

WEED, INSECT, and DISEASE CONTROL in TURFGRASS



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WEED, INSECT, and DISEASE CONTROL in TURFGRASS

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AggieTurf: <http://aggieturf.tamu.edu>

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Introduction

This guide was developed for professional turfgrass managers, county Extension agents, and others who maintain athletic, golf course, landscape, recreational, or utility turfgrasses. Resources include Texas A&M AgriLife Extension Service faculty, industry cooperators, published literature, and general knowledge of herbicides, insecticides, and fungicides available to the turfgrass industry.

Where appropriate, several kinds of information are included about each product:

- **Common name:** Products are listed alphabetically by the common name of the primary active ingredients.
- **Trade name:** Products with the same primary active ingredients are often sold under different trade names. There may be trade names and product formulations beyond the ones listed.
- **Application rate:** Application rates are provided in various units based on product labels. Examples: pounds per acre (lb/acre), ounces per acre (oz/acre), fluid ounces per 1,000 square feet (fl oz/1,000 ft²).
- **Application interval:** Recommended intervals between applications are based on the product label but vary depending on such factors as pest pressure/severity and acceptable damage thresholds.
- **Mode of action:** Information on a product's mode of action (MOA) is listed to help applicators rotate MOAs to prevent resistance from developing or to manage populations of weeds, insects, or diseases that are already resistant:
 - **HRAC, WSSA Code:** The herbicidal MOA as defined by the Herbicide Resistance Action Committee (HRAC) and the Weed Science Society of America (WSSA)
 - **IRAC Code:** The insecticidal mode of action as defined by the Insecticide Resistance Action Committee (IRAC)
 - **FRAC Code:** The fungicidal mode of action as defined by the Fungicide Resistance Action Committee (FRAC)

- **Comments:** Notes and cautions can help you improve control and learn about restricted-use pesticides, use sites, turfgrass tolerance, etc.
- **Turfgrass labeled for application:** Turfgrass tolerance to herbicides varies by turfgrass species and is listed on the product label. Table 1 lists turfgrass species that herbicides in this guide can be safely applied to according to their label. For more information on turfgrass tolerance, see the “Turfgrass tolerance to postemergence herbicides” section.

Table 1. Turfgrass application codes for labeled herbicide tolerance of various turfgrass species

Warm-season	Cool-season
BA: Bahiagrass	B: Bluegrass (species not specified)
BE: Bermudagrass	CBG: Creeping bentgrass
BU: Buffalograss	F: Fescue (species not specified)
CA: Carpetgrass	FF: Fine fescue
CE: Centipedegrass	KB: Kentucky bluegrass
SA: St. Augustinegrass	PR: Perennial ryegrass
SS: Seashore paspalum	R: Ryegrass (species not specified)
Z: Zoysiagrass	TF: Tall fescue

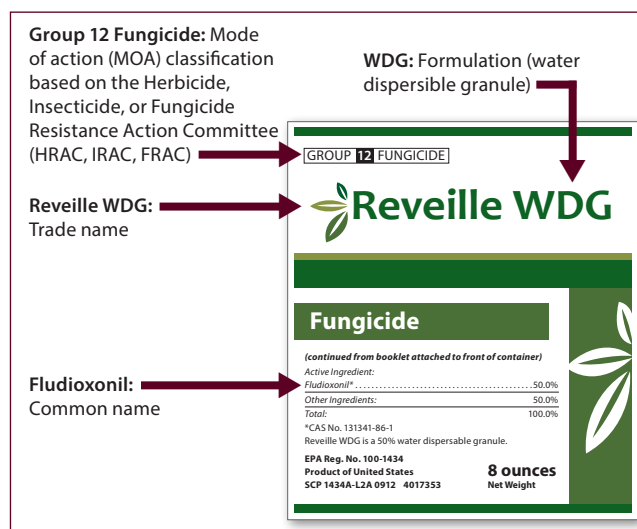


Figure 1. Information on product labels

Additional resources

- **AggieTurf:** <http://aggieturf.tamu.edu> includes current information on turfgrass management, pest ID and control, events such as workshops, factsheets, and other useful links.
- **Crop Data Management Systems (CDMS)**
<http://www.cdms.net/Label-Database>
Contains up-to-date information on product manufacturers, labels, supplemental labels, MSDS sheets, etc.

- **Plant Diagnostic Labs in the Southern United States**

Dr. Kevin Ong
Department of Plant Pathology and Microbiology
1500 Research Parkway, Room 130
College Station, TX 77845-2589
979-845-8032

Texas Plant Disease Diagnostic Lab
<http://plantclinic.tamu.edu/about-tpddl/>

Dr. William Crow
Department of Entomology and Nematology
University of Florida
PO Box 110620
FL 32611-0620
352-392-1901 extension 138
University of Florida Sampling Instructions for
Nematode Assays
<http://edis.ifas.ufl.edu/sr011>

Dr. Philip Harmon
Rapid Turfgrass Diagnostic Service
University of Florida Extension Plant Disease
Clinic
Building 78, Mowry Road
Gainesville, FL 32611-0830
352-392-1795
University of Florida Rapid Diagnostic Turfgrass
Service
<http://turf.ufl.edu/rapiddiag.shtml>

Plant Disease and Insect Clinic
North Carolina State University
Campus Box 7211
1227 Gardner Hall
100 Derieux Place
Raleigh, NC 27695
919-513-3878
North Carolina State University Turfgrass
Diagnostics
<https://turfpathology.plantpath.ncsu.edu>

Plant Disease and Nematode Diagnostic
Laboratory
Clarissa Balbalion, Director
190 Bost-North Room, 9
Mississippi State, MS 39762-912
622-325-2146
Nematology: 662-325-8336
Mississippi State University Plant Diseases and
Nematode Diagnostics
<http://extension.msstate.edu/lab>

*Texas A&M AgriLife Extension faculty update this guide as information becomes available. However, it is **always** the applicator's responsibility to follow the product label directions regarding application rate, use site, and other specifications.*

Herbicide Mode of Action (MOA) classification

Table 2. Mode of action classifications of herbicides registered for use in turfgrasses (Sources: HRAC and WSSA)

HRAC code	WSSA code	Mode of action (MOA) ¹	Chemical family	Common name
A	1	Acetyl CoA carboxylase (ACCase) inhibitor	Aryloxyphenoxypropionate 'Fops'	fenoxaprop-P-ethyl fluaizop-P-butyl
			Cyclohexandione 'Dims'	clethodim sethoxydim
B	2	Acetolactate synthase (ALS) inhibitor	Sulfonylurea 'SU'	chlorsulfuron flazasulfuron foramsulfuron halosulfuron-methyl iodosulfuron-methyl metsulfuron-methyl rimsulfuron sulfosulfuron trifloxysulfuron-sodium
			Triazolopyrimidine	penoxsulam
C1	5	Photosystem-II (PS II) inhibitor	Triazine	atrazine simazine
			Triazinone	metribuzin
			Triazolinone	amicarbazone
C2	7	Photosystem-II (PS II) inhibitor	Urea	siduron
C3	6	Photosystem-II (PS II) inhibitor	Nitrile	bromoxynil
			Benzothiadiazinone	bentazon
D	22	Photosystem-I (PS I) electron diversion	Bipyridylium	diquat
E	14	Protoporphyrinogen oxidase (PPO) inhibitor	Diphenylether	oxyfluorfen
			Phenylpyrazole	pyraflufen-ethyl
			N-phenylphthalimide	flumioxazin
			Oxadiazole	oxadiazon
			Triazolinone	carfentrazone-ethyl sulfentrazone
F2	27	4-hydroxyphenylpyruvate dioxygenase (HPPD) inhibitor	Triketone	mesotrione
			Pyrazole	topramezone
G	9	5-enolpyruvylshikimate-3-phosphate (EPSP) synthase inhibitor	Glycine	glyphosate
H	10	Glutamine synthetase inhibitor	Phosphinic acid	glufosinate-ammonium
I	18	Dihydroterate (DHP) synthase inhibitor	Carbamate	asulam
K1	3	Microtubule assembly inhibitor	Dinitroaniline (DNA)	prodiamine
			Pyridine	dithiopyr
			Benzamide	pronamide
			Benzoic acid	DCPA
K3	15	Very long chain fatty acid (VLCFA) synthesis inhibitor	Chloroacetamide	dimethenamid-P S-metolachlor
L	20, 21	Cellulose biosynthesis inhibitor	Benzamide	isoxaben
			Quinoline carboxylic acid	quinclorac
N	8	Lipid synthesis inhibitor	Thiocarbamate	EPTC
			Phosphorodithioate	bensulide

continued on next page

Table 2 continued. Mode of action classifications of herbicides registered for use in turfgrasses (Sources: HRAC and WSSA)

HRAC code	WSSA code	Mode of action (MOA) ¹	Chemical family	Common name
O	4	Synthetic auxins	Phenoxy-carboxylic acid	2,4-D 2,4-DP (dichlorprop) MCPA MCP (mecoprop)
			Benzoic acid	dicamba
			Pyridine carboxylic acid	clopyralid fluroxypyr triclopyr
			Quinoline carboxylic acid	quinclorac
			Semicarbazone	diflufenzopyr-sodium
P	19	Inhibition of auxin transport		
Z	17	Unknown	Organic arsenal	MSMA
			Other	dazomet pelargonic acid

1: When possible rotate repeated herbicide applications among various MOA groups to avoid or mitigate herbicide resistance development. For more information on herbicide chemistry and modes of action, see www.HRACglobal.com.

Herbicides for general control of grassy and broadleaf weeds

Preemergence herbicides for grassy and broadleaf weeds

Sometimes referred to as “pre” herbicides, preemergence herbicides must be applied before the target weed germinates or emerges, or they will not control it. Although these herbicides are commonly used to control **annual** weeds that germinate at predictable times of year, they can also control the seeds of many **perennial** weeds.

To enable the active ingredient (herbicide molecule) to reach the soil, these herbicides are either:

- Formulated on a granular carrier and applied through a rotary or drop spreader, or
- Mixed with water and applied through a sprayer

Preemergence herbicides are effective only if they are applied uniformly and are watered into the soil by rainfall or irrigation before the target weed emerges. See the herbicide label for information on the amount of irrigation or rainwater needed.

Application rates may vary by the soil’s texture and organic matter content; knowing these characteristics

can help you maximize herbicide efficacy and prevent injury to desirable turfgrasses. See the herbicide label for more information.

After they are watered in, the herbicide molecules remain in the upper layer of soil and control weeds or desirable grasses that germinate from seed. If you plan to seed, do not apply a preemergence herbicide without first checking the label for the appropriate reseeding interval.

Also, do not apply some preemergence herbicides before sprigging or sodding. If you are planning this type of turf renovation, use other weed-control options. In general, apply these herbicides only to well-established turfgrass. See the product label if you have established turf from sod, seed, or sprigs within the previous year. Many of the herbicides in Table 3 will impede encroachment of existing turfgrass into areas damaged by winterkill, traffic, or diseases.

As the herbicide remains in the soil, soil microbes and other processes slowly break them down into non-herbicide metabolites. After several weeks of degradation, the herbicide is usually no longer effective.

To control many summer annual weeds all season, you may need to apply herbicide several times. If so, you may be able to reduce the single-application rate, but always follow the product label instructions on application rates and timing.

Table 3 lists preemergence herbicides and their general uses. For more information on how to control specific weeds with pre- or post-emergence herbicides, see the section on herbicides for commonly occurring weeds beginning on page 25.

Table 3. Preemergence herbicides labeled for control of grassy (crabgrass, goosegrass, annual bluegrass, etc.) and small-seeded broadleaf weeds (purslane, spurge, chickweed, etc.)

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Weeds controlled	Comments	HRAC, WSSA group
atrazine	Aatrex 4L (1–4 qt) Aatrex Nine-O (1–4.4 lb) Others	BE, CE, SA, Z	Annual grassy weeds, many broadleaf weeds	Can provide early postemergence control of some weeds Use caution under tree driplines, especially in high pH (> 7.5) soils. See label for more information. Application at > 2 pt/A permitted only for sod production. Do not use on alkaline or muck soils. Do not apply 4 months before or 6 months after seeding; or until newly seeded grasses have overwintered. Do not use west of the high-rainfall areas of East Texas. Will cause substantial injury to actively growing bermudagrass.	C1, 5
benefin	Balan 2.5G (60–120 lb) Others	BA, BE, CE, KB, PR, SA, TF, Z	Annual grassy weeds, some small-seeded broadleaves	Is more volatile than other preemergence herbicides, so irrigation or rainfall shortly after application improves efficacy	K1, 3
benefin + trifluralin	Team 2G (75–150 lb) Team Pro (see label) Many fertilizer carriers	Most cool- and warm-season turfgrasses; see label	Annual grassy weeds, some small-seeded broadleaves	In bermudagrass areas overseeded with winter grasses, this product may thin overseeded grasses. Because benefin and trifluralin are more volatile than are other preemergence herbicides, irrigation, or rainfall shortly after application improves efficacy. Do not apply to newly sprigged areas.	K1, 3
bensulide	Bensumec 4LF (1.88–3.13 gal) Pre-San 7G (107–180 lb) Pre-San 12.5G (80–100 lb)	BA, BE, CBG, CE, FF, KB, PR, SA, TF, Z	Annual grassy weeds, some small-seeded broadleaves	Can be applied to putting greens up to twice/year; for use on golf courses, lawns only Has less residual than preemergence herbicides such as dithiopyr, prodiamine, pendimethalin, or indaziflam	N, 8
DCPA	Dacthal W-75 (6–14 pt) Dacthal Flowable (6–14 pt)	Most established and newly seeded grasses. See label	Some annual grassy and small-seeded broadleaf weeds	Can be applied to newly seeded grasses that are at least 1–2 in. tall and a uniform green color. Should be activated by 0.25 in. of rain or irrigation within 5 days of application. If soil moisture is below 10%, irrigate immediately.	Z, 17

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Table 3 continued. Preemergence herbicides labeled for control of grassy (crabgrass, goosegrass, annual bluegrass, etc.) and small-seeded broadleaf weeds (purslane, spurge, chickweed, etc.)

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Weeds controlled	Comments	HRAC, WSSA group
dithiopyr	Dimension 2EW (1–2 pt) Dithiopyr 2L (1–2 pt) Dimension Ultra 40WP (0.625–1.25 lb) Dithiopyr 40WSB (0.625–1.25 lb) Others and many fertilizer carriers	BA, BE, BU, CA, CBG, CE, FF, KB, PR, SA, TF, Z	Annual grassy weeds, some small-seeded broadleaves	Can provide early postemergent crabgrass control Do not apply to Tifgreen (328) hybrid bermudagrass. Some formulations such as those from Anderson's Golf Products can be used on creeping bentgrass and bermudagrass putting greens with well-developed root systems.	K1, 3
dimethenamid-P	Tower (21–32 fl oz)	BA, BE, BU, CE, FF, KB, PR, SA, SS, TF, Z	Annual grasses, small-seeded broadleaf weeds, some sedges Can help remove overseeded cool-season grasses in warm-season turf	Should be activated by 0.25–0.5 in. of rain or irrigation within 24 hours of application On grassy and broadleaf weeds, it is best used in a sequential application program after applying pendimethalin. Applying to cool-season turfgrass may cause unacceptable injury or thinning.	K3, 15
flumioxazin	SureGuard (8–12 oz wt)	BE	Several broadleaf and grassy weeds; provides postemergence control of many weeds	Apply to dormant bermudagrass only. Can provide early postemergence annual bluegrass control When applying upslope of sensitive cool-season grasses, follow label to prevent off-target movement. See supplemental label for use in turfgrass.	E, 14
indaziflam	Specticle FLO (6–10 fl oz) Specticle 20WSP (2.5–5 oz wt)	BA, BE, BU, CE, SA, Z	Annual grassy weeds, some small-seeded broadleaf weeds, sedges emerging from seed	Provides early postemergent control of annual bluegrass and crabgrass; should be activated by 0.25 in. of rain or irrigation within 2 days of application Do not apply to cool-season grasses. When applying upslope of sensitive cool-season grasses, follow label to prevent off-target movement.	L, 21
isoxaben	Gallery 75DF (0.66–1.33 lb) Gallery SC (16–31 fl oz/A) Isoxaben 75WG (0.66–1.33 lb)	BA, BE, BU, CBG, CE, FF, KB, PR, SA, TF, Z	Broadleaf weeds	Tank mixtures with preemergence herbicides that control grasses will broaden the spectrum of weed control. Can be applied after sprigging many warm-season turfgrasses	L, 21
S-metolachlor	Pennant MAGNUM (1.3–2.6 pt)	BA, BE, CE, SA, Z	Annual grassy weeds, some small-seeded broadleaves yellow nutsedge	Activate with at least 0.5 in. of rain or irrigation before weeds germinate and within 14 days of application. Spring greenup may be delayed after application.	K3, 15
oryzalin	Surflan AS (1.5–2 qt) Other formulations	BA, BE, BU, CE, SA, TF, Z	Annual grassy weeds, some small-seeded broadleaf weeds, sedges	Do not apply in the spring to tall fescue planted the previous fall. This herbicide thins overseeded grasses.	K1, 3

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Table 3 continued. Preemergence herbicides labeled for control of grassy (crabgrass, goosegrass, annual bluegrass, etc.) and small-seeded broadleaf weeds (purslane, spurge, chickweed, etc.)

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Weeds controlled	Comments	HRAC, WSSA group
oxadiazon	Ronstar Flo (5–7.5 pt) Ronstar 50WSP (4–8 lb) Ronstar G (100–200 lb)	BE, BU, CBG, KB, PR, SA, SS, Z	Annual grassy weeds, some small-seeded broadleaf weeds, sedges	Not for home lawns For use only by professional applicators. Sprayable formulations may be applied only to dormant warm-season turf. Granular formulation may be applied to non-dormant warm- and cool-season turf. Apply so that granules reach the soil surface. Do not apply to wet turf. Can be applied before or after sprigging; see label for more details	E, 14
oxadiazon + bensulide	Anderson's Crabgrass/Goosegrass Control (115.5 lb)	BE, CBG, KB, PR, TF, Z	Crabgrass, goosegrass	For use by professional applicators only Can be applied to bentgrass and bermudagrass putting greens if goosegrass infestation is heavy and injury is tolerable	E, 14 + N, 8
pendimethalin	Pendulum AquaCap (3.1–6.3 pt) Pendulum 3.3EC (3.6–7.2 pt) Pendulum 2G (75–150 lb) Many others	Most warm and cool-season species	Annual grassy weeds, some small-seeded broadleaves	Maximum single application rates are lower for residential turfgrass. Should be activated by at least 0.5 in. of rainfall or irrigation before weeds germinate and within 30 days of application	K1, 3
pendimethalin + dimethenamid-P	Freehand 1.75G (100–200 lb)	BE, BU, CE, SA, SS, Z	Annual grassy weeds, several small-seeded broadleaf weeds, some sedges Can help remove overseeded cool-season grasses in warm-season turf	Application rate maximums are lower for residential use. Do not apply to turf or ornamentals when soil temperature is less than 55 °F. Do not apply to plants under stress. Should be activated by irrigation or rainfall before weeds germinate and within 30 days of application	K1, 3 + K3, 15
prodiamine	Barricade 65WG (0.5–2.3 lb) Barricade 4FL (10–48 fl oz) ProClipse 65WDG (0.5–2.3 lb) Cavalcade 65 WDG (0.5–2.3 lb) Several others and many fertilizer carriers	BA, BE, BU, CBG, CE, FF, KB, PR, SA, SS, TF, Z	Annual grassy weeds, some small-seeded broadleaf weeds	Should be activated by at least 0.5 in. of irrigation before weeds germinate and within 14 days of application	K1, 3
prodiamine + quinclorac	Cavalcade PQ (1–2.3 lb)	BE, BU, CBG, FF, KB, PR, SS, Z	Annual grassy weeds, some small-seeded broadleaf weeds	Provides postemergence control of some broadleaf and grassy weeds including crabgrass. Apply with methylated seed oil. If rainfall does not occur within 7 days after application irrigate to 0.5 in.	K1, 3 + L, 21 (monocot) O, 4 (dicot)

continued on next page

Table 3 continued. Preemergence herbicides labeled for control of grassy (crabgrass, goosegrass, annual bluegrass, etc.) and small-seeded broadleaf weeds (purslane, spurge, chickweed, etc.)

