naturally occurring, wood-destroying fungi
Trifloxystrobin	Compass				

■ ADDITIONAL FUNGICIDES

Chlorothalonil	Daconil, Manicure, Concorde, Echo	general	contact	low	Chlorothalonil is a protectant fungicide. PCNB is often considered to be a protectant but may be locally systemic. Compounds from different groups
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¹Product list by trade name may not be all inclusive.

■ ADDITIONAL FUNGICIDES (CONTINUED)

Flutolanil	ProStar	specific	systemic (upward)	low	Broad-spectrum control.
PCNB	Terrachlor, Turfcide, Revere, FFII, PCNB, Defend, Engage	general	contact	low	
Fludioxonil	Medallion	specific	contact	moderate to low	

■ CHEMICAL FAMILY: STEROL INHIBITORS OR DEMETHYLASE INHIBITORS

Mefenoxam	Subdue MAXX	specific	systemic (upward)	high	Controls few diseases besides those caused by <i>Pythium</i> or closely related water molds. Azoxystrobin (Heritage) is unique with activity against <i>Pythium</i> species and the fungi.
Propamocarb	Banol	not well known	systemic (upward)	low	
Fosetyl-aluminum	Prodigy, Chipco Signature (Aliette)	not well known	systemic (upward & downward)	low	
Azoxystrobin	Heritage	specific	systemic (upward)	moderate to high	
Chloroneb	Teremec Sp	general	contact (local penetrant)	low	
Ethazol (Etridiazol)	Koban, Terrazole	general	contact	low	

SOURCE: "2002 MANAGEMENT OF TURFGRASS PESTS," OHIO STATE UNIVERSITY EXTENSION, AUTHORS MICHAEL J. BOEHM AND JOSEPH W. RIMELSBACH, TURFGRASS PATHOLOGISTS

5 tips to beat resistance

BY RICH HANRAHAN

Fungicides are valuable turfgrass management tools. To preserve their usefulness, develop a strategy to prevent resistance, which begins to take place when a fungus makes a genetic adjustment or undergoes a mutation that reduces its sensitivity to a particular fungicide. This change allows the affected fungus to survive the fungicide. In time, this surviving organism is likely to become the dominant strain when

the same fungicide is used frequently and exclusively with it. It becomes more difficult to control.

It's a class thing

When resistance develops, it's typically not limited to individual chemical compounds. Usually, strains of fungi that have become resistant to a fungicide will be resistant to all fungicides in the same chemical class.

Overexposure to just one fungicide might destroy the usefulness of several.

Here are five quick tips for maintaining the effectiveness of your disease-fighting chemical tools:

1 Mix it up. Use multiple fungicides from different chemical classes with varying modes of action. The two basic approaches are rotation and tank mixing. If a fungus has developed resistance to one of your fungicides, multiple

fungicides will increase your odds of riding turf of the fungus before it has a chance to spread and mutate further.

2 Reduce the frequency. Never make more applications than you absolutely need to achieve control. The fewer applications you make, the less the fungus is exposed to the chemical class.

3 Apply at the right rate. It's extremely important to apply enough product. Cutting the rate used in a single application will increase the likelihood of resistance developing. Observe recommended rates and strive to achieve complete coverage of the plants.

4 Reduce your dependence. Develop a solid Integrated Pest Management approach to disease control. Whenever possible, use plant species and/or vari-

eties that are disease resistant. Keep abreast of the newer varieties entering the market.

5 Fungicide selection. Although a product may be labeled for a particular disease, it doesn't guarantee it will solve your problem. Efficacy

can vary from region to region. How do you know which to choose? Consult with an expert such as a turf pathologist or university researcher.

— *The author is technical development manager of fungicides for Chipco Professional Products.*

Basic resistance info

Here are some points to keep in mind when developing your resistance strategy:

- ▶ The chemistries of some fungicides are more inclined to provide resistance than others.
- ▶ Fungi with higher reproductive rates are more likely to develop resistance because they pass on the mutated gene more quickly and broadly.
- ▶ Site-specific fungicides run a higher risk of resistance because they work by inhibiting just function in the fungal cell. Multi-site fungicides interfere with several vital functions of the fungal cell.
- ▶ When rotated and used in tank-mix combinations, certain fungicides can effectively control a broad spectrum of diseases without the concern for resistance development.



