► Insect Control / LM's Quick Reference Guide

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-

cording 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
Bacillusthuringiensis kurstak	<i>i</i> biological	0.67-1.67 qt/acre
Beauveria bassiana JW-1	biological	see label
Beta-cyfluthrin ^c	pyrethroid	0.046-0.07
Bifenthrin ^e	pyrethroid	0.05
Carbaryl	carbamate	2.0-4.0
Chlorpyrifosb	organ ophosphate	1.0
Cyfluthrin ^e	pyrethroid	0.1-0.2
Deltamethrine	pyrethroid	0.08-0.13
Diazinona	organ ophosphate	2.7-5.5
Halofenozide	growth regulator	1.0
Heterorhabiditis bacterioph	ora 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)
Steinernema carpocapsae	biological	(1.0 bill./acre)

BERMUDAGRASS MITE

Found in southern states

Beauveria bassiana JW-1	biological	see label
Bifenthrene	pyrethroid	0.05-0.1
Deltamethrine	pyrethroid	0.08-0.13
Diazinona	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.

Beauveria bassiana JW-1	biological	see label
Beta-cyfluthrin ^c	pyrethroid	0.046-0.07

Bifenthrine	pyrethroid	0.05
Chlorpyrifos ^b o	rganophosphate	1.0
Cyfluthrine	pyrethroid	0.1-0.2
Deltamethrin ^e	pyrethroid	0.08-0.13
Diazinon ^a o	rganophosphate	2.7-5.5
Heterorhabiditis bacteriophor	ra biological	see label
Lambda-cyhalothrin ^e	pyrethroid	0.027-0.055
Steinernema carpocapsae	biological	see label

BLUEGRASS BILLBUG LARVAE

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

Beauveria bassiana JW-1	biological	see label
Carbaryl	carbamate	2.0-4.0
Diazinona	organophosphate	2.7-5.5
Halofenozide	growth regulator	1.0
Heterorhabiditis bacteriop	hora biological	see label
Imidaclorid	chloronicotinyl	0.3-0.4
Steinernema carpocapsae	biological	see label

CHINCH BUGS

organophosphate	2.4-5.0
biological	see label
pyrethroid	0.046-0.07
pyrethroid	0.05
carbamate	2.0-4.0
organophosphate	1.0
pyrethroid	0.1-0.2
pyrethroid	0.08-0.13
organophosphate	2.7-5.5
nora biological	see label
chloronicotinyl	0.40 (suppression only)
pyrethroid	0.027-0.055
pyrethroid	0.44-0.87
biological	see label
	pyrethroid pyrethroid carbamate organophosphate pyrethroid organophosphate organophosphate chloronicotinyl pyrethroid pyrethroid

LM's Quick Reference Guide / Insect Control <

CLOVER MITE			Steinernema carpocapsae
Insecticidal treatment	Chemical class	Lbs. ai/acre	
Bifenthrin ^e	pyrethroid	0.05	GREENBUG
Chlorpyrifos ^b	organophosphate	1.0	Aphids
Deltamethrin ^e	pyrethroid	0.08-0.13	Acephate
Diazinona	organophosphate	2.7-5.5	Chlorpyrifosb
Dicofol	organochlorine	0.46-0.92	
Lambda-cyhalothrin ^e	pyrethroid	0.027-0.055	MOLE CRICKETS Imported mole crickets are
EUROPEAN CRAN	IE FLY LARVAE		Acephate
Carbaryl	carbamate	8.0	Beauveria bassiana JW-1
Chlorpyrifosb	organophosphate	1.0	Beta-cyfluthrin ^c
Diazinon	organophosphate	2.7	Bifenthrin ^e
			Carbaryl
GENERAL CRANE	FIVIARVAE		Chlorpyrifosb
	ILILANVAL		Cyfluthrine
Bifenthrin ^e	pyrethroid	0.05-0.1	Deltamethrin ^e
			Diazinona
■ CUTWORMS			Fipronil (golf course and commercial ground
Acephate	organophosphate	2.4-5.0	Imidocloprid
Azadirachtin	biological	see label	Lambda-cyhalothrin ^e
Beta-cyfluthrin ^c	pyrethroid	0.046-0.07	Permethrine
Bifenthrin ^e	pyrethroid	0.05	Steinernema riobravis
Carbaryl	carbamate	2.0-4.0	Steinernema scapterisci
Chlorpyrifosb	organophosphate	1.0	
Cyfluthrine	pyrethroid	0.1-0.2	= COD MEDIMODAN
Deltamethrin ^e	pyrethroid	0.08-0.13	SOD WEBWORM
Diazinona	organophosphate	2.7-5.5	Acephate
Halofenozide	growth regulator	1.0	Azadirachtin
Heterorhabiditis bacteriop	hora biological	see label	Bacillus thuringiensis kurst
Imidacloprid	chloronicotinyl	0.3-0.4	Beauveria bassiana JW-1
		(suppression only)	Beta-cyfluthrin ^e
Lambda-cyhalothrin ^e	pyrethroid	0.027-0.055	Bifenthrin ^e
Spinosad	spinosad	0.24 (small larvae), 0.4 (large larvae)	Carbaryl
Steinernema carpocapsae	biological	see label	Chlorpyrifosb
Trichlorfon	organophosphate	5.4-8.0	Cyfluthrine
Estyces bankdain	organiophiosphate	TOWN OF A SECTION AS	Deltamethrine
= FALL ADAM/00			Diazinona
FALL ARMYWOR	M		Fluvalinate
Acephate	organophosphate	1.0-2.4	Halofenozide
Azadirachtin	biological	0.02-0.43	Heterorhabiditis bacteriop
Bifenthrin ^e	pyrethroid	0.05	Lambda-cyhalothrin ^e
Carbaryl	carbamate	2.0-4.0	Permethrin ^c
Chlorpyrifosb	organophosphate	1.0	Spinosad
Halofenozide	growth regulator	1.0	Stain arm arms
Lambda-cyhalothrin ^e	pyrethroid	0.027-0.055	Steinernema carpocapsae
Spinosad	spinosad	0.07 (small larvae), 0.4 (large larvae)	Trichlorfon