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Weeds controlled	Comments	HRAC, WSSA group
prodiamine + sulfentrazone	Echelon 4SC (8–36 fl oz)	BA, BE, BU, CA, CBG, CE, FF, KB, PR, SA, SS, TF, Z	Annual grassy weeds, some broadleaf weeds, sedges	Provides postemergence control of some broadleaf weeds and yellow nutsedge May temporarily injure or discolor St. Augustinegrass. Mowing will remove discoloration. Do not apply with the plant growth regulator trinexapac-ethyl.	K1, 3 + E, 14
pronamide	Kerb SC (1.25–5 pt) Kerb 50WP (2–4 lb)	BE, CE, SA, Z	Annual grassy weeds	Restricted-use pesticide. Not for residential sites. Provides early postemergence control of several grassy weeds Should be activated by light rainfall or irrigation within 24 hours of application When applying upslope of sensitive cool-season grasses, follow label to prevent off-target movement. Removes overseeded perennial ryegrass from bermudagrass slowly (4–6 wk); apply after 50% bermudagrass greenup to prevent bermudagrass injury	K1, 3
siduron	Tupersan (4–24 lb)	CBG, FF, PR, TF, Z	Crabgrass, foxtail, bermudagrass suppression	Can be applied to CBG putting greens to suppress bermudagrass encroachment; can be used during the establishment of zoysiagrass from sprigs	C2, 7
simazine	Princep Liquid (1–2 qt)	BE, CE, SA, Z	Winter annual grassy and broadleaf weeds; some summer annual grasses	Use caution under tree driplines, especially in high pH (> 7.8) soils. See label for more information. Provides both pre and early post emergence control of many weeds. See label for muck or alkaline soils. Do not exceed 1 qt/A per treatment on hybrid bermudagrass or newly sprigged bermudagrass. Non-dormant bermuda or zoysiagrass may yellow or slow growth temporarily.	C1, 5

Selective postemergence herbicides

Postemergence herbicides are effective when applied after the target weed has emerged. They can be used to control annual and perennial weeds. Most postemergence herbicides are effective when they contact the leaf and are absorbed into the plant.

Postemergence herbicides are most often mixed with water and applied through a sprayer. Adjuvants such as non-ionic surfactants, crop oils, or methylated seed oil can often help the herbicide droplets remain on the leaf surface and be absorbed through the leaf cuticle.

Always check the product label for information on:

- What adjuvants, if any, to add
- Whether the herbicide has soil activity if you plan to reseed, sprig, or sod after application
- How to avoid off-target injury from drift or root absorption if you will be applying the herbicide around trees and large ornamental plants

A herbicide's ability to target a weed instead of the desirable turfgrass often depends on whether the turfgrass can convert the herbicide to a nonphytotoxic form more effectively than can the target weed. This is why it is important to apply these products to healthy, actively growing turfgrass at the rate indicated on the product label. Always follow the label directions as to the appropriate environmental conditions for application.

Precautions

Legal restrictions

In some Texas counties, the Texas Agricultural Code (Chapter 76) restricts or regulates the application of ester and amine phenoxy herbicides (such as 2,4-D or MCPA) to turfgrass not on home lawns. These restrictions often vary according to the time of year. Review these regulations before applying a phenoxy herbicide.

Table 4 specifies ester herbicides but not amine or acid formulations. For example, it lists an amine or

acid formulation as 2,4-D, but an ester formulation as 2,4-D ester. Ester formulations are more volatile than are amine formulations.

For more information on the advantages and disadvantages of ester and amine herbicides, see the section on synthetic auxin herbicide rates in various products, which begins on page 19.

Environmental conditions

Temperature, rainfall, and plant nutrient status greatly affect weed control efficacy and turfgrass injury. Always read the label to ensure that the environmental conditions are proper for a given application:

- Warm-season turfgrasses are generally most susceptible to injury in early spring and late fall, when the weather is cool and they are emerging from or entering dormancy.
 - Cool-season turfgrasses are more susceptible to injury in the summer when it is hot and dry.
- Environmental conditions that enable the target weeds to grow actively usually result in the best weed control.

Turfgrass cultivars

Product labels often give application information that is specific to some cultivars. For example, many product labels prohibit application to 'Floritam' St. Augustinegrass because it is more sensitive to herbicides than are other cultivars.

Also, hybrid bermudagrass is often more susceptible to herbicides than is common bermudagrass. Many labels specify lower application rates for hybrid bermudagrass than for common bermudagrass. As always, refer to the product label for information about application to specific turfgrass cultivars.

Table 4 lists selective postemergence herbicides labeled for use in turfgrass. These herbicides control grassy and/or broadleaf weeds. Information on products to control specific weeds is included in subsequent sections.

Table 4. Postemergence herbicides for selective weed control in turfgrasses

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Weeds controlled	Comments	HRAC, WSSA group
2,4-D	Hardball (1–1.75 qt) Others	B, BE, PR, TF, Z	Broadleaf weeds	Many broadleaf weeds are not controlled by 2,4-D alone. For more broad-spectrum control, combine with other active ingredients. Rates and recommended turf species differ for sod farms.	O, 4
2,4-D	Weedar 64 (1–1.5 qt) Others	See label	Broadleaf weeds	Amine formulations are less volatile than are ester or acid formulations.	O, 4
2,4-D + clopyralid + dicamba	Millennium Ultra 2 (1.5–3 pt)	B, BA, BE, CBG, F, R, Z	Many broadleaf weeds	Provides broad-spectrum broadleaf weed control Specifically for common bermudagrass; use on hybrid bermudagrass not specified. Do not apply to residential turfgrass or where clippings are collected.	O, 4
2,4-D + dicamba + quinclorac	2DQ (1–3 pt)	BA, BE, CBG, CE, KB, RA, PR, SA, TF, Z	Many broadleaf weeds	Provides broad-spectrum broadleaf weed control; apply to centipede and St. Augustine grasses during dormancy only. Can be applied to bentgrass putting and bowling greens at reduced rates	O, 4
2,4-D ester + mecoprop + dicamba + pyraflufen-ethyl	4-Speed (1.8–4 pt)	B, BA, BE, CBG, F, R, Z	Many broadleaf weeds	Can be applied to bentgrass putting greens	O, 4 + E, 14
2,4-D ester + triclopyr ester + dicamba + pyraflufen-ethyl	4 Speed XT (1.8–4 pt)	BA, BE, CBG, F, B, PR, Z	Many broadleaf weeds	Can be applied to bentgrass putting greens	O, 4 + E, 14
2,4-D + fluroxypyr ester + dicamba	Escalade 2 (2–3 pt)	B, BA, BE, CA, CBG, F, R, Z	Many broadleaf weeds	Application rate is lower for sod farms. Do not apply broadcast to carpetgrass when temperatures > 80°F. Applications to dormant bermuda, bahia, and zoysia grasses are suggested.	O, 4
2,4-D + MCPA + dicamba	EndRun (1.8–4 pt)	BA, BE, BU, CBG, FF, KB, RA, PR, TF, Z	Many broadleaf weeds	Do not apply to warm-season turfgrass unless temporary injury can be tolerated.	O, 4
2,4-D + triclopyr + fluroxypyr ester	Momentum FX ² (3–4 pt)	BA, BE, BU, CBG, CE, FF, KB, RA, PR, TF, Z	Many broadleaf weeds	Do not apply to warm-season turfgrass when mowing height is less than 0.5 in. Except for buffalograss, do not apply at > 3.0 pt/A to warm-season turfgrass species. Labeled for <i>Zoysia japonica</i> and <i>Z. tenuifolia</i> only	O, 4
2,4-D ester + mecoprop + dicamba + pyraflufen-ethyl	RedZone 2 (3–4 pt)	B, BA, BE, F, R, Z	Many broadleaf weeds	May temporarily injure warm-season grasses, especially hybrid bermudagrasses	O, 4
2,4-D + mecoprop + dichloroprop	Spoiler (1.7–4 pt)	B, BA, BE, CBG, F, R, Z	Many broadleaf weeds	Can be applied to bentgrass golf and bowling greens and golf tees; they may be injured temporarily	O, 4

continued on next page

Table 4 continued. Postemergence herbicides for selective weed control in turfgrasses

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Weeds controlled	Comments	HRAC, WSSA group
2,4-D + mecoprop + dichlorprop	Triamine (1.75–4 pt) Triamine Jet-Spray (see label)	B, BA, BE, CBG, CE, F, R, SA, Z	Many broadleaf weeds	Not for turf grown for sod Do not apply broadcast to carpetgrass or St. Augustinegrass when temperatures > 80°F.	O, 4
2,4-D + mecoprop + dicamba	Triplet SF (1.8–4 pt)	B, BA, BE, CBG, CE, F, R, SA, Z	Many broadleaf weeds	Apply only to dormant centipedegrass and some St. Augustinegrass varieties in Texas, Louisiana, and Mississippi only. Can be applied to golf course tees and bowling greens, but temporary injury may occur	O, 4
2,4-D + mecoprop + dicamba	Triplet Low Odor (1.8–4 pt)	B, BA, BE, CBG, CE, F, R, SA, Z	Many broadleaf weeds	Can be applied to golf course tees and bowling greens, but temporary injury may occur Avoid over application on bentgrass, centipedegrass, and St. Augustinegrass. For use by professional applicators only	O, 4
2,4-D + mecoprop + dicamba	Trimec Classic (3–4 pt)	BA, BE, CE, SA, Z. Cool-season grasses	Many broadleaf weeds	Can be applied to bentgrass putting and bowling greens Spot applications in centipede and St. Augustine grasses are suggested, as injury is likely. Do not apply when temperatures > 85°F.	O, 4
2,4-D + mecoprop + dicamba	Trimec Southern (1–3 pt)	B, BE, CBG, CE, F, SA, Z	Many broadleaf weeds	Do not apply to St. Augustine or centipedegrass when temperatures of < 50°F or > 90°F are expected within 72 hours of application.	O, 4
amicarbazone	Xonerate (1–10 oz wt)	BA, BE, BU, CBG, CE, FF, KB, PR, SA, SS, TF, Z	Many broadleaf, some grassy weeds including annual bluegrass	Turf may yellow temporarily after application. Apply to cool-season turfgrass in spring only; applications in summer or fall will injure it severely. Do not apply if soil pH is > 7.4. Turfgrass species tolerance varies widely; read the label carefully.	C1, 5
asulam	Asulox (6–8 pt)	BE (Tifway only), SA	Grassy weeds including goosegrass, crabgrass, sandbur	For use only on sod farms and only on Tifway (419) bermudagrass	I, 18
bentazon	Basagran T&O (24–32 fl oz) Several other formulations	B, BE, BA, BU, CA, CBG, CE, F, R, SA, Z	Some broadleaf weeds, yellow nutsedge, annual sedge	Apply to newly emerged or small weeds before they reach their maximum size. Thorough spray coverage will maximize weed control. Sequential applications are likely required for adequate control of yellow nutsedge and thistle.	C, 5
bispyribac-sodium	Velocity SG (2–6 oz wt)	CBG, PR	Some broadleaf weeds, annual and roughstalk bluegrass	Can be used in bermudagrass overseeded with perennial ryegrass Do not apply to golf greens or roughs or to wet turfgrass. If applied in the fall under cool temperatures, turfgrass injury lasts longer. Do not apply to cool-season turfgrass in the summer.	B, 2

continued on next page

Table 4 continued. Postemergence herbicides for selective weed control in turfgrasses

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Weeds controlled	Comments	HRAC, WSSA group
bromoxynil	Buctril (1–2 pt) Buctril 4EC (0.5–1 pt)	BA, BE, CBG, F, KB, PR, R, SA, Z	Broadleaf weeds	Do not apply to residential, playground, or schoolyard turfgrass. For control of immature weeds To broaden weed control spectrum, see label for suitable tank-mix partners.	C3, 6
carfentrazone	Quicksilver T&O (1–6.7 fl oz)	Most cool- and warm-season grasses. See label	Some broadleaf weeds; moss	Can be applied to control moss on creeping bentgrass and hybrid bermudagrass putting greens See label for guidelines on adjuvant use. Can be applied to many seedling turfgrasses as soon as 7 days after emergence from seed or sprigs Apply at up to 2.1 fl oz/A to control broadleaf weeds and up to 6.7 fl oz/A to control moss.	E, 14
carfentrazone + 2,4-D ester + mecoprop + dicamba	SpeedZone (2.0–5 pt)	B, BE, BU, CBG, FF, PR, R, TF, Z	Many broadleaf weeds	Application to fully dormant bermuda buffalo and zoysia grasses is suggested. Buffer the spray solution to pH 5–8. Nozzles that produce large (> 400 microns) spray droplets may reduce weed control.	E, 14 + O, 4
carfentrazone + 2,4-D ester + mecoprop + dicamba	SpeedZone Southern (1.5–5 pt)	B, BE, BA, BU, CBG, CE, FF, PR, R, SA SS, TF, Z	Many broadleaf weeds	Buffer the spray solution to pH 5–8. Do not apply to ‘Floritam’ or ‘Bitterblue’ St. Augustinegrass. See label for more information on St. Augustinegrass application. Applications to dormant warm-season turfgrass are suggested.	E, 14 + O, 4
carfentrazone + MCPA ester + mecoprop + dicamba	Powerzone (2–5 pt)	BE, FF, KB, PR, TF, Z	Many broadleaf weeds	Applications to dormant bermudagrass and zoysiagrass are suggested.	E, 14 + O, 4
carfentrazone + quinclorac	SquareOne (8–18 oz)	BE, BU, CE, FF, KB, PR, SS, TF, Z	Broadleaf and grassy weeds	Tall fescue and warm-season turfgrasses may yellow temporarily if applications are made during the transition period or when the turfgrass is under stress. Do not use clippings as mulch or compost.	E, 14 + L, 21 (monocot) O, 4 (dicot)
clpyralid	Lontrel, Clean Slate (0.25–1.33 pt)	BA, BE, BU, CBG, CE, FF, KB, PR, SA, SS, TF, Z	Broadleaf weeds	Can be applied to conifers, dichondra, and ornamental grasses. Provides excellent control of various clover and thistle species Not for residential turfgrass	O, 4
dicamba	Banvel, Vanquish, Vision, others (See label)	See label	Many broadleaf weeds	Do not use where it can move into the soil or wash across the surface and contact the roots of desirable trees and shrubs. Take extra care on sandy soils.	O, 4
diclofop	Illoxan 3EC (32.6–43.5 fl oz)	BE	Goosegrass	Manufacture discontinued in 2014 For use on golf courses only Can be applied to putting greens	A, 1

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Table 4 continued. Postemergence herbicides for selective weed control in turfgrasses

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Weeds controlled	Comments	HRAC, WSSA group
ethofumesate	Prograss 1.5 EC (0.5–1.33 gal.) Prograss 4 SC (0.75–3 qt)	BE, CBG, KB, PR, TF, SA	Annual bluegrass, crabgrass, foxtail, some broadleaf weeds, sedges	For use by professional applicators only Apply only to dormant bermudagrass. See label for instructions on application to all other turf species. Can be used for postemergence annual bluegrass control and bermudagrass suppression	N, 8
fenoxaprop-P-ethyl	Acclaim Extra (3.5–39 fl oz)	CBG, FF, KB, PR, TF, Z	Grassy weeds including goosegrass and crabgrass	Suppresses bermudagrass and johnsongrass; consider adding triclopyr ester to improve suppression. Application rate depends on tiller stage of target weed. May be applied to newly plugged zoysiagrass See label for information on surfactant use. Broadleaf herbicides such as 2,4-D will reduce efficacy on grassy weeds. Do not apply 5 days before or 21 days after an application of 2,4-D or similar herbicide.	A, 1
fenoxaprop-P-ethyl + fluroxypyr ester + dicamba	Last Call (3.5–4 pt)	FF, KB, PR, TF, Z	Grassy weeds including goosegrass and crabgrass and broadleaf weeds	Treat annual grassy weeds at the 1-leaf to 4-tiller growth stage for optimal control. Sequential applications suppress bermudagrass; make first application in the fall. May be applied to newly plugged zoysiagrass See label for information on surfactant use. Broadleaf herbicides such as 2,4-D reduce efficacy on grassy weeds. Do not apply 5 days before or 21 days after applying 2,4-D or similar herbicide.	A, 1 + O, 4
flazasulfuron	Katana (0.5–3 oz)	BE, BU, CE, SS, Z	Overseeded cool-season grasses, sedges, some broadleaf weeds	When applying upslope or near sensitive cool-season grasses, follow label to prevent off-target movement. Use with non-ionic surfactant at 0.25% v/v. Causes transient discoloration to seashore paspalum Can be used at reduced rates when applied with urea nitrogen. See label for more information. For spot treatment only in residential turfgrass	B, 2
florasulam	Defendor (4 fl oz)	BA, BE, CBG, CE, FF, KB, PR, SA, TF, SS, Z	Some broadleaf weeds	Packaged with Dimension 2 EW Sequential applications must be made on at least a 4-wk interval	B, 2

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Table 4 continued. Postemergence herbicides for selective weed control in turfgrasses

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Weeds controlled	Comments	HRAC, WSSA group
fluazifop-P-butyl	Fusilade II T&O (3–6 fl oz)	FF, TF, Z	Bermudagrass suppression	Now labeled for use in home lawns as of 2017. For best bermudagrass suppression, apply in mid to late spring or mid to late fall.	A, 1
fluazifop-P-butyl	Ornamec 170 (see label) Ornamec Over-the-top (see label)	TF, Z	Bermudagrass, dallisgrass suppression	Can be applied as a spot treatment for selective weed control in tall fescue or zoysiagrass To best control dallisgrass and bermudagrass, apply in mid to late spring or mid to late fall. See label for more information.	A, 1
fluroxypyr ester	Vista XRT (6–22 fl oz)	BA, BE, CBG, CE, FF, KB, PR, TF, SA, Z	Broadleaf weeds	See supplemental label for use in turfgrass. May injure bermudagrass temporarily On St. Augustinegrass, do not apply at > 6 fl oz/A or from April 1 to Oct. 31.	O, 4
foramsulfuron	Revolver (8.8–35.2 fl oz)	BE, BU, Z	Overseeded cool-season grasses, goosegrass, some broadleaf weeds	Use caution when applying upslope or near sensitive cool-season grasses. Can be applied to putting greens Sequential applications control small goosegrass plants. Suppresses centipedegrass and dallisgrass Adjuvants such as MSO, UAN, or AMS may improve control.	B, 2
halosulfuron-methyl	Sedgehammer+, Sedgehammer, Manage (0.66–1.33 oz)	BA, BE, CBG, CE, FF, KB, PR, TF, SA, SS, Z	Sedges	Include NIS at 0.25–0.5% v/v. Apply after nutsedge has reached the 3–8 leaf stage.	B, 2
imazapic	Plateau (2–12 fl oz)	See label	Broadleaf weeds, some grassy weeds, seedhead suppression	Tolerance of improved bermuda, buffalo, and centipede grasses varies widely. Best for weed control and/or seedhead suppression in low-maintenance areas. Some grasses may yellow temporarily after application.	B, 2
imazaquin	Image 70DG (8.6–11.4 oz)	BE, CE, SA, SS, Z	Broadleaf weeds, sedges, some grasses	Include NIS at 0.25% v/v. Do not use on St. Augustinegrass for winter weed control. When applying upslope or near sensitive cool-season grasses, follow label to prevent off-target movement. Absorbed by both roots and shoots. Irrigation or rainfall (0.25–0.5 in.) 1–7 days after application can improve weed control.	B, 2
mecoprop	Mecomec 2.5 (4–5.17 pt) Mecomec 4 (2.75–3.5 pt)	See label	Some broadleaf weeds	Can be applied to golf greens Not for turf being grown for sod or seed.	O, 4

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Table 4 continued. Postemergence herbicides for selective weed control in turfgrasses

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Weeds controlled	Comments	HRAC, WSSA group
MCPA + 2,4-D + dicamba	Trimec Bentgrass Formula (3.0–6.0 pt)	See label	Many broadleaf weeds	Injury is likely to centipede and St. Augustine grasses. Can be applied to putting and bowling greens. Not for turf being grown for sod.	O, 4
MCPA ester + triclopyr ester + dicamba	Cool Power (2.5–3.5 pt)	B, BA, BE, CBG, F, R, Z	Many broadleaf weeds	Use the 2.5 pt/A rate when warm-season turf is actively growing. The 3.5 pt/A rate can be applied to dormant warm-season turf. Do not apply to centipede or St. Augustine grasses when temperatures > 80°F, and unless injury can be tolerated.	O, 4
MCPA + triclopyr ester + dicamba	Horsepower (1–3 pt)	B, BA, BE, CBG, F, R, Z	Many broadleaf weeds	Not for turf being grown for sod. Do not apply broadcast to carpetgrass or St. Augustinegrass when temperatures > 80°F. Do not apply to centipede or St. Augustine grasses unless injury can be tolerated.	O, 4
MCPA + mecoprop + dicamba	Tri-Power (2–3.9 pt)	BE, CBG, FF, KB, TF, Z	Many broadleaf weeds	Except for bermudagrass and zoysiagrass, do not apply to warm-season turfgrass unless injury can be tolerated. Do not apply to centipede or St. Augustine grasses when the air temperatures > 80°F.	O, 4
MCPA + fluroxypyr ester + triclopyr	Battleship III (2–4 pt)	BA, BE, BU, CBG, CE, FF, KB, TF, Z	Many broadleaf weeds	For best results, add an adjuvant.	O, 4
MCPA + fluroxypyr ester + dicamba	ChangeUp (2–3 pt)	BA, BE, CBG, CE, F, R, SA, Z	Many broadleaf weeds	Use higher application rates for dense infestations of perennial weeds. Do not apply to 'Floritam' St. Augustinegrass. Applications to dormant bahiagrass, bermudagrass, and zoysiagrass are suggested. Do not apply broadcast to carpetgrass or St. Augustinegrass when temperatures > 80°F.	O, 4
mesotrione	Tenacity (5–8 fl oz)	BE, BU, CE, FF, KB, PR, SA, TF	Broadleaf and grassy weeds, including nimblewill and creeping bentgrass	Can be applied immediately before seeding tolerant species Apply to dormant bermudagrass only. See label for information on tank mixtures with simazine or atrazine. Temporarily bleaches (whitens) susceptible species Apply with NIS. Use on St. Augustine restricted to sod farms only	F2, 27