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Circle 123

▶ Seed Availability / LM's Quick Reference Guide

KEY (AVAILABILITY):

A= expected surplus
B= adequate supply
C= limited supply

KEY (PRICE):

H= higher price than last season
S= stable, equal to last season
L= lower prices than last season

CULTIVAR	MARKETER	AVAILABILITY	PRICE
Bentgrass			
Alister Colonial	Turf-Seed	C	S
Bardot Colonial	Barenbrug USA	B	S
Backspin	Turf Merchants	A	S
Cato	Pickseed West	B	S
Century	Proseed	A	S
Cobra	Cebeco	B	S
Crenshaw	Proseed	A	S
Dominant X-treme	SR Oregon	A	S
Grand Prix	LESCO	A	S
Imperial	Proseed	A	S
Independence	Lebanon Seaboard	C	S
L-93	Jacklin	B	S
Penn-G6	Pennington	A	S
Penn A-2	Tee-2-Green	B	S
Penn A-1	Turf-Seed	B	S
Penn A-4	Turf-Seed	B	S
Penn A-4	Tee-2-Green	B	S
Penn G-2	Tee-2-Green	B	S
Penneagle	Tee-2-Green	B	S
Pennlinks	Turf-Seed	B	S
Pennlinks	Tee-2-Green	B	S
Penntrio	Tee-2-Green	B	H
Pin-High	Barenbrug USA	B	S
Putter	Jacklin	B	S
Princeville	LESCO	A	S
Regent	Barenbrug USA	B	S
Southshore	Jacklin	B	S
SR 1119	SR Oregon	A	S
SR 1020	SR Oregon	A	S
Tiger II	Cebeco	C	new
Trueline	Turf Merchants	A	S
Vesper	Pickseed West	B	S
Viper	Cebeco	B	S
Bermudagrass			
Bermuda Triangle	Pennington	A	S
Jackpot	Jacklin	C	S
LaPrima	SR Oregon	A	S
Mirage	Cebeco	B	S
Mohawk	Pennington	A	S
Panama	Barenbrug USA	B	S
Princess-77	Pennington	A	S
Pyramid	Cebeco	B	S
Riviera	Johnston	B	new
Royal Blend	Pennington	A	S
Sahara	Pennington	A	S
Savannah	Turf-Seed	B	S
Southern Star	Jacklin	B	S
SR 9554	SR Oregon	B	S
Sultan	Pennington	A	S
Sundevil	Jacklin	B	S
Sunstar	LESCO	B	S
Sydney	Pennington	A	S
Transcontinental	Turf-Seed	C	H
Yukon	Johnston/Seed Research OR	C	H
Yuma	Pennington	A	S