GREENBUG Aphids		
A PART A STATE OF THE STATE OF		10
Acephate	organophosphate	1.0
Chlorpyrifosb	organophosphate	
MOLE CRICKETS		
Imported mole crickets are	pests of southern tu	irf.
Acephate	organophosphate	2.0-4.0
Beauveria bassiana 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 (golf course and commercial ground	phenyl pyrazole	0.0125-0.025
Imidocloprid	chloronicotinyl	0.4
	.1 .1	0.027-0.055
Lambda-cyhalothrin ^e	pyrethroid	
	pyrethroid	0.44-0.87
Permethrine		0.44-0.87 see label
Permethrine Steinernema riobravis	pyrethroid biological biological	
Permethrine Steinernema riobravis Steinernema scapterisci SOD WEBWORM	pyrethroid biological biological	see label
Permethrine Steinernema riobravis Steinernema scapterisci SOD WEBWORM Acephate	pyrethroid biological biological S organophosphate	see label
Permethrine Steinernema riobravis Steinernema scapterisci SOD WEBWORM Acephate Azadirachtin	pyrethroid biological biological S organophosphate biological	see label see label 2.4-5.0
Permethrine Steinernema riobravis Steinernema scapterisci SOD WEBWORM Acephate Azadirachtin Bacillus thuringiensis kurst	pyrethroid biological biological organophosphate biological aki biological	2.4-5.0 0.02-0.43
Permethrine Steinernema riobravis Steinernema scapterisci SOD WEBWORM Acephate Azadirachtin Bacillus thuringiensis kurst Beauveria bassiana JW-1	pyrethroid biological biological organophosphate biological aki biological biological	2.4-5.0 0.02-0.43 see label
Permethrine Steinernema riobravis Steinernema scapterisci SOD WEBWORM Acephate Azadirachtin Bacillus thuringiensis kurst Beauveria bassiana JW-1 Beta-cyfluthrine	pyrethroid biological biological organophosphate biological aki biological	2.4-5.0 0.02-0.43 see label see label
Permethrine Steinernema riobravis Steinernema scapterisci SOD WEBWORM Acephate Azadirachtin Bacillus thuringiensis kurst Beauveria bassiana JW-1 Beta-cyfluthrine Bifenthrine	pyrethroid biological biological organophosphate biological aki biological biological pyrethroid	2.4-5.0 0.02-0.43 see label see label 0.046-0.07
Permethrine Steinernema riobravis Steinernema scapterisci SOD WEBWORM Acephate Azadirachtin Bacillus thuringiensis kurst Beauveria bassiana JW-1 Beta-cyfluthrine Bifenthrine Carbaryl	pyrethroid biological biological organophosphate biological aki biological biological pyrethroid pyrethroid	2.4-5.0 0.02-0.43 see label see label 0.046-0.07 0.05
Permethrine Steinernema riobravis Steinernema scapterisci SOD WEBWORM Acephate Azadirachtin Bacillus thuringiensis kurst Beauveria bassiana JW-1 Beta-cyfluthrine Bifenthrine Carbaryl Chlorpyrifosb	pyrethroid biological biological organophosphate biological aki biological biological pyrethroid pyrethroid carbamate	2.4-5.0 0.02-0.43 see label see label 0.046-0.07 0.05 2.0-4.0
Permethrine Steinernema riobravis Steinernema scapterisci SOD WEBWORM Acephate Azadirachtin Bacillus thuringiensis kurst Beauveria bassiana JW-1 Beta-cyfluthrine Bifenthrine Carbaryl Chlorpyrifosb Cyfluthrine	pyrethroid biological biological organophosphate biological aki biological biological pyrethroid pyrethroid carbamate organophosphate	2.4-5.0 0.02-0.43 see label see label 0.046-0.07 0.05 2.0-4.0
Permethrine Steinernema riobravis Steinernema scapterisci SOD WEBWORM Acephate Azadirachtin Bacillus thuringiensis kurst Beauveria bassiana JW-1 Beta-cyfluthrine Bifenthrine Carbaryl Chlorpyrifosb Cyfluthrine Deltamethrine	pyrethroid biological biological organophosphate biological aki biological biological pyrethroid pyrethroid carbamate organophosphate pyrethroid	2.4-5.0 0.02-0.43 see label see label 0.046-0.07 0.05 2.0-4.0 1.0 0.1-0.2
Permethrine Steinernema riobravis Steinernema scapterisci SOD WEBWORM Acephate Azadirachtin Bacillus thuringiensis kurst Beauveria bassiana JW-1 Beta-cyfluthrine Bifenthrine Carbaryl Chlorpyrifosb Cyfluthrine Deltamethrine Diazinona	pyrethroid biological biological S organophosphate biological aki biological biological pyrethroid pyrethroid carbamate organophosphate pyrethroid pyrethroid	2.4-5.0 0.02-0.43 see label see label see label see label 0.046-0.07 0.05 2.0-4.0 1.0 0.1-0.2 0.08-0.13