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Table 4 continued. Postemergence herbicides for selective weed control in turfgrasses

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Weeds controlled	Comments	HRAC, WSSA group
metsulfuron-methyl	Blade, Manor, MSM turf, others (0.125–1 oz wt)	BE, CE, FF, KB, SA, Z	Broadleaf weeds, bahiagrass, ryegrass	Apply with NIS at 0.25% v/v. Rates vary depending on turfgrass species May injure centipedegrass Use caution around trees and ornamental plants. See label for more information.	B, 2
metsulfuron-methyl + sulfentrazone	Blindside (3.25–10 oz wt)	BE, BU, CE, KB, TF, SA, Z	Broadleaf weeds, some grasses, sedges	May temporarily discolor some turfgrass after application Do not apply within 7 days of trinepach-ethyl application. Use caution around trees and ornamental plants. See label for more information.	E, 14 + B, 2
metsulfuron-methyl + rimsulfuron	NEGATE 37WG (1.5 oz)	BE, Z	Grassy and broadleaf weeds, including bahiagrass	Not for residential property Use caution when applying upslope or near sensitive cool-season grasses. Apply with NIS at 0.25% v/v. Use caution around trees and ornamental plants. See label for more information.	B, 2
metribuzin	Sencor 75% (0.33–0.66 lb)	BE	Some broadleaf and grassy weeds, including goosegrass	Can be applied to dormant turf. Do not apply to dormant turf in the transition zone where stress from cold is expected. Do not apply if the mowing height is less than 0.5 in. Do not apply in root zone of ornamental trees or shrubs. Not for turf being sold for commercial use. For application by commercial applicators only	C1, 5
penoxsulam	Sapphire (0.25–1.5 pt)	BE, CBG, PR, TF	Some broadleaf weeds	May injure perennial ryegrass and tall fescue. Do not apply at > 0.5 pt/A to these species.	B, 2
penoxsulam + sulfentrazone + 2,4-D + dicamba	Avenue South (2.7–5.0 pt)	BE, BU, CE, KB, PR, TF, SA, SS, Z	Broadleaf weeds	Tank-mixing with metsulfuron-methyl at 0.25–0.5 oz/A increases spectrum of weed control. To ensure that weeds are actively growing, apply when temperatures are above 50°F and will not drop below 40°F for 10 days after application. May temporarily discolor St. Augustine or zoysiagrass; mowing will remove it Texas A&M research found it safe for 'Raleigh' St. Augustine during spring transition. Do not apply to St. Augustine during fall transition.	B, 2 + O, 4 + E, 14

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Table 4 continued. Postemergence herbicides for selective weed control in turfgrasses

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Weeds controlled	Comments	HRAC, WSSA group
pronamide	Kerb SC (1.25–5 pt) Kerb 50WP (1–4 lb)	BE, CE, SA, Z	Annual grassy weeds	Restricted-use pesticide. Not for residential sites. Provides early post emergence control of several grassy weeds Should be activated by light rainfall or irrigation within 24 hours of application When applying upslope of sensitive cool-season grasses, follow label to prevent off-target movement. Slowly removes overseeded perennial ryegrass from bermudagrass (4–6 wk); apply after 50% bermudagrass greenup to prevent bermudagrass injury	K1, 3
pyraflufen-ethyl	Octane 2% SC (0.7–4 fl oz)	BE, CBG, CE, KB, PR, SA, TF, Z	Broadleaf weeds	Consider tank-mixing with synthetic auxin herbicides such as 2,4-D. Treated areas may be seeded or overseeded 1 day after application. See label for adjuvant information.	E, 14
quinclorac	Drive XLR8 (22–64 fl oz) Quinclorac 75DF (1.0 lb)	Many warm- and cool-season species. See label	Many annual grassy weeds including crabgrass; some broadleaf weeds	MSO surfactant is preferred. For more information on quinclorac, see Table 5 and the section on crabgrass control, beginning on p. 25. Can be applied before, at, or after seeding many grasses	L, 21 monocot) O, 4 (dicot)
quinclorac + 2,4-D + dicamba	Quincept (7.0–8.0 pt)	Many warm- and cool-season species. See label	Some grassy weeds such as crabgrass; many broadleaf weeds	For crabgrass control, see comments for Drive XLR8 above. For more information on quinclorac, Table 5 and “Crabgrass control,” p. 25.	L, 21 monocot) O, 4 (dicot)
quinclorac + mecoprop + dicamba	Onetime (22–64 fl oz)	Many warm- and cool-season species. See label	Some grassy and many broadleaf weeds	Do not apply to turfgrass grown for sod. For more information on quinclorac, see Table 5 and the section on crabgrass control, beginning on p. 25.	L, 21 (monocot) O, 4 (dicot)
quinclorac + sulfentrazone	Solitaire (1–2 lb)	BE, BU, CE, KB, PR, TF, SS, Z	Broadleaf weeds, some grasses, including crabgrass, sedges	Applications within 7 days of trinexapac-ethyl are not recommended. May cause unacceptable injury to Centipedegrass. For more information on quinclorac, see Table 5 and the section on crabgrass control, beginning on p. 25.	E, 14 + L, 21 (monocot) O, 4 (dicot)
quinclorac + sulfentrazone + 2,4-D + dicamba	Q4 Plus (5–8 pt)	BE, F, PR, R, KB, Z	Some grassy weeds, nutsedge, broadleaf weeds	See label for information about potential injury to warm-season grasses.	L, 21 (monocot) O, 4 (dicot) + E, 14
MSMA (see label)	many (see label)	BE, KB, Z	Some grassy and broadleaf weeds, sedges	See EPA legislation on use restrictions at different sites. As of this writing, MSMA is registered for use only on golf courses and sod farms, with application restrictions.	Z, 17

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Table 4 continued. Postemergence herbicides for selective weed control in turfgrasses

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Weeds controlled	Comments	HRAC, WSSA group
MSMA + 2,4-D + mecoprop + dicamba	Trimec Plus (8–13.5 pt)	BE, KB, PR, TF, Z	Grassy and broadleaf weeds	This product contains MSMA. Read the label carefully for use restrictions. Do not apply to cool- or warm-season turfgrass when temperatures > 80°F and 90°F, respectively.	O, 4 + Z, 17
rimsulfuron	TranXit (0.5–2 oz wt) Rimsulfuron 25 DF (0.125–2 oz wt)	BE, CE, Z	Cool-season grasses including ryegrass, annual bluegrass, some broadleaf weeds	Do not apply to residential lawns. Can be applied to non-overseeded bermudagrass putting greens. Use caution when applying upslope or near sensitive cool-season grasses. May injure centipedegrass	B, 2
sethoxydim	Segment (1.5–3.75 pt)	CE, FF	Grassy weeds including bahiagrass and bermudagrass suppression	Can be applied to seedling centipedegrass and fine fescue. If tank-mixed with some broadleaf herbicides, it may not control grassy weeds	A, 1
sulfentrazone	Dismiss (4–12 fl oz)	Most warm- and cool-season grasses. See label	Broadleaf weeds, some sedges	May temporarily discolor exposed St. Augustine or zoysiagrass leaves; mowing will remove discoloration	E, 14
sulfentrazone + imazethapyr	Dismiss South (9.5–14.4 fl oz)	BA, BE, BU, CE, Z	Broadleaf weeds, sedges	Can discolor turfgrass temporarily. Imazethapyr has foliar and soil activity. Adequate soil moisture improves weed control.	E, 14 + B, 2
sulfentrazone + 2,4-D + mecoprop + dicamba	Surge (2.75–4 pt)	B, BA, BE, BU, CBG, CE, FF, PR, R, TF, Z	Broadleaf weeds	—	E, 14 + O, 4
sulfosulfuron	Certainty (0.75–2 oz)	BE, BA, BU, CE, SA, SS, Z	Broadleaf, grassy weeds, sedges	Use a non-ionic surfactant at 0.25–0.5% v/v. Controls tall fescue, early-stage rescuegrass, other cool-season grasses. No longer registered for cool-season turfgrasses	B, 2
thiencarbazone-methyl + iodosulfuron + dicamba	Celsius WG (2.5–4.9 oz)	BE, BU, CE, SA, Z	Broadleaf, grassy weeds	When applying upslope of sensitive cool-season grasses, follow label to prevent off-target movement. See label for information on adjuvant selection and spot treatment rates.	B, 2 + O, 4
thiencarbazone-methyl + foramsulfuron + halosulfuron-methyl	Tribute Total (1–3.2 oz)	BE, Z	Broadleaf, grassy, sedges	When applying upslope of sensitive cool-season grasses, follow label to prevent off-target movement. Can be used to remove overseeded cool-season species. See label for information on adjuvant selection and spot treatment rates.	B, 2
topramezone	Pylex (1–1.5 fl oz)	CE, CBG, FF, KB, TF, PR	Several grassy and broadleaf weeds including common bermudagrass, goosegrass, nimblewill	CBG is tolerant to applications at ≤ 0.25 fl oz/A. Can be applied any time before seeding tolerant turfgrasses. See label for surfactant information. Temporarily bleaches (whitens) susceptible species; see label for tank-mix partners to reduce bleaching Supplemental label should be available in 2016 for goosegrass control in bermudagrass and seashore paspalum.	F2, 27

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Table 4 continued. Postemergence herbicides for selective weed control in turfgrasses

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Weeds controlled	Comments	HRAC, WSSA group
triclopyr ester + sulfentrazone + 2,4-D ester + dicamba	T-Zone, T-Zone SE (2–4 pt)	BA, BE, FF, PR, R, TF, Z	Broadleaf weeds	See label for information on adjuvant use. Do not apply to warm-season turfgrass unless injury can be tolerated. See label for drift management BMPs.	O, 4 + E, 14
triclopyr ester	Turflon Ester, Turflon Ester Ultra (1–2 pt)	B, PR, TF	Broadleaf weeds	Can suppress bermudagrass and kikuyugrass Do not use on warm-season turfgrass unless injury can be tolerated.	O, 4
triclopyr + clopyralid	Confront (1.0–2.0 pt)	BA, BE, BU, CBG, CE, FF, KB, PR, TF, Z	Broadleaf weeds	Not for use in residential turfgrass. Do not collect clippings for mulch or compost. Do not apply to warm-season turfgrass unless injury can be tolerated; see label for more details. Do not apply to bermudagrass on sod farms.	O, 4
trifloxysulfuron	Monument 75WG (0.1–0.53 oz)	BE, Z	Grassy weeds, sedges, some broadleaf weeds	Can suppress bahiagrass, dallisgrass, and torpedograss. Use to remove overseeded ryegrass and Poa trivialis. Apply with NIS at 0.25–0.5 % v/v. When applying upslope or near sensitive cool-season grasses, follow label to prevent off-target movement.	B, 2

Synthetic auxin postemergence herbicides for broadleaf weeds

Several synthetic auxin herbicides, such as 2,4-D, are widely used for control of broadleaf weeds in turfgrass. Products usually contain more than one synthetic auxin herbicide to control different weed species. As a result, there are many different combinations of synthetic auxins, and choosing a product can be difficult.

Use the descriptions of active ingredients and Table 5 to help select the best herbicide for the target weed(s) and turfgrass. The table does not list all herbicides that provide broadleaf weed control, only those that contain synthetic auxin herbicides.

Amine vs. ester: Many synthetic auxin herbicides, especially 2,4-D, are formulated as either amine salts or esters. Amine formulations are less volatile and therefore less likely esters to enter the atmosphere in the vapor phase and injure sensitive plants in nearby gardens or ornamental beds.

Because volatilization increases as air temperatures increase, apply esters in early spring when temperatures are lower. Esters penetrate the waxy leaf cuticle better than amine formulations, which may improve broadleaf weed control.

To determine whether a product is an amine or an ester formulation, see Table 4. It lists products containing an ester herbicide in the “Common name” column. For example, a 2,4-D ester formulation is indicated as 2,4-D ester; amine and other salt formulations are not specified and appear simply as 2,4-D.

In some counties, application of both ester and amine phenoxy herbicides (2,4-D, MCPA, etc.) is restricted or regulated under Chapter 76 of the Texas Agricultural Code. Turfgrass on home lawns is exempt from these restrictions. Because the restrictions often vary based on the time of year, review them before applying a synthetic auxin herbicide.

2,4-D: This synthetic auxin has been produced since the 1940s and is still widely used because it con-

trols many broadleaf weeds economically. It does not control clovers (*Trifolium*, *Medicago*, and *Melilotus* spp.). It is often combined with other synthetic auxin herbicides, such as dicamba, to improve control of difficult target weeds.

Because creeping bentgrass and St. Augustinegrass are less tolerant of 2,4-D than are other turfgrasses, check the product label for formulations that contain lower rates of 2,4-D. Table 5 also lists synthetic auxin herbicide rates in various products.

Clopyralid: Although it controls fewer species than herbicides such as 2,4-D and triclopyr, clopyralid provides good to excellent control of tough-to-control weeds such as black medic (*Medicago lupulina*), clovers (*Trifolium*, *Medicago*, and *Melilotus* spp.), Virginia buttonweed (*Diodia virginiana*), and members of the Asteraceae family, which includes several genera of thistles.

Clopyralid can be applied to most warm- and cool-season grasses, including St. Augustinegrass and centipedegrass. It cannot be applied to residential turfgrass. In other areas, do not collect clippings for use as mulch or compost after application.

Dicamba: Often used in combination with 2,4-D to provide broad-spectrum weed control, dicamba provides control of clovers (*Trifolium*, *Medicago*, and *Melilotus* spp.) and weeds with a prostrate growth habit such as prostrate knotweed (*Polygonum aviculare*).

It is less effective against dandelion (*Taraxacum officinale*). Because dicamba can be absorbed through plant roots in addition to foliage, use caution when applying it around the driplines of trees and ornamental plants.

Dichlorprop: This herbicide is similar to 2,4-D. Dichlorprop is usually combined with 2,4-D to increase the spectrum of weed control compared to either applied alone.

Fluroxypyr: This herbicide is combined with other herbicides to provide broad-spectrum weed control. Weed control is similar to that provided by clopyralid except that fluroxypyr controls lespedeza (*Lespedeza* sp.).

Unlike clopyralid, fluroxypyr can be applied to residential lawns, and clippings may be collected. It is more likely than clopyralid to temporarily injure warm-season turfgrass, especially bermudagrass and St. Augustinegrass.

MCPA and mecoprop (MCP): These herbicides are chemically similar to 2,4-D and control similar weeds. MCPA may result in less injury than 2,4-D to some turfgrasses.

Triclopyr: This herbicide provides excellent control of some tough-to-control weeds such as clovers (*Trifolium*, *Medicago*, and *Melilotus* spp.), lespedeza (*Lespedeza* spp.), and wild violet (*Viola papilionacea*), among others.

However, it can injure some warm-season turfgrasses, especially bermudagrass at higher rates.

Quinclorac: This highly selective herbicide provides excellent black medic (*Medicago lupulina*) and clover (*Trifolium*, *Medicago*, and *Melilotus* spp.) control. It also controls grassy weeds such as crabgrass (*Digitaria* spp.), barnyardgrass (*Echinochloa crus-galli*), and foxtail (*Setaria* spp.) at higher rates.

Do not use it on bahiagrass, St. Augustinegrass, or centipedegrass. At higher rates, it may also injure warm-season grasses such as bermudagrass.

Product formulations containing synthetic auxin herbicides

Table 5. Synthetic auxin herbicide rates in various products

Trade name	Rate (per acre)	Active ingredient (lb/A)								
		2,4-D	clopyralid	dicamba	dichlorprop (2,4-DP)	fluroxypyr	MCPA	mecoprop (MCPP)	triclopyr	quinclorac
2DQ	1–3 pt	0.4–1.2	—	0.04–0.13	—	—	—	—	—	0.04–0.12
4Speed ¹	1.8–4 pt	0.5–1.1	—	0.05–0.11	—	—	—	0.13–0.29	—	—
4Speed XT ¹	1.8–4 pt	0.5–1.1	—	0.05–0.11	—	—	—	—	0.05–0.11	—
Avenue South ^{2,3}	2.7–5 pt	0.18–0.33	—	0.05–0.09	—	—	—	—	—	—
Banvel	0.5 pt–2 qt	—	—	0.25–2	—	—	—	—	—	—
Battleship III	3–4 pt	—	—	—	—	0.11–0.15	1.1–1.4	—	0.10–0.14	—
ChangeUp	2–3 pt	—	—	0.10–0.15	—	0.10–0.15	1.0–1.5	—	—	—
Clean Slate	0.25–1.33 pt	—	0.1–0.5	—	—	—	—	—	—	—
Confront	1–2 pt	—	0.1–0.2	—	—	—	—	—	0.28–0.56	—
Cool Power	2.5–3.5 pt	—	—	0.09–0.13	—	—	0.9–1.3	—	0.09–0.13	—
Drive XLR8	22–64 oz	—	—	—	—	—	—	—	—	0.25–0.75
EndRun	1.8–4 pt	0.5–1.2	—	0.04–0.1	—	—	0.1–0.3	—	—	—
Escalade 2	2–3 pt	0.8–1.2	—	0.1–0.15	—	0.1–0.15	—	—	—	—
Hardball	1–1.75 qt	0.4–0.8	—	—	—	—	—	—	—	—
Horsepower	2–3 pt	—	—	0.1–0.14	—	—	1.0–1.4	—	0.1–0.14	—
Last Call ⁴	3.5–4 pt	—	—	0.1–0.125	—	0.1–0.125	—	—	—	—
Lontrel	0.25–1.33 pt	—	0.1–0.5	—	—	—	—	—	—	—
Mecomec 2.5	4–5.17 pt	—	—	—	—	—	—	0.6–0.75	—	—
Mecomec 4	2.75–3.5 pt	—	—	—	—	—	—	0.6–0.75	—	—
Millennium Ultra 2	1.5–3 pt	0.6–1.1	0.03–0.07	0.07–0.14	—	—	—	—	—	—
Momentum FX2	3–4 pt	0.84–1.1	—	—	—	0.10–0.14	—	—	0.10–0.13	—
Momentum Q	7–8 pt	0.9–1.0	—	0.10–0.13	—	—	—	—	—	0.66–0.75
Onetime	22–64 oz	—	—	0.03–0.1	—	—	—	0.13–0.38	—	0.25–0.75
Powerzone ⁵	2–5 pt	—	—	0.06–0.14	—	—	0.6–1.4	0.11–0.28	—	—
Q4 ²	5–8 pt	0.6–0.9	—	0.06–0.1	—	—	—	—	—	0.47–0.75
Quincept	7–8 pt	0.9–1	—	0.11–0.13	—	—	—	—	—	0.66–0.75

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Table 5 continued. Synthetic auxin herbicide rates in various products

Trade name	Rate (per acre)	Active ingredient (lb/A)								
		2,4-D	clopyralid	dicamba	dichlorprop (2,4-DP)	fluroxypyr	MCPA	mecoprop (MCPP)	triclopyr	quinclorac
Quinclorac 75DF	1 lb	—	—	—	—	—	—	—	—	0.75
RedZone 2 ¹	3–4 pt	0.9–1.1	—	0.09–0.11	—	—	—	0.21–0.29	—	—
Solitare ²	1–2 lb	—	—	—	—	—	—	—	—	0.56–1.2
SpeedZone ⁵	2–5 pt	0.4–1	—	0.04–0.09	—	—	—	0.12–0.3	—	—
SpeedZone Southern	1.5–5 pt	0.1–0.3	—	0.01–0.03	—	—	—	0.05–0.125	—	—
Spoiler	1.7–4 pt	0.6–1.3	—	—	0.15–0.36	—	—	0.15–0.36	—	—
SquareOne ⁵	8–18 oz	—	—	—	—	—	—	—	—	0.33–0.74
Surge ²	2.75–4 pt	0.5–0.7	—	0.08–0.11	—	—	—	0.17–0.25	—	—
T-Zone ²	2–4 pt	0.4–0.9	—	0.05–0.1	—	—	—	—	0.13–0.25	—
Tri-Power	2–3.9 pt	—	—	0.08–0.15	—	—	0.8–1.5	0.15–0.3	—	—
Triamine	1.75–4 pt	0.3–0.6	—	—	0.14–0.31	—	—	0.14–0.31	—	—
Trimec Bentgrass Formula	3–6 pt	0.2–0.3	—	0.07–0.14	—	—	0.3–0.5	—	—	—
Trimec Classic	2–4 pt	0.5–1	—	0.05–0.11	—	—	—	0.13–0.27	—	—
Trimec Plus ⁶	8–13.5 pt	0.5–0.8	—	0.12–0.2	—	—	—	0.24–0.41	—	—
Trimec Southern	1–3 pt	0.2–0.5	—	0.04–0.11	—	—	—	0.17–0.5	—	—
Triplet Low Odor	1.8–4 pt	0.5–1.2	—	0.05–0.11	—	—	—	0.14–0.32	—	—
Triplet SF	1.8–4 pt	0.5–1.2	—	0.05–0.11	—	—	—	0.14–0.32	—	—
Turflon Ester, Turflon Ester Ultra	1–2 pt	—	—	—	—	—	—	—	0.5–1	—
Vanquish	0.5–2 pt	—	—	0.25–1	—	—	—	—	—	—
Vision	0.5–2 pt	—	—	0.24–1	—	—	—	—	—	—
Vista XRT	—	—	—	—	—	0.13–0.48	—	—	—	—
Weeder 64	1–1.5 qt	1.0–1.4	—	—	—	—	—	—	—	—

1: Also contains pyraflufen-ethyl, which kills susceptible weeds within 48 hours

2: Also contains sulfentrazone, which kills susceptible weeds within 48 hours

3: Also contains penoxsulfam, a systemic ALS-inhibiting herbicide that controls broadleaf weeds

4: Also contains fenoxaprop-P-ethyl, which controls many grassy weeds

5: Also contains carfentrazone, which kills susceptible weeds within 48 hours

6: Also contains MSMA, which controls some broadleaf and grassy weeds

Nonsynthetic auxin herbicides for postemergence broadleaf weed control

Several products do not contain synthetic auxin herbicides but provide primarily postemergence broadleaf weed control (Table 6). These products may be desirable in areas where products with less active ingredient are required to provide weed control or where volatility is a concern.