CULTIVAR	MARKETER	AVAILABILITY	PRICE
Kentucky bluegrass			
Adams	Jonathan Green	C	S
Allure	Cebeco	B	S
America	Pickseed West	B	S
Apollo	Scotts/Proseed/Landmark	A-	S
Arcadia	SR Oregon	C	S
Barcelona	Barenbrug USA	B	S
Baron	Barenbrug USA	B	S
Bartitia	Barenbrug USA	B	S
Blacksburg II	Turf-Seed	C-	new
Blackstone	Scotts	B	S
Blue Ridge	Pennington	C	S
Bedazzled	Turf Merchants	C	new
Blue Knight	DLF-Jenks	B	L
Bordeaux	Lebanon Seaboard	B	S
Boutique	Turf Merchants	C	S
Broadway	DLF-Jenks	B	S
Brooklawn	Turf Merchants	C	S
Cabernet	Lebanon Seaboard	B	S
Champagne	Lebanon Seaboard	B	S
Chatau	ULTRATurf	B	S
Chicago II	Jacklin	B	S
Coventry	Scotts	B	S
DEEPBLUE	Jonathan Green	B	S
Dragon	Proseed	A	S
Fortuna	Cebeco	C-	S
Julius	Cebeco	C	S
Hallmark	LESCO	A	S
Jefferson	Jonathan Green	B	S
Langara	Pickseed West	B	S
Mallard	Pennington	C	S
Midnight II	Turf-Seed	C-	new
Midnight Star	Turf-Seed	C-	new
Monte Carlo	Pennington	C	S
Moonshadow	Pickseed West	B	S
NuGlide	Jacklin	B	S
P-105	Proseed	C	S
Rita	Turf-Seed	B	S
Shamrock	LESCO/DLF-Jenks	A-	S
Showcase	SR Oregon	B	S
SR 2284	SR Oregon	C	new
Tsunami	Jacklin	B	S
Wildwood	LESCO	A	S
Fine fescue			
Ambassador Chewings	Lebanon Seaboard	B	S
Aruba Creeping Red	Jacklin	B	L
Azay	Pickseed West	B	S
Badger Creeper	Scotts	A	S
Bardur Hard	Barenbrug USA	B	S
Berkshire Hard	Scotts	A	S
Bridgeport Chewings	Barenbrug USA	B	S
Brittany Chewings	LESCO	A	L
Carmen Chewing	Jonathan Green	B+	S
Celestial	Turf Merchants	C	new
Cindy	Cebeco	B	H
Columbia Chewings	Proseed	A	H
Defiant Hard	LESCO	A	L
Ecostar	Jacklin	B	L
Eureka	Cebeco	B	S
Hardtop Hard	Barenbrug USA	B	S
Hood Chewing	Jonathan Green	B+	S

CULTIVAR	MARKETER	AVAILABILITY	PRICE
Intrigue	Turf Merchants	A	S
Jasper II	Pickseed West	B	S
Little Bighorn	Turf-Seed	C-	new
Longfellow II	Cebeco	B	H
Minotaur	Turf Merchants	A	L
Osprey Hard	SR Oregon	A	S
Oxford	Lebanon Seaboard	B	S
Pathfinder	Lebanon Seaboard	B	S
Reliant II	Proseed	A	H
Rescue 911	Jacklin	B	L
Ridu Hard	DLF-Jenks	B	H
Rose Chewings	DLF-Jenks	B	H
Salem Creeping	Proseed	A	H
Sandpiper Chewings	SR Oregon	A	S
Shademark Creeping Red	LESCO	A	L
Shademaster II	Turf-Seed	B	S
SR 3200 Blue	SR Oregon	A	S
Tiffany	Turf-Seed	B	S
Treasure Chewings	Scotts	A	S
Victory 2	Pickseed West	B	S
Weston Creeping Red	Jonathan Green	B+	S
Wrigley Chewings	DLF-Jenks	B	H
Tall fescue			
Admiral	Burlingham	A	L
Apache II	Turf-Seed	B	S

CULTIVAR	MARKETER	AVAILABILITY	PRICE
Arid 3	Jacklin	B	L
Barlexas II	Barenbrug USA	B	S
Biltmore	LESCO	A	S
Bingo	Cebeco	B	L
Black Magic	Jonathan Green	C	S
Bravo	LESCO	A	S
Coronado Gold	Turf-Seed	B	S
Coyote	Scotts	C	H
Crew-Cut II	SR Oregon	A	L
Crossfire II	Pickseed West	B	L
Daytona	Burlingham	A	L
Defiance	SR Oregon	A	S
Dominion	Scotts	A	L
Dynasty	Pickseed West	B	L
Focus	Turf Merchants	C	S
Grande	SR Oregon	A	L
Hounddog	Cebeco	B	L
Jaguar 3	Jacklin	B	L
Laramie	LESCO	A	S
Masterpiece	Lebanon Seaboard	B	S
Millennium	Turf Merchants	A	L
Mustang 3	Pickseed West	B	L
Obsidian	Jonathan Green	C	S
Onyx	Jonathan Green	C	S
Picasso	Lebanon Seaboard	B	S
Pixie	Jacklin	B	L

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► Seed Availability / LM's Quick Reference Guide