Permethrine Steinernema riobravis Steinernema scapterisci SOD WEBWORM Acephate Azadirachtin Bacillus thuringiensis kurst Beauveria bassiana JW-1 Beta-cyfluthrine Bifenthrine Carbaryl Chlorpyrifosb Cyfluthrine Deltamethrine Diazinona Fluvalinate	pyrethroid biological biological organophosphate biological aki biological biological pyrethroid pyrethroid carbamate organophosphate pyrethroid pyrethroid carbamate	2.4-5.0 0.02-0.43 see label see label see label see label 0.046-0.07 0.05 2.0-4.0 1.0 0.1-0.2 0.08-0.13 2.7-5.5
Permethrine Steinernema riobravis Steinernema scapterisci SOD WEBWORM Acephate Azadirachtin Bacillus thuringiensis kurst Beauveria bassiana JW-1 Beta-cyfluthrine Bifenthrine Carbaryl Chlorpyrifosb Cyfluthrine Deltamethrine Diazinona Fluvalinate Halofenozide	pyrethroid biological biological organophosphate biological aki biological biological pyrethroid carbamate organophosphate pyrethroid pyrethroid pyrethroid organophosphate pyrethroid organophosphate pyrethroid organophosphate pyrethroid	see label see label 2.4-5.0 0.02-0.43 see label see label 0.046-0.07 0.05 2.0-4.0 1.0 0.1-0.2 0.08-0.13 2.7-5.5 0.05-0.16
Permethrine Steinernema riobravis Steinernema scapterisci SOD WEBWORM Acephate Azadirachtin Bacillus thuringiensis kurst Beauveria bassiana JW-1 Beta-cyfluthrine Bifenthrine Carbaryl Chlorpyrifosb Cyfluthrine Deltamethrine Diazinona Fluvalinate Halofenozide Heterorhabiditis bacteriop	pyrethroid biological biological organophosphate biological aki biological biological pyrethroid carbamate organophosphate pyrethroid pyrethroid pyrethroid organophosphate pyrethroid organophosphate pyrethroid organophosphate pyrethroid	see label see label 2.4-5.0 0.02-0.43 see label see label 0.046-0.07 0.05 2.0-4.0 1.0 0.1-0.2 0.08-0.13 2.7-5.5 0.05-0.16 1.0
Permethrine Steinernema riobravis Steinernema scapterisci SOD WEBWORM Acephate Azadirachtin Bacillus thuringiensis kurst Beauveria bassiana JW-1 Beta-cyfluthrine Bifenthrine Carbaryl Chlorpyrifosb Cyfluthrine Deltamethrine Diazinona Fluvalinate Halofenozide Heterorhabiditis bacteriop Lambda-cyhalothrine	pyrethroid biological biological S organophosphate biological aki biological biological pyrethroid carbamate organophosphate pyrethroid carbamate organophosphate pyrethroid organophosphate pyrethroid organophosphate pyrethroid	see label see label 2.4-5.0 0.02-0.43 see label see label 0.046-0.07 0.05 2.0-4.0 1.0 0.1-0.2 0.08-0.13 2.7-5.5 0.05-0.16 1.0 see label
Lambda-cyhalothrine Permethrine Steinernema riobravis Steinernema scapterisci SOD WEBWORM Acephate Azadirachtin Bacillus thuringiensis kurst Beauveria bassiana JW-1 Beta-cyfluthrine Bifenthrine Carbaryl Chlorpyrifosb Cyfluthrine Deltamethrine Diazinona Fluvalinate Halofenozide Heterorhabiditis bacteriop Lambda-cyhalothrine Permethrinc Spinosad	pyrethroid biological biological organophosphate biological aki biological biological pyrethroid carbamate organophosphate pyrethroid pyrethroid organophosphate pyrethroid growth regulator hora biological pyrethroid	see label see label 2.4-5.0 0.02-0.43 see label see label 0.046-0.07 0.05 2.0-4.0 1.0 0.1-0.2 0.08-0.13 2.7-5.5 0.05-0.16 1.0 see label 0.027-0.055 0.44-0.87 0.24 (small larvae
Permethrine Steinernema riobravis Steinernema scapterisci SOD WEBWORM Acephate Azadirachtin Bacillus thuringiensis kurst Beauveria bassiana JW-1 Beta-cyfluthrine Bifenthrine Carbaryl Chlorpyrifosb Cyfluthrine Deltamethrine Diazinona Fluvalinate Halofenozide Heterorhabiditis bacteriop Lambda-cyhalothrine Permethrinc	pyrethroid biological biological organophosphate biological aki biological biological pyrethroid carbamate organophosphate pyrethroid organophosphate pyrethroid organophosphate pyrethroid growth regulator hora biological pyrethroid	see label see label 2.4-5.0 0.02-0.43 see label see label 0.046-0.07 0.05 2.0-4.0 1.0 0.1-0.2 0.08-0.13 2.7-5.5 0.05-0.16 1.0 see label 0.027-0.055