Table 6. Nonsynthetic auxin herbicides for postemergence broadleaf weed control in turfgrasses

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Weeds controlled	Comments	HRAC, WSSA group
carfentrazone	Quicksilver (1–6.7 fl oz)	Most cool- and warm-season grasses. See label	Some broadleaf weeds, moss	A contact herbicide with little residual activity. Tank-mixing with synthetic auxin herbicides enhances weed control, especially against perennial weeds. Can be applied to creeping bentgrass and hybrid bermudagrass putting greens for moss control. Apply at up to 2.1 fl oz/A for broadleaf weed control and up to 6.7 fl oz/A for moss control.	E, 14
florasulam	Defendor (4 fl oz)	BA, BE, CBG, CE, FF, KB, PR, SA, TF, SS, Z	Some broadleaf weeds	Controls small, actively growing weeds. Best for controlling small weeds in late winter or early spring. Apply in combination with dithiopyr (Dimension) for residual weed control.	B, 2
metsulfuron-methyl	Blade, Manor, MSM turf, others (0.125–1 oz)	BE, CE, FF, KB, SA, Z	Broadleaf weeds, bahiagrass, ryegrass	Provides good to excellent control of many broadleaf weed species. A systemic herbicide with some soil residual; injury symptoms may not be evident for 2 wk after application Use caution around trees and ornamental plants. See label for more information.	B, 2
metsulfuron-methyl + rimsulfuron	NEGATE 37WG (1.5 oz)	BE, Z	Grassy and broadleaf weeds, including bahiagrass	See metsulfuron-methyl above for information on broadleaf weed control. Rimsulfuron generally does not enhance broadleaf weed control compared to metsulfuron-methyl alone. Use caution around trees and ornamental plants. See label for more information.	B, 2
penoxsulam	Sapphire (0.25–1.5 pt) LockUp (see label)	BE, CBG, PR, TF	Some broadleaf weeds	Provides control of weeds in the early stages of growth with some residual control LockUp is a granular material often formulated with other herbicides such as dicamba to enhance broadleaf weed control.	B, 2

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Table 6 continued. Nonsynthetic auxin herbicides for postemergence broadleaf weed control in turfgrasses

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Weeds controlled	Comments	HRAC, WSSA group
pyraflufen-ethyl	Octane (0.7–4 oz)	BE, CBG, CE, KB, PR, SA, TF, Z	Broadleaf weeds	A contact herbicide with little residual activity Combining with synthetic auxin herbicides enhances weed control, especially for perennial weeds.	E, 14
sulfentrazone + metsulfuron-methyl	Blindside (3.25–10 oz)	BE, BU, CE, KB, TF, SA, Z	Broadleaf weeds, some grasses, sedges	Provides good to excellent control of many broadleaf weed species. A systemic herbicide with some soil residual. Use caution around trees and ornamental plants. See label for more information. Sulfentrazone results in injury symptoms visible within 48 hours, compared to about 2 wk for metsulfuron-methyl alone.	E, 14 + B, 2
thiencarbazone-methyl + iodosulfuron + dicamba	Celsius WG (2.5–4.9 oz)	BE, BU, CE, SA, Z	Broadleaf, grassy weeds	Controls many broadleaf weeds. Two applications may be needed for difficult-to-control weeds such as dichondra, wild geranium, and Virginia buttonweed.	B, 2 + O, 4

Nonselective herbicides for general weed control

Table 7. Nonselective herbicides for general weed control and/or turfgrass renovations

Common name	Trade name (Product/A)	Comments	HRAC, WSSA group
dazomet	Basamid (218–525 lb)	See label regarding site preparation, use rates, tarping and overhead irrigation after application. Tarping may improve efficacy. Restricted-use pesticide	Z, 17
diquat	Reward (1–2 pt)	Quickly dries out green tissues. Adequate spray volume is essential to obtain leaf coverage and best control. A contact herbicide that does not translocate and therefore does not control perennial weeds	D, 22
glufosinate	Finale (3–6 qt)	Translocation more limited than that of glyphosate; thus, it is excellent for edging around desirable turfgrass. Can be applied to dormant bermudagrass	H, 10
glyphosate	RoundUp, Touchdown, many others (see label)	Optimal for control of grasses and many broadleaf plants. At low rates, does not completely control legumes or Cyperaceae (sedges and kyllingas)	G, 9
pelargonic acid	Scythe (see label)	Dries out green tissues quickly. Spray volume must be adequate to obtain leaf coverage and best control. Does not translocate or control perennial weeds.	Z, 17

Herbicides for commonly occurring weeds

Crabgrass

Preemergence herbicides

Most preemergence herbicides in the section on preemergence herbicides for grassy and broadleaf weeds (beginning on page 4) provide suitable crabgrass control when applied before crabgrass germination.

Germination typically occurs in late winter (February to mid-March), but varies from year to year, based on temperature, rainfall, and location. Crabgrass germination usually begins when the soil temperature at a 2-inch depth reaches 55°F for at least 3 days.

The forsythia (*Forsythia* spp.) plant can sometimes be used to time preemergence herbicide application. Make preemergence applications when forsythia is in full bloom (since they are usually among the first plants to bloom, their yellow flowers are easy to spot). Forsythia plants are more prevalent in East Texas—they are rare in West Texas.

Some preemergence herbicides can provide early postemergence control of small crabgrass plants. Consider using one of these herbicides if you cannot make an application before crabgrass germinates:

- Dithiopyr (such as Dimension) and prodiamine + sulfentrazone (Echelon) can control crabgrass

up to the 4- to 5-leaf stage, which is usually the last growth stage before it produces tillers. The Dimension label will likely change in 2016 to indicate control of larger crabgrass plants with multiple tillers.

- Indaziflam (Specticle) can control crabgrass at the 2-leaf stage or smaller.

Postemergence herbicides

These herbicides control crabgrass plants at various growth stages after germination. See the comments section and the product label for efficacy and application rates at various growth stages. Most products in Table 8 control smooth (*Digitaria ischaemum*) and large (*Digitaria sanguinalis*) crabgrass. Control may vary for other crabgrass species, such as blanket (*D. serotina*), India (*D. longiflora*), and tropical (*D. bicomis*) crabgrass.

If you apply herbicides early in the season in areas where the desirable turfgrass is thin and crabgrass infestations are severe, new crabgrass plants will germinate in the voids after the existing crabgrass plants are controlled. For residual control, consider tank-mixing a preemergence herbicide with the postemergence herbicides in Table 8.

Table 8. Postemergence herbicides for crabgrass control in turfgrasses

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Other weeds controlled	Comments	HRAC, WSSA group
asulam	Asulox (6.0–8.0 pt)	BE (Tifway only), SA	Grassy weeds including crabgrass and sandbur	For use on sod farms only. For use only on Tifway (419) bermudagrass.	I, 18
fenoxaprop-P-ethyl	Acclaim Extra (3.5–39 fl oz)	CBG, FF, KB, PR, TF, Z	Some grassy weeds including goosegrass	Application rate depends on crabgrass tiller stage. See label for information on surfactant use. Broadleaf herbicides such as 2,4-D reduce efficacy on grassy weeds. Do not apply 5 days before or 21 days after an application of 2,4-D or similar herbicide.	A, 1
fenoxaprop-P-ethyl + fluroxypyr ester + dicamba	Last Call (3.5–4 pt)	FF, KB, PR, TF, Z	Some grassy weeds including goosegrass and broadleaf weeds	Treat annual grassy weeds at the 1-leaf—4-tiller stage for best control. See label for information on surfactant use. Broadleaf herbicides such as 2,4-D reduce efficacy on grassy weeds. Do not apply 5 days before or 21 days after applying 2,4-D or a similar herbicide.	A, 1 + O, 4
imazapic	Plateau (2–12 fl oz)	See label	Broadleaf weeds, some grassy weeds, seedhead suppression	Suppresses crabgrass. Best for weed control and/or seedhead suppression in low-maintenance areas	B, 2
imazaquin	Image 70DG (8.6–11.4 oz wt)	BE, CE, SA, SS, Z	Broadleaf weeds, sedges, some grasses	Suppresses crabgrass	B, 2
mesotrione	Tenacity (5–8 fl oz)	BE, BU, CE, FF, KB, PR, SA, TF	Broadleaf and grassy weeds, including nimblewill and creeping bentgrass	Control is inconsistent against crabgrass above the 4-tiller stage.	F2, 27
MSMA	Many (see label)	BE, KB, Z	Some grassy and broadleaf weeds, sedges	See EPA legislation regarding use restrictions on different sites. As of this writing MSMA is registered for use only on golf courses, sod farms with application restrictions.	Z, 17
MSMA + 2,4-D + mecoprop + dicamba	Trimec Plus (8–13.5 pt)	BE, KB, PR, TF, Z	Grassy and broadleaf weeds	This product contains MSMA; read the label carefully for use restrictions.	O, 4 + Z, 17
quinclorac	Drive XLR8 (22–64 fl oz) Quinclorac 75DF (1 lb)	Many warm- and cool-season species. See label	Many annual grassy weeds and some broadleaf weeds	Apply with MSO or other high-quality surfactant. Apply before plants reach the 1-tiller stage or once they have matured to 5 tillers or greater. Applications to grasses at the 2- to 4-tiller stage may not provide complete control.	L, 21 (monocot) O, 4 (dicot)
quinclorac + 2,4-D + dicamba	Quincept (7–8 pt) Momentum Q (7–8 pt)	Many warm- and cool-season species. See label	Many broadleaf weeds	Apply before plants reach the 1-tiller stage or once they have matured to 5 tillers or greater. Applications to grasses at the 2- to 4-tiller stage may not provide complete control.	L, 21 (monocot) O, 4 (dicot)
quinclorac + mecoprop + dicamba	Onetime (22–64 fl oz)	Many warm- and cool-season species. See label	Some grassy and many broadleaf weeds	Apply before plants reach the 1-tiller stage or once they have matured to 5 tillers or greater. Applications to grasses at the 2- to 4-tiller stage may not provide complete control. Do not apply to turfgrass grown for sod.	L, 21 (monocot) O, 4 (dicot)

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Table 8 continued. Postemergence herbicides for crabgrass control in turfgrasses

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Other weeds controlled	Comments	HRAC, WSSA group
quinclorac + sulfentrazone	Solitare (1–2 lb)	BE, BU, CE, KB, PR, TF, SS, Z	Broadleaf weeds, some grasses and sedges	Applications within 7 days of trinexapac-ethyl are not recommended.	E, 14 + L, 21 (monocot) O, 4 (dicot)
quinclorac + sulfentrazone + 2,4-D + dicamba	Q4 (5–8 pt)	BE	Some grassy weeds, nutsedge, broadleaf weeds	See label for information about potential injury to warm-season grasses.	L, 21 (monocot) O, 4 (dicot) + E, 14
sethoxydim	Segment (1.5–3.75 pt)	CE, FF	Grassy weeds including bahiagrass and bermudagrass suppression	Tank mixture with some broadleaf herbicides can result in failure to control grassy weeds.	A, 1
thiencarbazone-methyl + iodosulfuron + dicamba	Celsius WG (2.5–4.9 oz)	BE, BU, CE, SA, Z	Many broadleaf, grassy weeds	Controls crabgrass in early stages of growth	B, 2 + O, 4
thiencarbazone-methyl + foramsulfuron + halosulfuron-methyl	Tribute Total (1–3.2 oz)	BE, Z	Broadleaf, grassy, sedges	Apply at the 3.2 oz/A rate to crabgrass up to the 2-tiller stage. Sequential applications may be necessary.	B, 2
topramezone	Pylex (1.0–1.5 fl oz)	CE, CBG, FF, KB, TF, PR	Several grassy and broadleaf weeds including common bermudagrass and nimblewill	Apply at 1.0–1.5 fl oz/A for crabgrass control.	F2, 27

Goosegrass

Goosegrass (*Eleusine indica*) often outcompetes desirable turfgrass in compacted areas with limited root zone oxygen. Aeration or other cultural practices that reduce compaction in combination with herbicide applications can help reduce goosegrass infestations.

Goosegrass populations resistant to one or more herbicidal modes of action have been reported in turfgrass across the United States. This includes preemergence WSSA Group 3 herbicides such as prodiamine, pendimethalin, and trifluralin as well as postemergence WSSA group 1 and 5 herbicides such as fenoxaprop-P-ethyl and metribuzin. Rotate herbicide modes of action to prevent development of resistant populations.

Preemergence herbicides

Most preemergence herbicides in the section on preemergence herbicides for grassy and broadleaf weeds (beginning on page 4) provide suitable goosegrass control when applied before goosegrass germination.

Several studies suggest that goosegrass germinates when temperatures reach 85 to 95°F during the day

and go down to 65 to 75°F at night. It is particularly suited to germinate in bare areas where temperatures fluctuate more rapidly. Germination typically occurs 4 to 6 weeks after crabgrass, but varies from year to year, based on temperature and rainfall.

Therefore, in areas with a history of goosegrass infestations, a second preemergence herbicide application is recommended 6 to 8 weeks after an application timed for crabgrass control.

Postemergence herbicides

Apply postemergence herbicides before goosegrass plants become too large. Most herbicides in Table 9 do not control multi-tiller goosegrass plants with single applications. They do control plants in the pre-tiller or leaf stages of growth.

Scouting areas with a history of goosegrass infestations before plants tiller can help reduce herbicide applications and application rates necessary for control. To prevent emergence of new goosegrass plants from seed, tank-mix postemergence herbicides with preemergence herbicides for early and mid-season applications.

Table 9. Postemergence herbicides for goosegrass control in turfgrasses

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Other weeds controlled	Comments	HRAC, WSSA group
asulam	Asulox (6–8 pt)	BE (Tifway only), SA	Grassy weeds including crabgrass and sandbur	For use on sod farms only. For use only on Tifway (419) bermudagrass	I, 18
diclofop	Illoxan (32.6–43.5 fl oz)	BE	Goosegrass only	Manufacturing discontinued in 2014 For use on golf courses only; can be applied to bermudagrass putting greens	A, 1
sulfentrazone	Dismiss, Spartan 4F (4–12 fl oz)	Most warm- and cool-season grasses; see label	Broadleaf weeds	Apply at 4–12 fl oz/A for control of leaf stage (pre-tiller) goosegrass plants. Apply the highest rate allowed by the label in your desirable turfgrass. May discolor St. Augustine or zoysiagrass temporarily, but it typically recovers after a brief period of new growth. Other sulfentrazone-containing herbicides such as Dismiss South and Solitare also provide similar goosegrass control. Refer to product labels for more information.	E, 14
fenoxaprop-P-ethyl	Acclaim Extra (3.5–39 fl oz)	CBG, FF, KB, PR, TF, Z	Grassy weeds including crabgrass	Application rate depends highly on goosegrass tiller stage. Apply 13 fl oz/A to leaf-stage plants. Apply between 13 and 39 fl oz/A to tillered plants. See label for more information. Do not apply more than 28 fl oz/A to zoysiagrass.	A, 1
fluazifop-P-butyl (see label)	Fusilade II (2–6 fl oz) Ornamec 170 (see label) Ornamec Over-The-Top (see label)	TF, Z	Bermudagrass, dallisgrass suppression	Refer to the label for recommended application rate. Provides good goosegrass control in the early tillering stages More effective against goosegrass than large crabgrass	A, 1
foramsulfuron	Revolver (8.8–35.2 fl oz)	BE, BU, Z	Overseeded cool-season grasses, some broadleaf weeds	2 or 3 sequential applications of at least 17.4 fl oz/A control small goosegrass plants. Can be applied to bermudagrass putting greens for goosegrass control; apply before goosegrass tillering Follow label to prevent off-target movement. Adjuvants such as MSO, UAN, or AMS may improve control. Tank-mixing with metribuzin (Sencor) or MSMA in bermudagrass may improve control but will likely injure it temporarily.	B, 2

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Table 9 continued. Postemergence herbicides for goosegrass control in turfgrasses

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Other weeds controlled	Comments	HRAC, WSSA group
mesotrione	Tenacity (5–8 fl oz)	BE, BU, CE, FF, KB, PR, SA, TF	Broadleaf and grassy weeds, including nimblewill and creeping bentgrass	In the state of Florida, see 24(c) label for goosegrass control on bermudagrass athletic fields and golf courses Controls goosegrass in the early stages of growth Apply to bermudagrass only if injury can be tolerated.	F2, 27
metribuzin	Sencor 75% (0.33–0.66 lb)	BE	Some broadleaf and grassy weeds	Do not apply if the mowing height is less than 0.5 in. Do not apply within the root zone of ornamental trees or shrubs. Tank-mixing with MSMA improves goosegrass control, but also increases temporary bermudagrass injury. Metribuzin + MSMA will likely injure bermudagrass more than metribuzin + foramsulfuron or MSMA + foramsulfuron. Use low rate if soil pH > 7.5.	C1, 5
MSMA (see label)	Many (see label)	BE, KB, Z	Some grassy and broadleaf weeds, sedges	A restricted-use pesticide; see EPA legislation regarding use restrictions on different sites May cause transient injury to bermudagrass and zoysiagrass Not recommended for application to Kentucky bluegrass in summer	Z, 17
thiencarbazone-methyl + foramsulfuron + halosulfuron-methyl	Tribute Total (1.0–3.2 oz)	BE, Z	Broadleaf, grassy weeds, sedges	Apply at 3.2 oz/A with MSO and ammonium sulfate. A second application may be necessary 4 wk later. Can control goosegrass up to early tiller stages	B, 2
topramezone	Pylex (1.0–1.5 fl oz)	BE, CE, CBG, FF, KB, SS, TF, PR	Several grassy and broadleaf weeds, including common bermudagrass and nimblewill	A supplemental label for use in bermudagrass and seashore paspalum may be available in 2016. Controls multi-tiller goosegrass plants; make a second application 14–21 days later if necessary Temporarily whitens many desirable turfgrasses, especially bermudagrass, seashore paspalum, and creeping bentgrass. Test a small area before application. Apply with COC or MSO adjuvant.	F2, 27

Sandbur

Sandbur (*Cenchrus* spp.) is a summer annual weed that is extremely difficult to control. Complete control usually requires combinations of pre- and postemergence herbicides. Lack of turfgrass density is often a contributing factor to sandbur infestations. Important components of an overall sandbur control program are proper turfgrass species selection, adequate nitrogen fertilizer, and other cultural practices that improve turfgrass density.