CULTIVAR	MARKETER	AVAILABILITY	PRICE
Plantation	Pennington	A	L
Rebel Exeda	Pennington	A	L
Rembrandt	Lebanon Seaboard	B	S
Reserve	DLF-Jenks	B	L
2nd Millennium	Turf Merchants	C	new
Signia	Pennington	A	L
Southern Comfort	DLF-Jenks	B	L
Tar Heel	Turf-Seed	B	S
Tempest	Burlingham	A	L
Tomcat	Cebeco	C-	S
Tracer	Barenbrug USA	B	S
Vegas	Barenbrug USA	B	S
Wildfire	DLF-Jenks	B	L
Wolfpack	Turf-Seed	B	S
Wyatt	Scotts	C	H

Perennial ryegrass

Accent	Jacklin	B	S
Affirmed	Lebanon Seaboard	B	H
Allsport	LESCO	B+	S
AllStar2	Cebeco	C-	H
Applaud	Pennington	C	S
Barlennium	Barenbrug USA	B	S
Brightstar SLT	Turf-Seed	C	H
Caddyshack	Jacklin	B	S

CULTIVAR	MARKETER	AVAILABILITY	PRICE
Catalina II	Turf-Seed	C-	new
Champion GC	SR Oregon	A	S
Chaparral II	Turf-Seed	C-	new
Churchill	Lebanon Seaboard	B	H
Citation Fore	Turf-Seed	C	H
Cutter	Pickseed West	C	H
Dogstar	Jonathan Green	A	S
Elfkin	DLF-Jenks	B	H
Esquire	DLF-Jenks	B	H
Exacta	Lebanon Seaboard	B	H
Fiesta 3	Pickseed West	C	H
Gallery	Scotts	C	H
Gator 3	Cebeco	C	H
Hawkeye	SR Oregon	B	new
Icon	Burlingham	A	H
Inspire	Scotts	C	H
Integra	Pennington	C	H
Jet	Pennington	A	S
Jockey	Jonathan Green	A	S
Keystone	DLF-Jenks	C	H
Line Drive	LESCO	B+	S
Majesty	Scotts	B	H
Manhattan 3	Turf Merchants	A	S
Manhattan 4	Turf-Seed	C-	new
Pacesetter	LESCO	B+	S

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CULTIVAR	MARKETER	AVAILABILITY	PRICE
Palmer III	Proseed	A	H
Paragon	Turf Merchants	C	S
Pennant II	Proseed	A	H
Pinnacle II	Barenbrug USA	B	S
Pizzazz	Turf Merchants	A	H
Plymouth	Jonathan Green	A	S
Prelude III	Proseed	A	H
Premiere II	Barenbrug USA	B	S
Quick Trans	Turf-Seed	C	H
Salinas	Turf-Seed	C-	new
Seville II	Pickseed West	C	H
SR 4220	SR Oregon	C	new
Stallion Supreme	ULTRA Turf	B	H
TopGun	Jacklin	B	S
Top Hat	Cebeco	B	H
Vixen	Burlingham	A	H
Other			
Bluegrass			
Supina	ULTRA Turf	B	S
Canada bluegrass			
Reubens	Jacklin	B	S
Creeping bluegrass			
True Pitt	DLF-Jenks	B	S

CULTIVAR	MARKETER	AVAILABILITY	PRICE
Buffalograss			
Plains	Patten	B	L
Texoka	Patten	B	L
Top Gun	Patten	B	L
Centipede			
Centi-Seed	Patten	B	S
Intermediate ryegrass			
Harbour	LESCO	C	new
Midway	LESCO	B	S
Poa trivialis			
Baraviera	Barenbrug USA	B	S
Darkhorse	Pickseed West	B	S
ProAm	LESCO	B	S
Maximum	SR Oregon	A	S
Sabre II	Cebeco	C	H
Winterplay	Turf-Seed	B	S
Winterplex	Turf-Seed	B	S
Zoysia			
Cathay	Jacklin	C	S
Companion	SR Oregon	B	S
Ming	Cebeco	C-	H
Sunrise	Jacklin	C	S
Zenith	Patten	C+	S



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