biological

see label

0.4 (large larvae)

TURF PEST INSECTS AND CHEMICAL CONTROLS (CONTINUED)

WHITE GRUBS

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

Bacillus popilliae Japanese beetle only	biological	see label
Beauveria bassiana JW-1	biological	see label
Bifenthrine	pyrethroid	0.1 (adults only)
Carbaryl	carbamate	8.0
Chlorpyrifosb	organophosphate	2.0-4.0
Cyfluthrine	pyrethroid	0.2 (JP adults only)
Deltamethrine	pyrethroid	0.08-0.13 (JP adults only)
Diazinona	organophosphate	4.0-5.5
Halofenozide	grown regulator	1.5-2.0
Heterorhabiditis bacterioph	ora biological	see label
Imidaclorid	chloronicotinyl	0.3-0.4
Lambda-cyhalothrin ^e	pyrethroid	0.055 (suppression)
Permethrin ^c	pyrethroid	0.44-0.87
Steinernema glaseri	biological	see label
Trichlorfon	(Ballet)	8.0

■ MAY/JUNE BEETLES, PHYLLOPHAGA SPP

carbamate	8.0	
growth regulator	1.5	
chloronicotinyl	0.3	
organophosphate	8.0	956
	growth regulator chloronicotinyl	growth regulator 1.5 chloronicotinyl 0.3

BLACK TURFGRASS ATAENIUS

Acephate	organophosphate	3.0-4.0
Beauveria bassiana JW-1	biological	see label
Beta-cyfluthrin ^c	pyrethroid	0.07 (adults)
Bifenthrine	pyrethroid	0.05-0.1 (adults)
Chlorpyrifosb	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

Beauveria bassiana 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.

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

Grub identification tips

BY PAT VITTUM, 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.

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

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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

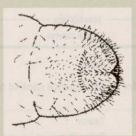
Identifier: Transverse anal slit and two fairly compact parallel rows of spines. These grubs have short legs that aren't used for locomotion.

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 <u>www.turfgrasstrends.com</u>

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.