Some herbicides listed in Table 10 are registered specifically for field sandbur (*Cenchrus spinifex*) control, while others are more general and are simply registered for sandbur (*Cenchrus* spp.) control. In addition to field sandbur, longspine (*C. longispinus*) and southern (*C. echinatus*) sandbur can be found in Texas.

Because sandbur can sometimes survive the winter in areas without a hard freeze, preemergence herbicides and some postemergence herbicides may not be effective for controlling these plants.

For more information on sandbur identification, see aggieturf.tamu.edu.

Preemergence herbicides

Several preemergence herbicides are labeled for sandbur control (Table 10). Because sandbur plants germinate later in the season than crabgrass, sequential applications may improve control with preemergence herbicides.

Using only preemergence herbicides will likely not provide acceptable control. Some sandbur plants can survive as perennials; in these cases, preemergence herbicides alone are ineffective. Preemergence herbicides other than those listed may also provide control.

Postemergence herbicides

Although applications made before sandbur plants tiller are most effective, multiple applications may still be required for acceptable control. Single applications to larger plants will not control them acceptably.

Consider combining postemergence herbicides (Table 11) with preemergence herbicides to control existing plants as well as those that continue to germinate from seed.

Table 10. Preemergence herbicides for sandbur control in turfgrasses

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Other weeds controlled	Comments	HRAC, WSSA group
dithiopyr	Dimension 2EW (1–2 pt) Dithiopyr 2L (1–2 pt) Dimension Ultra 40WP (0.625–1.25 lb) Dithiopyr 40WSB (0.625–1.25 lb) Several others and many fertilizer carriers	BA, BE, BU, CA, CBG, CE, FF, KB, PR, SA, TF, Z	Annual grassy weeds, some small-seeded broadleaves	Labeled for control of sandbur species, not exclusive to field sandbur Provides early postemergence crabgrass control, but not postemergence control of other weeds, including sandbur Sequential applications that apply at least 0.5 lb AI/A per year are recommended to improve control. See label for more information.	K1, 3
dimethenamid-P	Tower (21–32 fl oz)	BA, BE, BU, CE, FF, KB, PR, SA, SS, TF, Z	Annual grassy weeds, several small-seeded broadleaves, sedges	Best when applied as a sequential application to pendimethalin (such as Pendulum) or as a tank-mixture with pendimethalin Can be tank-mixed with postemergence herbicides including sethoxydim (Segment) to provide postemergence residual control in centipedegrass	K3, 15

continued on next page

Table 10 continued. Preemergence herbicides for sandbur control in turfgrasses

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Other weeds controlled	Comments	HRAC, WSSA group
indaziflam	Specticle FLO (6–10 fl oz) Specticle 20WSP (2.5–5 oz)	BA, BE, BU, CE, SA, Z	Annual grassy weeds, some small-seeded broadleaves, sedges emerging from seed	In sandy soils, downward movement may injure turfgrass roots. When sand content is > 80%, make several low-rate applications at 30–45 day intervals. See label for more information. Provides early postemergence control of crabgrass but not sandbur Tank-mix with metribuzin (Sencor) to provide postemergence residual control in bermudagrass.	L, 21
S-metolachlor	Pennant MAGNUM (1.3–2.6 pt)	BA, BE, CE, SA, Z	Annual grassy weeds, some small-seeded broadleaves, sedges	Best when applied as a sequential application to prodiamine (such as Barricade) or as a tank-mixture with prodiamine Application rates vary, based on soil texture. See label for more information.	K3, 15
oryzalin	Surflan AS (1.5–2 qt) Several other formulations	BA, BE, BU, CE, SA, TF, Z	Annual grassy weeds, some small-seeded broadleaves, sedges	Consider splitting applications: 1.5 qt/A followed by 1.5 qt/A 8–10 wk later. Apply only to well-established mature turfgrass.	K1, 3
pendimethalin	Pendulum AquaCap (3.1–6.3 pt) Pendulum 3.3EC (3.6–7.2 pt) Pendulum 2G (75–150 lb) Many others	Most warm- and cool-season species	Annual grassy weeds, some small-seeded broadleaves	See label for sequential application programs where heavy infestations are expected.	K1, 3
pendimethalin + dimethenamid-P	Freehand 1.75G (100–200 lb)	BE, CE, SA, SS, Z	Annual grassy weeds, several small-seeded broadleaves, sedges Can help remove overseeded cool-season grasses in warm-season turf	Apply at least 150 lb/A for sandbur control. Can be applied before or after postemergence herbicides including sethoxydim (Segment) to provide postemergence residual control	K1, 3 + K3, 15

Table 11. Postemergence herbicides for sandbur control in turfgrasses

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Other weeds controlled	Comments	HRAC, WSSA group
fenoxaprop-P-ethyl	Acclaim Extra (3.5–39 fl oz)	CBG, FF, KB, PR, TF, Z	Grassy weeds including goosegrass and crabgrass	Application rate depends on tiller stage of target weed. May be applied to newly plugged zoysiagrass. See label for information on surfactant use. Broadleaf herbicides such as 2,4-D or triclopyr reduce sandbur control. Do not apply 5 days before or 21 days after an application of 2,4-D or similar herbicide.	A, 1
imazaquin	Image 70DG (8.6–11.4 oz)	BE, CE, SA, SS, Z	Broadleaf weeds, sedges, some grasses	Include NIS at 0.25% v/v. Use the high application rate. Multiple applications may be required for control. Both roots and shoots absorb this herbicide. Irrigation or rainfall (0.25 to 0.5 in) within 1–7 days after application is suggested to improve weed control.	B, 2
metribuzin	Sencor 75% (0.33–0.66 lb)	BE	Some broadleaf and grassy weeds, including goosegrass	Provides control when applied in combination with MSMA Short-term phytotoxicity may appear after application. Apply only to actively growing turf.	C1, 5
MSMA	Many (see label)	BE, KB, Z	Some grassy and broadleaf weeds, sedges	See EPA legislation regarding use restrictions on different sites. As of this writing, MSMA is registered only for golf courses, sod farms with application restrictions.	Z, 17
sethoxydim	Segment (1.5–3.75 pt)	CE, FF	Grassy weeds, including bahiagrass and bermudagrass suppression	Apply at 2.25 pt/A to grasses < 6 in. tall. Can be applied to seedling centipedegrass and fine fescue	A, 1

Annual bluegrass

Annual bluegrass (*Poa annua* L.) is a winter annual that typically germinates in late summer to early fall and becomes problematic in late winter through early spring. Although it can be a weak perennial in some parts of the United States, it generally cannot survive Texas summers.

Annual bluegrass is one of the most problematic weeds because of its clumping growth habit, seed production at low mowing heights, and ability to produce 1,000 to 2,250 seeds per plant.

Herbicide resistance

Herbicide-resistant annual bluegrass is widespread across the southern United States. When using the same herbicidal mode of action for several years, herbicide resistance is more likely to develop.

Herbicide programs that use multiple modes of action make resistance development less likely. For more information on herbicide resistance in annual bluegrass, see the factsheet “How to Manage Herbicide Resistance in Annual Bluegrass” at aggieturf.tamu.edu.

Preemergence herbicides

Apply these products before annual bluegrass germinates. Germination can occur in early to mid-September in North Texas and later in South Texas.

In turfgrasses mowed at lower heights (such as golf course fairways), annual bluegrass germination and subsequent control with some preemergence herbicides can be highly variable, so herbicides that provide pre and postemergence annual bluegrass control may perform more consistently in these areas.

Most products in Table 12 cannot be applied for several weeks before ryegrass overseeding, so plan accordingly. See the comments in the table and check

the product label before overseeding with cool-season grasses such as perennial ryegrass.

Pre/postemergence herbicides

These herbicides control annual bluegrass shortly after germination, but they also provide season-long residual control when applied as directed. Consider these herbicides where annual bluegrass germination is less predictable or flexibility in application timing is desired.

Among products listed in Table 13, only ethofumesate can be used on cool-season turfgrasses or in conjunction with ryegrass overseeding. For more information, see the comments in Table 13 and refer to the product label.

Postemergence herbicides

These herbicides are typically applied from late fall through early spring for control of emerged annual bluegrass. Most postemergence herbicides have limited residual activity and require tank-mixing a preemergence herbicide for season-long control. All products in Table 14 provide excellent control when applied to actively growing annual bluegrass.

Nonselective postemergence herbicides

Nonselective postemergence herbicides (Table 15) can injure nondormant turfgrass and delay its greenup. To ensure that the turfgrass is dormant, thoroughly inspect the canopy and ensure that no green leaf tissue is within the turfgrass canopy, thatch, or soil/thatch interface.

These herbicides provide no residual annual bluegrass control, but they can be tank-mixed with preemergence herbicides for residual weed control.

Table 12. Preemergence herbicides for annual bluegrass control in turfgrasses

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Other weeds controlled	Comments	HRAC, WSSA group
Benefin	Balan 2.5G (60–120 lb) Others	BA, BE, CE, KB, PR, SA, TF, Z	Annual grassy weeds, some small-seeded broadleaves	Because benefin is more volatile than other preemergence herbicides, irrigation or rainfall shortly after application improves efficacy.	K1, 3
benefin + trifluralin	Team 2G (75–150 lb) Team Pro (see label) Many fertilizer carriers	Most cool- and warm-season turfgrasses—see label	Annual grassy weeds, some small-seeded broadleaves	May thin overseeded grasses in bermudagrass areas overseeded with winter grasses Because benefin and trifluralin are more volatile than other preemergence herbicides, irrigation or rainfall shortly after application improves efficacy.	K1, 3
bensulide	Bensumec 4LF (1.88–3.13 gal) Pre-San 7G (107–180 lb) Pre-San 12.5G (80–100 lb)	BA, BE, CBG, CE, FF, KB, PR, SA, TF, Z	Annual grassy weeds, some small-seeded broadleaves	Can be used on putting greens	N, 8
dithiopyr	Dimension 2EW (1–2 pt) Dithiopyr 2L (1 to 2 pt) Dimension Ultra 40WP (0.625–1.25 lb) Dithiopyr 40WSB (0.625–1.25 lb) Several others and many fertilizer carriers	BA, BE, BU, CA, CBG, CE, FF, KB, PR, SA, TF, Z	Annual grassy weeds, some small-seeded broadleaves	Do not apply to Tifgreen (328) hybrid bermudagrass. Certain formulations such as those from Anderson's Golf Products can be applied to putting greens with well-developed root systems.	K1, 3
dimethenamid-P	Tower (21–32 fl oz)	BA, BE, BU, CE, FF, KB, PR, SA, SS, TF, Z	Annual grassy weeds, several small-seeded broadleaves, yellow nutsedge	Controls annual bluegrass only when applied with pendimethalin Application to cool-season turfgrass may cause unacceptable injury or thinning.	K3, 15
S-metolachlor	Pennant MAGNUM (1.3–2.6 pt)	BA, BE, CE, SA, Z	Annual grassy weeds, some small-seeded broadleaves, sedges	This herbicide thins overseeded grasses. Do not apply 4 months before or after overseeding.	K3, 15
oryzalin	Surflan AS (1.5–2 qt) Several other formulations	BA, BE, BU, CE, SA, TF, Z	Annual grassy weeds, some small-seeded broadleaves, sedges	This herbicide thins overseeded grasses.	K1, 3
oxadiazon	Ronstar Flo 3.17L (5–7.5 pt) Ronstar 50 WSP (4–8 lb) Ronstar G (100–200 lb)	BE, BU, CBG, KB, PR, SA, SS, Z	Annual grassy weeds, some small-seeded broadleaves, sedges	Not for home lawns. For use only by professional applicators. Sprayable formulations (Flo, WP) may only be applied to dormant warm-season turf. Apply so that granules reach the soil surface. Do not apply to wet turf.	E, 14 Surflan

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Table 12 continued. Preemergence herbicides for annual bluegrass control in turfgrasses

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Other weeds controlled	Comments	HRAC, WSSA group
pendimethalin	Pendulum AquaCap (3.1–6.3 pt) Pendulum 3.3EC (3.6–7.2 pt) Pendulum 2G (75–150 lb) Many others	Most warm and cool-season species	Annual grassy weeds, some small-seeded broadleaves	Maximum single application rates are lower for residential turfgrass. Make a second application 5–8 wk later for extended annual bluegrass control. Delay overseeding for at least 3 months after application.	K1, 3
prodiamine	Barricade 65WG (0.5–2.3 lb) Barricade 4FL (10–48 fl oz) ProClipse 65WDG (0.5–2.3 lb) Cavalcade 65 WDG (0.5–2.3 lb) Several others, many fertilizer carriers	BA, BE, CBG, CE, FF, KB, PR, SA, TF, Z	Annual grassy weeds, some small-seeded broadleaves	Has demonstrated excellent annual bluegrass control in Texas A&M research trials when applied before emergence or combined with Monument 75 WDG after emergence. Can be used in bermudagrass overseeded with perennial ryegrass when applied 6–8 wk before and 4–8 wk after overseeding. See label for more information.	K1, 3
prodiamine + quinclorac	Cavalcade PQ 65WG (1.0–2.3 lb)	BE, BU, CBG, FF, KB, PR, SS, Z	Annual grassy weeds, some small-seeded broadleaves; postemergence control of many broadleaf and some grassy weeds including crabgrass	Quinclorac does not increase annual bluegrass control compared to prodiamine alone.	K1, 3 + L, 21 (monocot), O, 4 (dicot)

Table 13. Pre/postemergence herbicides for annual bluegrass control in turfgrasses

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Other weeds controlled	Comments	HRAC, WSSA group
atrazine	Aatrex 4L (1–4 qt) Others	BE, CE, SA, Z	Annual grassy weeds, many broadleaf weeds	Provides annual bluegrass control shortly after emergence. Do not use on alkaline or muck soils. Do not apply 4 months before or 6 months after seeding or until newly seeded grasses have overwintered. Do not use west of high-rainfall areas of East Texas.	C1, 5
ethofumesate	Prograss (0.5–1.33 gal) Prograss SC (0.75–3 qt)	BE, CBG, KB, PR, TF, SA	Annual bluegrass, crabgrass, foxtail, some broadleaf weeds, sedges	Ideal for annual bluegrass control in overseeded dormant or predormant bermudagrass. Application to bermudagrass subjected to stress (such as traffic or shade) increases risk for injury. At least 2 applications are required for season-long control. See label for more information.	N, 8

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Table 13 continued. Pre/postemergence herbicides for annual bluegrass control in turfgrasses

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Other weeds controlled	Comments	HRAC, WSSA group
flumioxazin	SureGuard (8–12 oz)	BE	Several broadleaf and grassy weeds; provides postemergence control of many weeds	Apply to dormant bermudagrass only. See supplemental label for use in turfgrass. When applying upslope of sensitive cool-season grasses, follow label to prevent off-target movement.	E, 14
indaziflam	Specticle FLO (6–10 fl oz) Specticle 20WSP (2.5–5 oz)	BA, BE, BU, CE, SA, Z	Annual grassy weeds, some small-seeded broadleaves, sedges emerging from seed	Apply before annual bluegrass tillering. When applied shortly after annual bluegrass emergence and before tillering, this product has demonstrated excellent efficacy in Texas A&M research trials. Refer to the label for use rates on sandy soils (> 80% sand) to prevent desirable turfgrass injury. When applying upslope of sensitive cool-season grasses, follow label to prevent off-target movement.	L, 21
pronamide	Kerb SC (1.25–5 pt) Kerb 50WP (2–4 lb)	BE, CE, SA, Z	Annual grassy weeds	Provides postemergence control at all stages of annual bluegrass growth; control occurs 3–5 wk after application Should be activated by light rainfall or irrigation within 24 hours of application When applying upslope of sensitive cool-season grasses, follow label to prevent off-target movement. The label does not restrict applications to warm-season putting greens.	K1, 3
simazine	Princep Liquid, (1–2 qt)	BE, CE, SA, Z	Winter annual grassy and broadleaf weeds; some summer annual grasses	Provides annual bluegrass control soon after emergence. Apply at 1 qt/A shortly after annual bluegrass germination (around October 1 in Texas). Application at 2 qt/A will improve broadleaf weed control. See information on page 8 for application restrictions. When applied shortly after annual bluegrass emergence and before tillering, this product has demonstrated excellent efficacy against annual bluegrass and broadleaf weeds in Texas A&M research trials.	C1, 5

Table 14. Postemergence herbicides for annual bluegrass control in turfgrasses

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Other weeds controlled	Comments	HRAC, WSSA group
amicarbazone	Xonerate (1–10 oz)	BA, BE, BU, CBG, CE, FF, KB, PR, SA, SS, TF, Z	Many broadleaf, some grassy weeds including annual bluegrass	Can be applied at up to 10 oz/A 1 or more wk before overseeding bermudagrass with ryegrass Can be applied in the spring to overseeded perennial ryegrass at 2–4 oz/A. Two sequential applications may be required for annual bluegrass control. Temporary ryegrass injury may occur. Can be applied at up to 10 oz/A to warm-season turfgrass before, during, or after emergence from dormancy. Application at rates < 5 oz/A may not provide complete annual bluegrass control. Repeat applications may be required.	C1, 5
bispyribac-sodium	Velocity SG (2–6 oz)	CBG, PR	Some broadleaf weeds, annual and roughstalk bluegrass	Primarily for use in cool-season turfgrass or overseeded bermudagrass See label for more information on rates and timings. Discolors and stunts perennial ryegrass for 14–21 days after application.	B, 2
flazasulfuron	Katana (0.5–3 oz)	BE, BU, CE, SS, Z	Overseeded cool-season grasses, sedges, some broadleaf weeds	Can be used at reduced rates when applied in conjunction with 0.25–0.75 lb urea N/1,000 ft² tank-mixed or as a granular within 1 day of application. Apply at 1.0–1.5 oz/A with urea nitrogen or 3.0 oz/A without nitrogen. When applying upslope or near sensitive cool-season grasses, follow label to prevent off-target movement.	B, 2
foramsulfuron	Revolver (8.8–35.2 oz)	BE, BU, Z	Overseeded cool-season grasses, goosegrass, some broadleaf weeds	Registered for bermudagrass putting greens. Apply at 8.8–17.4 fl oz/A for annual bluegrass control. Residual control of annual bluegrass that germinates after the application is very limited compared to other sulfonylurea herbicides. Can be applied up to 1 week before ryegrass overseeding When applying upslope or near sensitive cool-season grasses, follow label to prevent off-target movement.	B, 2
rimsulfuron	TranXit (0.5–2 oz) Rimsulfuron 25DF (0.125–2 oz)	BE, CE, Z	Cool-season grasses including ryegrass, annual bluegrass, some broadleaf weeds	Apply at 0.5–2.0 oz for annual bluegrass control. Can be applied to non-overseeded bermudagrass putting greens Can be applied up to 10 days before ryegrass overseeding Use caution when applying upslope or near sensitive cool-season grasses.	B, 2

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Table 14 continued. Postemergence herbicides for annual bluegrass control in turfgrasses

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Other weeds controlled	Comments	HRAC, WSSA group
sulfosulfuron	Certainty (0.75–2 oz)	BE, BA, BU, CE, SA, SS, Z	Broadleaf, grassy weeds, sedges	Best for use 7–10 days before ryegrass overseeding at 2.0 oz/A or for annual bluegrass control in St. Augustinegrass. Control of annual bluegrass after tillering can be inconsistent.	B, 2
thiencarbazone-methyl + foramsulfuron + halosulfuron-methyl	Tribute Total (1.0–3.2 oz)	BE, Z	Broadleaf, grassy weeds, sedges	Apply at 1.0 oz/A for annual bluegrass control. When applying upslope of sensitive cool-season grasses, follow label to prevent off-target movement.	B, 2
trifloxysulfuron-sodium	Monument 75WG (0.1–0.53 oz)	BE, Z	Grassy weeds, sedges, some broadleaf weeds	Apply at 0.35–0.53 oz/A for annual bluegrass control. Apply at least 3 wk before ryegrass overseeding. Demonstrated excellent postemergence annual bluegrass control in Texas A&M research trials. When applying upslope or near sensitive cool-season grasses, follow label to prevent off-target movement.	B, 2

Table 15. Nonselective postemergence herbicides for annual bluegrass control in turfgrasses

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Comments	HRAC, WSSA group
diquat	Reward (1–2 pt)	Dormant BE, Z	Provides rapid desiccation of green tissues. Adequate spray volume is essential to obtain leaf coverage and best control. A contact herbicide that does not translocate and therefore not control perennial weeds	D, 22
glufosinate	Finale (3–6 qt)	Dormant BE	If spray volume > 80 GPA, it may delay spring greenup. Control is reduced when average temperatures are below 50°F.	H, 10
glyphosate	RoundUp, Touchdown, others (see label)	Dormant BA, BE	Spray volume should not exceed 40 GPA. Certain product labels permit application to non-dormant bermudagrass. However, applying to nondormant bermudagrass will likely delay greenup.	G, 9

Dallisgrass

Dallisgrass (*Paspalum dilatatum*) is a warm-season perennial weed commonly found in Central, East, and North Texas. Unlike most bunch-type grasses, dallisgrass produces short rhizomes that increase the diameter of the plant and store carbohydrates. These reserve carbohydrates make controlling dallisgrass extremely difficult, even with systemic herbicide applications.

Because dallisgrass is a perennial, preemergence herbicides will not control existing plants. Preemergence herbicides are also not typically recommended because germination occurs throughout the summer. Despite prolific seed production, most dallisgrass seeds are not viable.

Multiple applications of postemergence herbicides are required for dallisgrass control. Applications in the early fall and spring will provide more control

than those made in the summer. Successful control usually requires a program of two herbicide applications in the fall and at least one the following spring. Begin the program in early fall when the average of the high and low daily air temperature falls below 70 to 75°F for at least 3 days (usually mid-September to mid-October in Texas). Make another application 4 weeks later. Follow the fall applications by at least one application in the spring when the treated plants begin to recover.

Use Table 16 to select herbicide products for dallisgrass control. With difficult-to-control weeds such as dallisgrass, adjuvant selection is especially important. Most products in Table 16 require adjuvants such as non-ionic surfactants (NIS) or methylated seed oils (MSO) to maximize efficacy. Refer to the product label for more information.

Table 16. Postemergence herbicides for dallisgrass control in turfgrasses

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Other weeds controlled	Comments	HRAC, WSSA group
fluazifop-P-butyl	Fusilade II (2–6 fl oz) Ornamec 170, Ornamec Over-The-Top (see label)	TF, Z	Bermudagrass, dallisgrass suppression	Zoysiagrass is more tolerant when temperatures are warmer in the summer than in spring or fall. Tall fescue is more tolerant in the fall than in the spring or summer. See label for more information on application rates. Zoysiagrass tolerance varies widely by variety. <i>Z. matrella</i> species are generally less tolerant than are <i>Z. japonica</i> species. Always test a small area before applying. Although tank-mixing with triclopyr is recommended to reduce turfgrass injury when controlling bermudagrass, it reduces dallisgrass control. Do not tank-mix with triclopyr if the target weed is dallisgrass.	A, 1
foramsulfuron	Revolver (8.8–35.2 oz)	BE, BU, Z	Overseeded cool-season grasses, goosegrass, some broadleaf weeds	Suppresses dallisgrass when applied as a spot treatment with 1.5 fl oz–2 fl oz/gal Adjuvants such as MSO, UAN, or AMS may improve control. Applying MSMA 7 days before Revolver improves control.	B, 2
MSMA	many (see label)	BE, KB, Z	Some grassy and broadleaf weeds, sedges	Can cause transient turfgrass injury See EPA legislation regarding use restrictions on different sites. As of this writing MSMA is registered for use only on golf courses, sod farms with application restrictions.	Z, 17

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Table 16 continued. Postemergence herbicides for dallisgrass control in turfgrasses

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Other weeds controlled	Comments	HRAC, WSSA group
sulfosulfuron	Certainty (0.75–2 oz)	BE, BA, BU, CE, SA, SS, Z	Broadleaf, grassy, sedges	Improves control provided by MSMA To suppress dallisgrass in bermudagrass turf, make sequential applications at 1.25 oz/A in a tank mixture with MSMA (2 lb/A). Alternatively, apply MSMA 2 wk before and again 2 wk after applying Certainty at 2.0 oz/A.	B, 2
thiencarbazone-methyl + foramsulfuron + halosulfuron-methyl	Tribute Total (1–3.2 oz)	BE, Z	Broadleaf, grassy, sedges	Provided control similar to that of MSMA in Texas A&M AgriLife research trials Controls dallisgrass when sequential applications are made at 3.2 oz/A according to the schedule described above. Applications made otherwise will only suppress it. The yearly maximum use rate is 6.4 oz/A. Spot treatments also provide control. Depending on the application volume, the application rate may be higher, which increases the risk of turfgrass injury.	B, 2
thiencarbazone-methyl + iodosulfuron + dicamba	Celsius WG (2.5–4.9 oz)	BE, BU, CE, SA, Z	Broadleaf, grassy weeds	Use the 4.9 oz/A rate and tank-mix with foramsulfuron (Revolver) herbicide for best control according to the schedule described above. The yearly maximum use rate is 7.4 oz/A. Do not tank-mix with foramsulfuron in St. Augustinegrass or centipedegrass.	B, 2 + O, 4
trifloxysulfuron	Monument 75WG (0.1–0.53 oz)	BE, Z	Grassy weeds, sedges, some broadleaf weeds	Suppresses dallisgrass at 0.53 oz/A	B, 2

Bermudagrass

While often cultivated as a desirable turfgrass, bermudagrass (*Cynodon* spp.) is one of the most difficult weeds to control when it is growing in other desirable turfgrasses. Successful control requires combining a herbicide program with proper cultural practices to encourage the growth of the desired turfgrass species.

Begin applying herbicides to control bermudagrass in cool-season turfgrasses such as tall fescue in late summer to early fall, when the bermudagrass is

still actively growing but the tall fescue is not under drought or temperature stress.

Begin applications to control it in warm-season turfgrass in mid to late spring and continue into the summer while the desirable warm-season turfgrass and bermudagrass are both actively growing.

Herbicides in Table 17 are registered only for bermudagrass suppression. Although complete control is extremely difficult, multiple applications at the right time of year often suppress bermudagrass adequately.

Table 17. Postemergence herbicides for bermudagrass control in turfgrasses

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Other weeds controlled	Comments	HRAC, WSSA group
fenoxaprop-P-ethyl	Acclaim Extra (3.5–39 fl oz)	CBG, FF, KB, PR, TF, Z	Grassy weeds, including goosegrass, crabgrass	Make sequential applications at 20 fl oz/A beginning in early spring or late summer/early fall. Add triclopyr ester (Turflon Ester) to improve bermudagrass suppression. Fenoxaprop tends to be less effective than fluazifop-P-butyl (Fusilade II or Ornamec) for bermudagrass suppression, but is less likely to injure tall fescue. Tolerance of various <i>Zoysia</i> species and cultivars to fenoxaprop is variable. The addition of triclopyr (Turflon Ester) reduces injury to <i>Zoysia japonica</i> cultivars such as 'Palisades', 'Zenith' and 'Meyer' but may increase injury to some <i>Zoysia matrella</i> cultivars such as 'Diamond'. Always test a small area for tolerance to fenoxaprop alone and in combination with triclopyr. May be applied to newly plugged zoysiagrass. This herbicide has no soil activity; the foliage must absorb it. Add NIS or other surfactant for best results. See label for information on surfactant use.	A, 1
fenoxaprop-P-ethyl + fluroxypyr ester + dicamba	Last Call (3.5–4 pt)	FF, KB, PR, TF, Z	Grassy weeds, including goosegrass, crabgrass; broadleaf weeds	Sequential applications at 3.5–4 pt/A suppress bermudagrass; make first application in the fall. Bermudagrass suppression provided by this product will be similar to that from fenoxaprop alone. May be applied to newly plugged zoysiagrass See label for information on surfactant use.	A, 1 + O, 4

continued on next page

Table 17 continued. Postemergence herbicides for bermudagrass control in turfgrasses

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Other weeds controlled	Comments	HRAC, WSSA group
fluazifop-P-butyl	Fusilade II (3.0–6.0 fl oz)	TF, Z	Dallisgrass, other grassy weeds	This herbicide has only short-term soil activity and must be absorbed by the foliage of susceptible weeds. Do not apply to tall fescue in the summer. Apply at 5–6 fl oz/A on tall fescue in early spring as bermudagrass is breaking dormancy and in the late summer or early fall as temperatures cool to limit injury to tall fescue. On zoysiagrass, apply at 3–4 fl oz in spring and fall and 4–5 fl oz/A in summer; zoysiagrass is more tolerant in summer. Reapply as bermudagrass regrowth occurs, about every 3–4 wk during summer and fall and 6 wk in spring and fall. Tolerance of various <i>Zoysia</i> species and cultivars to fluazifop-P-butyl is variable. Adding triclopyr (Turflon Ester) reduces injury to <i>Zoysia japonica</i> cultivars such as ‘Palisades’, ‘Zenith’, and ‘Meyer’ but may increase injury to some <i>Zoysia matrella</i> cultivars such as ‘Diamond’. Always test a small area for tolerance to fluazifop-P-butyl alone and in combination with triclopyr. Can be used in residential areas, but not on home lawns. See Ornamec for home lawns.	A, 1
fluazifop-P-butyl	Ornamec 170 (8–24 fl oz) Ornamec Over-The-Top (see label)	TF, Z	Dallisgrass suppression	This herbicide has only short term soil activity and must be absorbed by the foliage of susceptible weeds. On zoysiagrass, apply at 12–16 fl oz/A in late spring, 16–20 fl oz/A during mid-summer, and 8–12 oz in late summer or early fall. For more information on zoysiagrass tolerance, see information for Fusilade II above. On tall fescue, apply at 20–24 fl oz in early spring after bermudagrass emerges from dormancy, and again in late fall while bermudagrass is still actively growing. In Texas, spring applications are more likely to injure tall fescue than are fall applications.	A, 1
sethoxydim	Segment (1.5–3.75 pt)	CE, FF	Grassy weeds, including bahiagrass	This herbicide has limited soil activity; the leaves of susceptible weeds must absorb it. Delay mowing 7 days before and after application of this herbicide in centipedegrass to increase absorption and translocation by bermudagrass.	A, 1

continued on next page

Table 17 continued. Postemergence herbicides for bermudagrass control in turfgrasses

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Other weeds controlled	Comments	HRAC, WSSA group
topramezone	Pylex 2.8SC (1.0–1.5 fl oz)	CE, CBG, FF, KB, TF, PR	Several grassy and broadleaf weeds, including goosegrass, nimblewill	Tank-mix with triclopyr (Turflon Ester at 32 fl oz/A) to reduce bermudagrass whitening and increase bermudagrass control in tall fescue and Kentucky bluegrass. Begin applications in late summer/early fall at 1–1.5 fl oz/A. Interseeding desirable turfgrass improves bermudagrass control. Apply with COC or MSO at 0.5 to 1.0% v/v.	F2, 27
triclopyr ester	Turflon Ester, Turflon Ester Ultra (1.0–2.0 pt)	B, PR, TF	Broadleaf weeds	Can suppress bermudagrass at high rates, but suppression is greatly increased when applied in combination with other herbicides listed above. Refer to labels of other products listed above to determine the appropriate rate of triclopyr.	O, 4

Nutsedge and kyllinga

Sedges (*Cyperus* spp.) and kyllingas (*Kyllinga* spp.) are perennials that emerge in the spring from underground rhizomes and/or tubers; they disappear at first frost in the fall/winter. Annual sedge, however, is a true annual and does not develop rhizomes or

tubers—it emerges from seed and persists throughout the warmer months.

Sedges and kyllingas often indicate chronically excessive soil moisture, which should always be addressed as part of an overall treatment program. Yellow nutsedge is generally easier to control than purple nutsedge; kyllinga species are often the most difficult.

Preemergence herbicides

Table 18. Preemergence herbicides for nutsedge control in turfgrasses

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Other weeds controlled	Comments	HRAC, WSSA group
dimethenamid-P	Tower 6EC (21–32 fl oz)	BA, BE, BU, CE, FF, KB, PR, SA, SS, TF, Z	Annual grassy weeds, several small-seeded broadleaves; can help remove overseeded cool-season grasses in warm-season turf	Does not provide purple nutsedge control Suppresses kyllinga Apply before emergence. If applying after emergence, apply in a tank mixture with a postemergence herbicide.	K3, 15
S-metolachlor	Pennant MAGNUM 7.62EC (1.3–2.6 pt)	BA, BE, CE, SA, Z	Annual grassy weeds, some small-seeded broadleaves, sedges	Provides yellow nutsedge and annual sedge control only. Apply at 2.6 pt/A for yellow nutsedge control. If applying after emergence, apply in a tank-mixture with a postemergence herbicide.	K3, 15

Selective postemergence herbicides

To reduce tuber and rhizome production, apply herbicides (Table 19) after full nutsedge or kyllinga shoots emerge in the spring. This also helps reduce the number of sequential applications required for control.

Make sequential applications after regrowth appears and enough shoot tissue is present to absorb the herbicide. This typically occurs 4 to 6 weeks after the initial application.

Many products registered for yellow nutsedge control are labeled only for suppression of purple nutsedge and kyllingas.

Table 19. Postemergence herbicides for nutsedge control in turfgrasses

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Other weeds controlled	Comments	HRAC, WSSA group
bentazon	Basagran T&O (24–32 fl oz)	B, BE, BA, BU, CA, CBG, CE, F, R, SA, Z	Some broadleaf weeds	Thorough spray coverage is important to maximize weed control. Apply at 24–32 fl oz/A. This herbicide has limited systemic activity. Reapply once new growth appears, which may be as soon as 10 days after initial treatment. Sequential applications are likely required to control yellow nutsedge. Not registered for purple nutsedge control	C, 5
flazasulfuron	Katana (0.5–3.0 oz)	BE, BU, CE, SS, Z	Overseeded cool-season grasses, some broadleaf weeds	Apply at 3.0 oz/A for purple nutsedge control and 1.5–3.0 oz/A for yellow nutsedge control. Control may not be evident until 2 wk after application. Although this product has systemic properties, multiple applications on ~4-wk intervals are often required for long-term control, especially of purple nutsedge. When applying upslope or near sensitive cool-season grasses, follow label to prevent off-target movement.	B, 2
halosulfuron-methyl	Sedgehammer, Manage (0.66–1.33 oz)	BA, BE, CBG, CE, FF, KB, PR, TF, SA, SS, Z	none	Include NIS at 0.25–0.5% v/v. Apply after nutsedge has reached the 3–8 leaf stage. Results may not be evident until 2 wk after application. While this herbicide has systemic properties, multiple applications are often required for long-term control, especially for purple nutsedge. Suppresses some kyllingas	B, 2
imazaquin	Image 70DG (8.6–11.4 oz)	BE, CE, SA, SS, Z	Broadleaf weeds, some grasses	Include NIS at 0.25% v/v. Results may not be evident until 2 wk after application. A second application may be required if regrowth occurs. When applying upslope or near sensitive cool-season grasses, follow label to prevent off-target movement. This herbicide is both root and shoot absorbed. Irrigation or rainfall (0.25–0.5 in.) within 1–7 days after application can improve weed control.	B, 2

continued on next page

Table 19 continued. Postemergence herbicides for nutsedge control in turfgrasses

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Other weeds controlled	Comments	HRAC, WSSA group
MSMA	Many (see label)	BE, KB, Z	Some grassy and broadleaf weeds, sedges	See EPA legislation regarding use restrictions on different sites. As of this writing MSMA is registered for use only on golf courses, sod farms with application restrictions. MSMA can improve the control provided by other herbicides such as halosulfuron-methyl, imazaquin, or sulfosulfuron in a tank mixture.	Z, 17
MSMA + 2, 4-D + mecoprop + dicamba	Trimec Plus (8–13.5 pt)	BE, KB, PR, TF, Z	Grassy and broadleaf weeds	This product contains MSMA. Registered for yellow nutsedge control only. Sequential applications may be needed.	O, 4 + Z, 17
sulfentrazone	Dismiss, Spartan 4F (4.0–12 fl oz)	Most warm- and cool-season grasses. See label	Broadleaf weeds	Control becomes evident within 48 hr after application. Good spray coverage is important for optimal nutsedge control with sulfentrazone. Apply the highest rate listed on the label that will not injure desirable turfgrass. Sequential applications may be required for acceptable control, especially when purple nutsedge is present. See Dismiss South for purple nutsedge control. Sulfentrazone has limited soil residual activity, thus, it can also provide yellow nutsedge suppression when applied before emergence.	E, 14
sulfentrazone + imazethapyr	Dismiss South (9.5–14.4 fl oz)	BA, BE, BU, CE, Z	Broadleaf weeds	Dismiss South is similar to Dismiss except that it controls purple nutsedge better. Imazethapyr has foliar and soil activity. Adequate soil moisture improves weed control.	E, 14 + B, 2
Other sulfentrazone-containing products	Blindside, Echelon, Q4, Solitare, Surge, T-Zone	See label	See label	See Table 20 for more information. Sulfentrazone is more effective against yellow nutsedge than against purple nutsedge.	E, 14
sulfosulfuron	Certainty (0.75–2.0 oz)	BE, BA, BU, CE, SA, SS, Z	Some broadleaf, some winter annual grasses	Current research indicates that sulfosulfuron can control purple nutsedge better than can sulfentrazone or halosulfuron-methyl. However, a second application may be required, especially for purple nutsedge control. Use a non-ionic surfactant at 0.25–0.5% v/v. Results may not be evident until 2 wk after application. This product is no longer registered for use in cool-season turfgrasses.	B, 2
thiencarbazone-methyl + foramsulfuron + halosulfuron-methyl	Tribute Total 60.5WDG (1.0–3.2 oz)	BE, Z	Broadleaf and grassy weeds	Nutsedge control is similar to that provided by halosulfuron-methyl. When applying upslope of sensitive cool-season grasses, follow label to prevent off-target movement.	B, 2

continued on next page

Table 19 continued. Postemergence herbicides for nutsedge control in turfgrasses

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Other weeds controlled	Comments	HRAC, WSSA group
trifloxysulfuron	Monument 75WG (0.1–0.53 oz)	BE, Z	Grassy weeds, some broadleaf weeds	Trifloxysulfuron-sodium is similar to flazasulfuron (Katana) except that it can be applied to bermudagrass and zoysiagrass only. Current research indicates that trifloxysulfuron-sodium can control purple nutsedge better than sulfentrazone or halosulfuron, and is similar to that provided by sulfosulfuron. Results may not be evident until 2 wk after application. Apply with NIS at 0.5 % v/v. When applying upslope or near sensitive cool-season grasses, follow label to prevent off-target movement.	B, 2

Khakiweed or mat chafflower

Khakiweed (*Alternanthera pungens*) and mat chafflower (*Alternanthera caracasana*) are especially problematic in Central and West Texas, where less rainfall occurs. These warm-season plants often survive the winter and emerge in the spring from an extensive taproot. They are also prolific seed producers.

Few products are labeled for khakiweed control. However, research shows that herbicides containing metsulfuron-methyl (such as MSM turf, Manor, and Blindside) provide control. Because khakiweed and

mat chafflower have thick leaf cuticles, including an adjuvant such as NIS as recommended by the product label is needed to maximize herbicide efficacy.

Herbicides containing mixtures of synthetic auxin herbicides, such as SpeedZone, have also demonstrated some efficacy, but usually less than that of metsulfuron-methyl. Multiple applications are often required for control.

Researchers are testing the efficacy of preemergence herbicides applied in combination with metsulfuron for broadleaf weed control.

Herbicides containing sulfentrazone

Many products contain sulfentrazone, which provides postemergence control of many broadleaf weeds and yellow nutsedge. It also has limited residual activity in soil.

For acceptable control of yellow nutsedge, apply sulfentrazone at rates at or above 0.25 lb/A. Rates below 0.25 lbs/A accelerate the appearance of injury to broadleaf weeds but will not provide acceptable nut-

sedge control. Susceptible weeds usually begin showing injury within 48 hours after sulfentrazone application.

Sulfentrazone does not control purple nutsedge acceptably. For more information on nutsedge control, see pages 43–46.

Table 20 lists sulfentrazone rates from the application of various sulfentrazone-containing products at labeled use rates.

Table 20. Comparisons of common products containing sulfentrazone

Trade name	Sulfentrazone lb/A	Product rate	Other active ingredients
Avenue South	0.02–0.04	2.7–5.0 pt/A	penoxsulam, 2,4-D, dicamba
Blindside	0.13–0.38	3.25–10 oz/A	metsulfuron-methyl
Dismiss	0.13–0.38	4–12 fl oz/A	—
Dismiss South	0.25–0.37	9.5–14.4 fl oz/A	imazethapyr
Echelon 4 SC	0.08–0.37	8–36 fl oz/A	prodiamine
Q4	0.04–0.06	5–8 pt/A	2,4-D, dicamba, quinclorac,
Solitaire	0.19–0.38	1–2 lb/A	quinclorac
Surge	0.02–0.03	2.75–4 pt/A	2,4-D, dicamba, mecoprop
T-Zone	0.02–0.03	2–4 pt/A	2,4-D, dicamba, triclopyr

Herbicides containing quinclorac

Quinclorac provides postemergence control of crabgrass (*Digitaria* spp.), barnyardgrass (*Echinochloa crus-galli*), and foxtail (*Setaria* spp.). It also provides excellent control of some broadleaf weeds such as white clover (*Trifolium repens*). Three sequential applications of quinclorac at or above 0.5 lb/A can suppress torpedograss (*Panicum repens*); refer to the label for more information.

Quinclorac is not safe for use on bahiagrass, centipede grass, or St. Augustine grass; it may injure bermudagrass and seashore paspalum temporarily.

The application rate of quinclorac is vital to the efficacy of a product against crabgrass. Quinclorac

rates at or above 0.75 lb/A generally control crabgrass acceptably at the 1-tiller and greater than 5-tiller growth stages. However, control can sometimes be inconsistent when applied at the 2- to 4-tiller growth stage.

Many products that contain quinclorac require a methylated seed oil (MSO) adjuvant for best performance. When selecting an adjuvant, refer to the label for more information.

Table 21 lists quinclorac rates from the application of various quinclorac-containing products at labeled use rates.

Table 21. Common products containing quinclorac

Trade name	Quinclorac lb/A	Product rate	Other active ingredients
2DQ 3.86L	0.04–0.12	1–3 pt/A	2,4-D, dicamba
Cavalcade PQ	0.33–0.75	1–2.3 lb/A	proflaminate
Drive XLR8	0.25–0.75	22–64 fl oz/A	—
Momentum Q	0.66–0.75	7–8 pt/A	2,4-D, dicamba
Onetime	0.25–0.75	22–64 fl oz/A	mecoprop, dicamba
Q4	0.47–0.75	5–8 pt/A	2,4-D, dicamba, sulfentrazone
Quincept	0.66–0.75	7–8 pt/A	2,4-D, dicamba
Quinclorac 75DF	0.75	1 lb/A	—
Solitare	0.56–1.20	1–2 lb/A	sulfentrazone
SquareOne	0.30–0.75	4–12 fl oz/A	carfentrazone

Turfgrass tolerance to postemergence herbicides

Table 22. Turfgrass tolerance to postemergence herbicides

Herbicide common name (trade name)	Warm-season						Cool-season		
	Bermudagrass	Buffalograss	Centipedegrass	Seashore paspalum	St. Augustinegrass	Zoysia	Kentucky bluegrass	Perennial ryegrass	Tall fescue
2,4-D (Hardball, Weedar 64, others)	T	—	NR	—	NR	T	T	T	T
2,4-D + clopyralid + dicamba (Millennium Ultra 2 ¹)	T ²	—	NR	—	NR	T	T	T	T
2,4-D + dicamba + quinclorac (2DQ)	T	—	T ⁴	—	T ⁴	T	T	T	T
2,4-D + fluroxypyr + dicamba (Escalade 2)	T	—	NR	—	NR	T	T	T	T
2,4-D + MCPA + dicamba (EndRun)	T	T	—	—	NR	T	T	T	T
MCPA, mecoprop + dicamba (Tri-Power)	T	—	I	—	I	T	T	T	T
2,4-D + mecoprop + dicamba (Trimec Classic)	T	T	I	—	I	T	T	T	T
2,4-D + mecoprop + dicamba (Triplet SF, Triplet Low Odor)	T	—	I	—	I	T	T	T	T
2,4-D + mecoprop + dicamba + pyraflufen (4-Speed)	T	—	—	—	—	T	T	T	T
2,4-D + mecoprop + dicamba + pyraflufen (RedZone 2)	T	—	—	—	—	T	T	T	T
2,4-D + triclopyr + dicamba + pyraflufen (4-speed XT)	T	—	—	NR	—	T	T	T	T
2,4-D + triclopyr + fluroxypyr (Momentum FX2)	T	T	—	NR	NR	I	T	T	T
2,4-D + mecoprop + dichlorprop (Spoiler)	T	—	—	—	—	T	T	T	T
2,4-D + mecoprop + dichlorprop (Triamine)	T	—	I	—	I	T	T	T	T
2,4-D + quinclorac + dicamba (Quincept)	I	—	NR	NR	NR	I	T	T	T
amicarbazone (Xonerate)	T	T	T	T	T	T	T	T	T
asulam (Asulox ^{1,2})	I ²	NR	NR	NR	I	NR	NR	NR	NR
atrazine ³ (Aatrex, Image)	T ⁴	—	T	—	T	T	NR	NR	NR
bentazon (Basagran)	T	T	T	—	T	T	T	T	T
bispyribac-sodium (Velocity)	T ⁵	NR	NR	NR	NR	NR	NR	I	NR
bromoxynil (Buctril ¹)	T	—	—	—	T	T	T	T	T
carfentrazone (Quicksilver)	T	T	T	T	T	T	T	T	T
carfentrazone + 2,4-D + mecoprop + dicamba (SpeedZone Southern)	T	T	I	I	I	T	T	T	T
carfentrazone + 2,4-D + mecoprop + dicamba (SpeedZone)	T	T	—	—	NR	T	T	T	T
carfentrazone + MCPA + mecoprop + dicamba (PowerZone)	T	—	—	—	—	T	T	T	T
carfentrazone + quinclorac (SquareOne)	I	T	I	I	NR	T	T	T	T
chlorsulfuron (Corsair)	T	T	I	T	T	T	T	NR	NR
clopyralid (Clean Slate ¹ , Lontrel ¹)	T	T	T	—	T	T	T	T	T
dicamba (Banvel, Vanquish, Vision, others)	T	I	—	—	I	T	T	T	T
diclofop (Illoxan)	I	NR	NR	NR	NR	NR	NR	NR	NR
ethofumesate (Prograss)	I	—	—	T	T	—	T	T	T
fenoxaprop-P-ethyl (Acclaim Extra)	NR	—	—	—	—	T	T	T	T
fenoxaprop-P-ethyl + fluroxypyr + dicamba (Last Call)	NR	NR	NR	NR	NR	T	T	T	T
flazasulfuron (Katana)	T	T	T	T	NR	T	NR	NR	NR
florasulam (Defendor)	T	—	T	T	T	T	T	T	T

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Table 22 continued. Turfgrass tolerance to postemergence herbicides

Herbicide common name (trade name)	Warm-season						Cool-season		
	Bermudagrass	Buffalograss	Centipedegrass	Seashore paspalum	St. Augustinegrass	Zoysia	Kentucky bluegrass	Perennial ryegrass	Tall fescue
fluzifop-P-butyl (Fusilade II ¹ , Ornamec)	NR	NR	NR	NR	NR	I	NR	NR	I
fluroxypyr (Vista XRT)	I	NR	—	NR	I	T	T	T	T
foramsulfuron (Revolver)	T	T	—	—	—	T	—	—	—
halosulfuron-methyl (Sedgehammer)	T	—	T	T	T	T	T	T	T
imazapic (Plateau ¹)	I	T	—	—	—	NR	NR	NR	I
imazaquin (Image)	I	NR	T	T	T	T	NR	NR	NR
MCPA + fluroxypyr + dicamba (Change Up)	T	T	I	—	I	T	T	T	T
MCPA + fluroxypyr + triclopyr (Battleship III)	T	T	I	NR	NR	T	T	T	T
MCPA + triclopyr + dicamba (Cool Power)	I	—	I	—	I	T	T	T	T
MCPA + triclopyr + dicamba (Horsepower)	I	—	I	—	I	T	T	T	T
mecoprop + 2,4-D + dicamba (Trimec Bentgrass)	T	—	I	—	I	—	T	T	T
mecoprop + 2,4-D + dicamba (Trimec Southern)	T	T	I	—	I	T	T	T	T
mesotrione (Tenacity)	NR	T	T	NR	I	NR	T	T	T
metribuzin (Sencor)	T	NR	NR	NR	NR	NR	NR	NR	NR
metsulfuron-methyl (Blade, Manor, MSM Turf)	T	T	I	—	T	T	T	NR	NR
MSMA ^{1,2} (many)	T	—	NR	—	NR	T	T	—	I
penoxsulam (LockUp, Sapphire)	T	—	T	—	—	T	T	T	T
pronamide (Kerb ¹)	T	—	T	—	T	T	NR	NR	NR
pyraflufen-ethyl (Octane)	T	—	T	—	T	T	T	T	T
quinclorac (Drive XLR8, Quinclorac 75 DF)	T ²	T	NR	I	NR	T	T	T	T
quinclorac + mecoprop + dicamba (Onetime)	T ²	T	NR	I	NR	T	T	T	T
quinclorac + sulfentrazone + 2,4-D + dicamba (Q4)	I	—	—	—	—	I	T	T	T
rimsulfuron (TranXit, Rimsulfuron 25 DF ¹)	T	—	I	—	—	T	NR	NR	NR
rimsulfuron + metsulfuron-methyl (NEGATE ¹)	T	—	—	—	—	T	NR	NR	NR
sethoxydim (Segment)	NR	NR	T	NR	NR	NR	NR	NR	NR
simazine (Princep Liquid)	T	—	T	—	T	T	NR	NR	NR
sulfentrazone (Dismiss)	T	T	T	T	T	T	T	T	T
sulfentrazone + 2,4-D + mecoprop + dicamba (Surge)	T	T	I	—	NR	T	T	T	T
sulfentrazone + imazethapyr (Dismiss South)	T	T	T	NR	NR	T	NR	NR	NR
sulfentrazone + metsulfuron-methyl (Blindside)	T	T	I	NR	T	T	I	NR	I
sulfentrazone + quinclorac (Solitare)	I	T	I	I	NR	T	T	T	T
sulfosulfuron (Certainty)	T	T	T	T	T-I	T	NR	NR	NR
thiencarbazone-methyl + foramsulfuron + halosulfuron-methyl (Tribute Total)	T	NR	NR	NR	NR	T	NR	NR	NR
thiencarbazone-methyl + iodosulfuron + dicamba (Celsius WG)	T	T	T	—	T	T	NR	NR	NR
topramezone (Pylex)	—	NR	T	—	NR	NR	T	T	T
triclopyr (Turflo Ester Ultra, others)	I	—	I	—	I	I	T	T	T
triclopyr + clopyralid (Confront)	I	I	I	—	I	I	T	T	T
triclopyr + sulfentrazone + 2,4-D + dicamba (T-zone)	I	—	—	—	NR	T	T	T	T
trifloxysulfuron (Monument 75WG)	T	NR	NR	NR	NR	T	NR	NR	NR

Tolerance key

T = Tolerant: Herbicide not expected to cause injury when applied at recommended rate according to the product label

I = Intermediate: Herbicide may cause injury. Consider spot treating or testing a small area before applying broadcast.

NR = Not registered: This product is not registered on this species and/or may cause significant injury

1: Not for residential turfgrass

2: May injure hybrid bermudagrass

3: Restricted use herbicide. See label for more information about application restrictions.

4: For use on dormant turfgrass; otherwise injury may occur

5: Registered for use only in bermudagrass overseeded with perennial ryegrass

Plant growth regulators

Plant growth regulators (PGRs) listed in Table 23 are commonly used to reduce vertical shoot growth and clipping production in fine turf areas. Other benefits such as greater turfgrass density, darker color, and reduced seedhead production are commonly observed, but only when PGRs are applied repeatedly during the growing season. PGRs do not typically increase turfgrass lateral spread, and research demonstrates that they can reduce athletic field traffic tolerance when applied during periods of wear.

PGRs typically reduce clipping production for a period of 7 to 28 days after the application, and the duration of growth regulation varies among products. For a particular product, how long regulation lasts depends mostly on air temperature and height of cut. PGR effects subside more quickly on putting greens than on fairway- or rough-height turfgrass. Furthermore, warmer air temperatures and more active turfgrass growth reduce the duration of growth regulation and make more frequent applications necessary. If PGRs are not reapplied at the appropriate interval, regulation will wear off and clipping production can actually be greater, for a period of 1 to 2 weeks, than it was before the PGR was applied. This is commonly referred to as the “rebound” effect. Benefits of PGR applications are best realized when the product is reapplied at the appropriate interval throughout most of the growing season. Growing degree-day models have been developed to schedule PGR reapplication on creeping bentgrass putting greens, and they are

currently being developed for use on ultradwarf bermudagrass putting greens as well. Visit the University of Nebraska Turfgrass website (turf.unl.edu) for more information on growing degree-day based models.

With the exception of ethephon and mefluidide, all of the PGRs listed in the table below reduce growth by inhibiting the plant’s ability to produce gibberellin, a plant hormone that promotes elongation of plant cells. Products such as mefluidide, which inhibit cell division, are often referred to as Type I PGRs, while products that inhibit gibberellin biosynthesis are often referred to as Type II PGRs. When gibberellin production is inhibited, plants cells are shorter, which results in shorter leaves, stems, internodes and reduced vertical growth. PGRs that interfere with the gibberellin biosynthesis early in the pathway are referred to as Class B PGRs (flurprimidol and paclobutrazol). These PGRs are also absorbed through plant roots more so than leaves. PGRs that interfere with gibberellin biosynthesis later in the pathway are referred to as Class A PGRs (trinexapac-ethyl and prohexadione-calcium). These PGRs are absorbed through plant leaves and stems only. In general, Class A PGRs are less likely to cause turfgrass injury, but reduce growth for a shorter period of time than Class B PGRs.

Plant growth regulator use rates can often vary widely by turfgrass species, use, mowing height, etc., so be sure to consult the label for specific use rates and timings.

Table 23. Plant growth regulators labeled for use in Turfgrasses

Common name	Trade name (Product/A)	Turfgrasses labeled for application	Mode of action/ absorption site/type and class	Comments
ethephon	Proxy, Etephon 2SL (5 fl oz/1,000 sq ft)	BE, CBG, FF, KBG, PR, TF	Reduces cell elongation/ Foliar uptake	Labeled for commercial uses only, including golf courses, parks, and sports turf. Not labeled for residential use. Commonly used in combination with trinexapac-ethyl for annual bluegrass seedhead suppression on golf course putting greens.
flurprimidol	Cutless 50W (4 to 16 oz; 2 to 8 oz on CBG putting greens) Cutless MEC (12.3 to 49.2 fl oz; 6.1 to 24.6 fl oz on CBG putting greens)	BE, CBG, KBG, PR, SS, Z	Reduces cell elongation by suppressing gibberellic acid/ Root uptake Type II: Class B	Not labeled for use on bermudagrass putting greens or sod production.
flurprimidol + trinexapac-ethyl	Legacy (5 to 30 fl oz; 5 to 10 fl oz on CBG putting greens)	BE, CBG, KBG, PR, SS, Z	Reduces cell elongation by suppressing gibberellic acid / Foliar, root, and stem uptake Type II; Class B & Class A	Not labeled for use on bermudagrass putting greens or sod production.
flurprimidol + paclobutrazol + trinexapac-ethyl	Musketeer (18 to 40 fl oz; 12 to 22 fl oz on CBG putting greens)	BE, CBG, KBG, PR	Reduces cell elongation by suppressing gibberellic acid/ Foliar, root, and stem uptake Type II: Class B, Class B, & Class A	Not labeled for use on bermudagrass putting greens, residential lawns or sod production.
Mefluidide	Embark (2 to 20 pts)	BE, CE, FF, KBG, PR, TF, SA, Z	Inhibits mitosis during growth and development/ Foliar uptake Type I	Not labeled for use in sod production. Production was discontinued in 2015.
paclobutrazol	Trimmit 2SC, Pac-Low, others (6.4 to 48 oz; 6.4 to 16 oz on CBG putting greens)	BE, CBG, KBG, PR, SA	Reduces cell elongation by suppressing gibberellic acid/ Root uptake Type II; Class B	Not labeled for use on residential turf. Do not use on bermudagrass putting greens except for winter overseeding enhancement.
prohexadione calcium	Anuew (4 to 24 oz; 2 to 8 oz on CBG putting greens and 8 to 16 oz on BE putting greens)	BE, CBG, FF, KBG, PR, SA, SS, TF, Z	Reduces cell elongation by suppressing gibberellic acid/ Foliar uptake Type II; Class A	Consult label for tolerance of specific turfgrass varieties. Test a small area first if using a variety not listed on the product label.
trinexapac-ethyl	Primo Maxx, T-NEX, T-NEX 1 AQ, others (rate varies by species and use site)	Most warm and cool-season turfgrasses	Reduces cell elongation by suppressing gibberellic acid/ Foliar uptake Type II; Class A	

Insect pests of turfgrasses

Insects benefit landscapes and golf courses by pollinating flowering plants, decomposing organic residues, and aerating the soil by tunneling. However, some insects cause problems in turfgrasses by chewing or sucking on plant tissue, uprooting turf, and creating mounds that can affect mowing (Table 24). To manage insect pests in turfgrasses, it is important to understand their function, life cycle, and habits.

Insect bodies have three distinct divisions: head, thorax, and abdomen. They develop through a process called metamorphosis, of which there are two types: gradual and complete.

Insects that undergo **gradual metamorphosis** have three stages: egg, nymph (immature stage), and adult. Examples are chinch bugs, ground pearls, mealybugs, mites, and mole crickets.

Insects that undergo **complete metamorphosis** have four stages: the egg, the larva (immature stage), the pupa (resting stage), and the adult. Examples are armyworms, billbugs, cutworms, fire ants, sod webworms, and white grubs.

Because damage symptoms and insecticide treatment options often vary by life stage (such as larvae vs. adult and nymph vs. adult), it is important to understand which life stage is present before applying an insecticide. Always follow the insecticide label instructions on application timing, rate, length of residual control, etc.

For more information on identifying and treating specific insect pests, see aggieturf.tamu.edu/turfgrass-insects/.

Table 24. Insect pests in turfgrass production and management¹

Insect	Latin name	Occurrence	Frequent, major pests
Ag termites	<i>Nasutitermes</i> sp.	Occasional	—
Bermudagrass mites	<i>Eriophyes cynodoniensis</i>	Common	—
Bermudagrass scales	<i>Odonaspis ruthae</i>	Occasional	—
Black turfgrass ataenius	<i>Ataenius spretulus</i>	Occasional	—
Cicada killers	<i>Sphecius speciosus</i>	Occasional	—
Black cutworms	<i>Agrostis ipsilon</i> ²	Common	—
Fall armyworms	<i>Spodoptera frugiperda</i>	Common	Yes
Ground pearls	<i>Margarodes</i> spp.	Occasional	—
Hunting billbugs	<i>Sphenophorus venatus vestitus</i>	Common	—
Leaf cutter ants	<i>Atta texana</i>	Occasional	—
Red imported fire ants	<i>Solenopsis invicta</i>	Common	Yes
Rhodesgrass mealybugs	<i>Antonina graminis</i>	Occasional	—
Southern chinch bugs	<i>Blissus insularis</i>	Common	Yes
Southern mole crickets	<i>Scapteriscus borellii</i>	Common	Yes
Sugarcane beetles	<i>Eutheoloa humilis</i>	Occasional	—
Tawny mole crickets	<i>Scapteriscus vicinus</i>	Common	Yes
Tropical sod webworms	<i>Herpetogramma phaeopteralis</i> ²	Common	—
White grubs	<i>Phyllophaga</i> spp. ²	Common	Yes

1: The Southern IPM Pest Management Working Group has identified these insects as commonly occurring pests in Texas and classified 6 of them as frequent, major pests.

2: Other species also present

Insecticide Mode of Action (MOA) classification

Table 25. Mode of action classification of insecticides registered for use in turfgrass (Source: IRAC)

IRAC Code	Mode of action (MOA) ¹	Subgroup	Common name
1	Acetylcholinesterase (AChE) inhibitors	1A: Carbamates	carbaryl methomyl
		1B: Organophosphates	acephate chlorpyrifos trichlorfon
2	GABA-gated chloride channel antagonists	2A: Cyclodiene organochlorines	—
		2B: Phenylpyrazoles	flupyrifen
3	Sodium channel modulators	3A: Pyrethroids, pyrethrins	bifenthrin cyfluthrin deltamethrin lambda-cyhalothrin permethrin zeta-cypermethrin
4	Nicotinic acetylcholine receptor (nAChR) agonists	4A: Neonicotinoids	clothianidin dinotefuran imidacloprid thiamethoxam
		4B: Nicotine	—
		4C: Sulfoxaflor	—
5	Nicotinic acetylcholine receptor (nAChR) allosteric modulators	5: Spinosyns	spinosad
6	Chloride channel modulators	6: Avermectins, milbemycins	abamectin
7	Juvenile hormone mimics	7A: Juvenile hormone analogues	(S)-methoprene
		7B: Fenoxycarb	fenoxycarb
		7C: Pyriproxyfen	pyriproxyfen
8	Miscellaneous non-specific (multisite) inhibitors	8A: Alkyl halides	—
		8B: Chloropicrin	—
		8C: Sulfuryl fluoride	—
		8D: Borax	—
		8E: Tartar emetic	—
9	Selective homopteran feeding blockers	9B: Pymetrozine	—
10	Mite growth inhibitors	10A: Clofentezine, hexythiazox	—
		10B: Etoxazole	—
11	Microbial disruptors of insect midgut	11A: <i>Bacillus thuringiensis</i>	—
		11B: <i>Bacillus sphaericus</i>	—
12	Mitochondrial ATP synthase inhibitors	12A: Diafenthiuron	—
		12B: Organotin miticides	—
		12C: Propargite	—
		12D: Tetradifon	—
13	Uncouplers of oxidative phosphorylation via disruption of proton gradient	13: Pyrroles, dinitrophenols, sulfluramid	—
14	Nicotinic acetylcholine receptor (nAChR) channel blockers	14: Nereistoxin analogues	—
15	Chitin biosynthesis inhibitors, type 0	15: Benzoylureas	—
16	Chitin biosynthesis inhibitors, type 1	16: Buprofezin	—
17	Moulting disruptor, Dipteran	17: Cyromazine	—

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Table 25 continued. Mode of action classification of insecticides registered for use in turfgrass (Source: IRAC)

IRAC Code	Mode of action (MOA) ¹	Subgroup	Common name
18	Ecdysone receptor agonists	18: Diacyl-hydrazines	halofenozide
19	Octopamine receptor agonists	19: Amitraz	—
20	Mitochondrial complex III electron transport inhibitors	20A: Hydramethylnon	hydramethylnon
		20B: Acequinocyl	—
		20C: Fluacrypyrim	—
21	Mitochondrial complex I electron transport inhibitors	21A: METI acaricides and insecticides	—
		21B: Rotenone	—
22	Voltage-dependent sodium channel blockers	22A: Oxadiazines	indoxacarb
		22B: Semicarbazones	metaflumizone
23	Inhibitors of acetyl CoA carboxylase	23: Tetrone and tetramic acid derivatives	—
24	Mitochondrial complex IV electron transport inhibitors	24A: Phosphides	—
		24B: Cyanide	—
25	Mitochondrial complex II electron transport inhibitors	25: beta-ketonitrile derivatives	—
28	Ryanodine receptor modulators	28: Diamides	chlorantraniliprole cyantraniliprole
UN	Compounds of unknown or uncertain modes of action	Dicofol	dicofol

¹: Do not treat successive generations of a pest with compounds from the same MOA group. For more information on insecticide chemistry and modes of action, see www.IRAC-online.org.

Insecticides registered for use in turfgrasses

Ants

Table 26. Insecticides registered to control ants in turfgrasses (see label for specific species)

Common name	Trade name	Product/A	Product/ 1,000 sq ft	Insecticide group	Comments
abamectin	Award II	1.0 lb	—	6	NR ¹ for sod farms; IMT ²
acephate	Acephate 90 Prill	See label	See label	1B	IMT ² : See label
	Acephate 90-SP	See label	See label		IMT ² : See label
	Acephate 97	See label	See label		IMT ² : See label
	Acephate 97 UP	See label	See label		IMT ² : See label
	Bracket 97	See label	See label		IMT ² : See label
	Orthene-T, T&O Spray 97	See label	See label		IMT ² : See label
bifenthrin	Bifen 2 AG Gold	—	0.16–0.32 fl oz	3A	Restricted-use pesticide
	Brigade 2EC	7.0–14.0 fl oz	0.16–0.32 fl oz		Restricted use; sod farms only
	Capture LFR	8.7–17.42 fl oz	0.2–0.4 fl oz		Restricted use; sod farms only
	Fanfare ES	7.0–14.0 fl oz	0.16–0.32 fl oz		Restricted use; sod farms only
	Menace GC 7.9% Flowable	40 fl oz	1.0 fl oz		Restricted-use pesticide
	Pro-Mate Bifenthrin	—	0.5–1.0 fl oz		—
	Sniper	7.0–14.0 fl oz	0.16–0.32 fl oz		Restricted-use pesticide
	Tailgunner	7.0–14.0 fl oz	0.16–0.32 fl oz		Restricted use; sod farms only
	Talstar GC	100–200 lb	2.3–4.6 lb		Restricted use; lawns, parks, athletic fields, sod farms, golf courses
	Talstar P	—	0.5–1.0 fl oz		Lawns, parks, athletic fields
	Talstar S Select	10–20 fl oz; large infestations: 40 fl oz	0.25–0.5 fl oz; large infestations: 1 fl oz		Restricted use; golf courses, sod farms only
	Up-Star GC	100–200 lb	2.3–4.6 lb		Restricted-use pesticide
	Up-Star Gold	—	0.5–1.0 fl oz		Lawns, parks, athletic fields
	Up-Star SC	0.25–0.5 fl oz	10–20 fl oz		Restricted-use pesticide
bifenthrin + zeta- cypermethrin	Talstar XTRA GC	100–200 lb	2.3–4.6 lb	3A and 3A	Lawns, parks, athletic fields
carbaryl	Carbaryl 4L	2.0–4.0 qt	1.5–3.0 fl oz	1A	Spot treatments only in residential turf
	Sevin SL	2.0–4.0 qt	1.5–3.0 fl oz		—
chlorpyrifos	Chlorpyrifos 4E AG	1.0 qt	0.75 fl oz	1B	Restricted use; sod farms only
	Dursban 50W-WSP	2.0 lb	—		Restricted use; sod farms only
	Govern 4E	1.0 qt	0.75 fl oz		Restricted use; sod farms only
	Hatchet	1.0 qt	0.75 fl oz		Restricted use; sod farms only
	Lorsban 4E	1.0 qt	0.75 fl oz		Restricted use; sod farms only
	Lorsban Advanced	1.0 qt	0.75 fl oz		Restricted use; sod farms only
	Nufarm Chlorpyrifos SPC 2	2.0 qt	1.5 fl oz		Restricted use; golf courses, industrial sites, road medians only
	Nufarm Chlorpyrifos SPC 4	1.0 qt	0.75 fl oz		Restricted use; golf courses, industrial sites, road medians only
	Vulcan	1.0 qt	0.75 fl oz		Restricted use; golf courses, industrial sites, road medians only
	Warhawk	2.0 pt	0.75 fl oz		Restricted use; sod farms only

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Table 26 continued. Insecticides registered to control ants in turfgrasses (see label for specific species)

Common name	Trade name	Product/A	Product/ 1,000 sq ft	Insecticide group	Comments
chlorpyrifos <i>cont.</i>	Whirlwind	1.0 qt	0.75 fl oz	1B	Restricted use; sod farms only
	Yuma 4E	1.0 qt	0.75 fl oz		Restricted use; sod farms only
clothianidin + bifenthrin	Aloft GC G	80–160 lb	1.8–3.6 lb	4A and 3A	Restricted-use pesticide
	Aloft GC SC	11.65–23.3 fl oz	0.27–0.54 fl oz		Restricted-use pesticide
	Aloft LC G	80–160 lb	1.8–3.6 lb		Restricted use; NR ¹ for golf courses, sod farms
	Aloft LC G	80–160 lb	1.8–3.6 lb		Restricted use; NR ¹ for golf courses, sod farms
cyfluthrin	Tempo 20 WP-GC	—	See label	3A	Restricted-use pesticide
	Tempo SC Ultra	6–12 fl oz	0.135–0.270 fl oz		Landscape and recreational turf only: NR ¹ for golf courses, sod farms
	Tempo Ultra WP	7.7–15.4 oz	5–10 g		Landscape and recreational turf only: NR ¹ for golf courses, sod farms
	Tempo Ultra WSP	—	See label		Landscape and recreational turf only: NR ¹ for golf courses, sod farms
deltamethrin	Deltagard G	87–131 lb	2–3 lb	3A	NR ¹ for golf courses, sod farms
	Deltagard GC	87–131 lb	2–3 lb		Restricted-use pesticide
	Deltagard GC 5SC	17.5–26 fl oz	0.4–0.6 fl oz		Restricted-use pesticide
	Deltagard T&O	87–131 lb	2–3 lb		NR ¹ for golf courses, sod farms
	Deltagard T&O 5SC	17.5–25.6 fl oz	0.4–0.6 fl oz		NR ¹ for sod farms
	Suspend SC	17.5–26 fl oz	0.4–0.6 fl oz		NR ¹ for sod farms
dinotefuran	Zylam Liquid	4.9 pt	1.8 fl oz	4A	—
fenoxycarb	Award	1–1.5 lb	—	7B	—
fipronil	Topchoice	87 lb	2 lb	2B	Nuisance ants
hydramethylnon	Amdro Pro	1.0–1.5 lb; bigheaded ants: 1.0–2.0 lb	2.0–3.0 oz; bigheaded ants: 2.0–4.0 oz	20A	IMT ² : See label
imidacloprid + bifenthrin	Allectus G	75–125 lb	1.7–2.9 lb	4A and 3A	NR ¹ for golf courses, sod farms
	Allectus GC	75–125 lb	1.7–2.9 lb		Restricted use; golf courses, sod farms only
	Allectus SC	3.6–4.5 pt	1.32–1.65 fl oz		NR ¹ for golf courses, sod farms
indoxacarb	Advion Insect Granule	50–200 lb	1.15–4.6 lb	22A	NR ¹ for sod farms
lambda-cyhalothrin	Demand G	88–131 lb	2–3 lb	3A	NR ¹ for golf courses, sod farms
	Nufarm Lambda- Cyhalothrin 1 EC	See label	See label		Restricted-use pesticide
	Scimitar CS	5–10 fl oz	3.4–7 mL		NR ¹ for golf courses, sod farms
	Scimitar GC	5–10 fl oz	3.4–7 mL		Restricted-use pesticide
permethrin	Permethrin 3.2 EC	—	0.4–0.8 fl oz	3A	Restricted-use pesticide
	Perm-Up 3.2 EC	—	0.4–0.8 fl oz		Restricted-use pesticide
lambda-cyhalothrin	Demand G	88–131 lb	2–3 lb	3A	NR ¹ for golf courses, sod farms
	Nufarm Lambda- Cyhalothrin 1 EC	See label	See label		Restricted-use pesticide
	Scimitar CS	5–10 fl oz	3.4–7 mL		NR ¹ for golf courses, sod farms
	Scimitar GC	5–10 fl oz	3.4–7 mL		Restricted-use pesticide
permethrin	Permethrin 3.2 EC	—	0.4–0.8 fl oz	3A	Restricted-use pesticide
	Perm-Up 3.2 EC	—	0.4–0.8 fl oz		Restricted-use pesticide
(S)-methoprene	Extinguish Plus	1–2 lb	—	7A	IMT ² ; see label
spinosad	Seduce	See label	See label	5	IMT ² ; see label
thiamethoxam	Meridian 0.33G	60–80 lb	7–9 lb/5,000 sq ft	4A	—
	Meridian 25 WG	12.7–17 oz	3–4 oz/10,000 sq ft		—

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Table 26 continued. Insecticides registered to control ants in turfgrasses (see label for specific species)

Common name	Trade name	Product/A	Product/ 1,000 sq ft	Insecticide group	Comments
zeta-cypermethrin	Mustang	3.0–4.3 fl oz	—	3A	Restricted use; sod farms only
	Mustang Max/ Maxx	2.2–4.0 fl oz	—		Restricted use; sod farms only
zeta-cypermethrin + bifenthrin + imidacloprid	Triple Crown Golf	20–35 fl oz	0.46–0.8 fl oz	3A and 4A	Golf courses only
	Triple Crown T&O	20–35 fl oz	0.46–0.8 fl oz		Lawns, parks, athletic fields

1: NR = Not registered

2: IMT = Individual mound treatment

Armyworms

Table 27. Insecticides registered to control armyworms in turfgrasses

Common name	Trade name	Product/A	Product/ 1,000 sq ft	Insecticide group	Comments
acephate	Acephate 90 Prill	1.1–2.7 lb	0.4–1.0 oz	1B	Golf courses, sod farms only
	Acephate 90 WDG	1.1–2.7 lb	0.4–1.0 oz		Golf courses only
	Acephate 97	1.0–2.5 lb	0.4–0.9 oz		Golf courses, sod farms only
	Acephate 97UP	1.0–2.5 lb	0.4–0.9 oz		Golf courses, sod farms only
	Bracket 90 WDG	1.1–2.71 lb	0.4–1.0 oz		Golf courses only
	Bracket 97	1.0–2.5 lb	0.4–0.9 oz		Golf courses, sod farms only
	Orthene-T, T&O Spray 97	1.0–2.5 lb	0.4–0.9 oz		Golf courses, sod farms only
	Orthene-T, T&O WSP	1.33–3.33 lb	See label		Golf courses, sod farms only
bifenthrin	Bifen 2 AG Gold	—	0.05–0.08 fl oz	3A	Restricted-use pesticide
	Brigade 2EC	2.2–3.5 fl oz	0.05–0.08 fl oz		Restricted use; sod farms only
	Capture LFR	2.8–4.35 fl oz	0.066–0.1 fl oz		Restricted use; sod farms only
	Fanfare ES	2.2–3.5 fl oz	0.05–0.08 fl oz		Restricted use; sod farms only
	Pro-Mate Bifenthrin	—	0.18–0.25 fl oz		—
	Sniper	2.2–3.5 fl oz	0.05–0.08 fl oz		Restricted-use pesticide
	Tailgunner	2.2–3.5 fl oz	0.05–0.08 fl oz		Restricted use; sod farms only
	Talstar GC	50 lb	1.15 lb		Restricted use; lawns, parks, athletic fields, sod farms, golf courses
	Talstar P	—	0.18–0.25 fl oz		Lawns, parks, athletic fields
	Talstar S Select	10 fl oz	0.25 fl oz		Restricted use; golf courses, sod farms only
	Up-Star GC	50 lb	1.15 lb		Restricted-use pesticide
	Up-Star Gold	—	0.18–0.25 fl oz		Lawns, parks, athletic fields
	Up-Star SC	0.25 fl oz	10 fl oz		Restricted-use pesticide
	Wisdom EZ	50 lb	1.15 lb		Lawns, parks, athletic fields
	Wisdom Flowable	10–20 oz	0.23–0.46 fl oz		Restricted-use pesticide
	Wisdom GC Granular	50 lb	1.15 lb		Restricted-use pesticide
	Wisdom Lawn Granular	50 lb	1.15 lb		Lawns, parks, athletic fields
	Wisdom TC Flowable	—	0.18–0.25 fl oz		Lawns, parks, athletic fields

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Table 27 continued. Insecticides registered to control armyworms in turfgrasses

Common name	Trade name	Product/A	Product/ 1,000 sq ft	Insecticide group	Comments
bifenthrin + zeta-cypermethrin	Talstar XTRA GC	50–100 lb	1.15–2.3 lb	3A and 3A	Lawns, parks, athletic fields
carbaryl	Carbaryl 4L	2.0–4.0 qt	1.5–3.0 fl oz	1A	Spot treatments only in residential turf
	Sevin SL	2.0–4.0 qt	1.5–3 fl oz		—
chlorantraniliprole	Acelepryn	2.0–4.0 fl oz	0.046–0.092 fl oz	28	—
	Acelepryn G	50–100 lb	1.15–2.3 lb		—
chlorpyrifos	Chlorpyrifos 4E AG	1.0 qt	0.75 fl oz	1B	Restricted use; sod farms only
	Dursban 50W-WSP	2.0 lb	—		Restricted use; sod farms only
	Govern 4E	1.0 qt	0.75 fl oz		Restricted use; sod farms only
	Lorsban 4E	1.0 qt	0.75 fl oz		Restricted use; sod farms only
	Lorsban Advanced	1.0 qt	0.75 fl oz		Restricted use; sod farms only
	Nufarm Chlorpyrifos SPC 2	2.0 qt	1.5 fl oz		Restricted use; golf courses, industrial sites, road medians only
	Nufarm Chlorpyrifos SPC 4	1.0 qt	0.75 fl oz		Restricted use; golf courses, industrial sites, road medians only
	Vulcan	1.0 qt	0.75 fl oz		Restricted use; golf courses, industrial sites, road medians only
	Warhawk	2.0 pt	0.75 fl oz		Restricted use; sod farms only
	Whirlwind	1.0 qt	0.75 fl oz		Restricted use; sod farms only
	Yuma 4E	1.0 qt	0.75 fl oz		Restricted use; sod farms only
clothianidin + bifenthrin	Aloft GC G	80–160 lb	1.8–3.6 lb	4A and 3A	Restricted-use pesticide
	Aloft GC SC	11.65–23.3 fl oz	0.27–0.54 fl oz		Restricted-use pesticide
	Aloft LC G	80–160 lb	1.8–3.6 lb		Restricted use; NR ¹ for golf courses, sod farms
	Aloft LC SC	11.65–23.3 fl oz	0.27–0.54 fl oz		Restricted use; NR ¹ for golf courses, sod farms
cyantraniliprole	Ference	2–16 fl oz	0.046–0.367 fl oz	28	—
cyfluthrin	Tempo 20 WP-GC	—	See label	3A	Restricted-use pesticide
	Tempo SC Ultra	6.0–12 fl oz	0.135–0.270 fl oz		Landscape and recreational turf only; NR ¹ for golf courses, sod farms
	Tempo Ultra WP	7.7–15.4 oz	5–10 g		Landscape and recreational turf only; NR ¹ for golf courses, sod farms
	Tempo Ultra WSP	—	See label		Landscape and recreational turf only; NR ¹ for golf courses, sod farms
deltamethrin	Deltagard G	87–131 lb	2–3 lb	3A	NR ¹ for golf courses, sod farms
	Deltagard GC	87–131 lb	2–3 lb		Restricted-use pesticide
	Deltagard GC 5SC	8.75–17.5 fl oz	0.2–0.4 fl oz		Restricted-use pesticide
	Deltagard T&O	87–131 lb	2–3 lb		NR ¹ for golf courses, sod farms
	Deltagard T&O 5SC	8.75–17.5 fl oz	0.2–0.4 fl oz		NR ¹ for sod farms
	Suspend SC	17.5–26 fl oz	0.4–0.6 fl oz		NR ¹ for sod farms
dinotefuran	Zylam Liquid	4.9 pt	1.8 fl oz	4A	—
imidacloprid + bifenthrin	Allectus G	50–125 lb	1.2–2.9 lb	4A and 3A	NR ¹ for golf courses, sod farms
	Allectus GC SC	1.8–4.5 pt	0.67–1.65 fl oz		Restricted use; golf courses, sod farms only
	Allectus GC	50–125 lb	1.1–2.9 lb		Restricted use; golf courses, sod farms only
	Allectus SC	1.1–4.5 pt	0.4–1.65 fl oz		NR ¹ for golf courses, sod farms

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Table 27 continued. Insecticides registered to control armyworms in turfgrasses

Common name	Trade name	Product/A	Product/ 1,000 sq ft	Insecticide group	Comments
indoxacarb	Provaunt	2.0–4.0 oz	0.046–0.092 oz	22A	NR ¹ for sod farms
lambda-cyhalothrin	Demand G	88–131 lb	2–3 lb	3A	NR ¹ for golf courses, sod farms
	Nufarm Lambda-Cyhalothrin 1 EC	See label	See label		Restricted-use pesticide
	Scimitar CS	5.0–10 fl oz	3.4–7 mL		NR ¹ for golf courses, sod farms
	Scimitar GC	5.0–10 fl oz	3.4–7 mL		Restricted-use pesticide
permethrin	Permethrin 3.2 EC	—	0.4–0.8 fl oz	3A	Restricted-use pesticide
	Perm-Up 3.2 EC	—	0.4–0.8 fl oz		Restricted-use pesticide
spinosad	Blackhawk	1.1–2.2 oz	—	5	Sod farms only
	Conserve SC	10 fl oz	0.25 fl oz		—
	Tracer	1.0–2.0 fl oz	—		Sod farms only
thiamethoxam + lambda-cyhalothrin	Tandem	See label	See label	3A and 4A	NR ¹ for sod farms
trichlorfon	Dylox 420 SL	200–300	4.6–6.9 fl oz	1B	Golf courses, recreational turf, lawns only
	Dylox 6.2G	87 lb	2 lb		NR ¹ for sod farms
zeta-cypermethrin	Mustang	3.0–4.3 fl oz	—	3A	Restricted use; sod farms only
	Mustang Max/Maxx	2.8–4.0 oz	—		Restricted use; sod farms only
zeta-cypermethrin + bifenthrin + imidacloprid	Triple Crown Golf	10–15 fl oz	0.23–0.34 fl oz	3A and 4A	Golf courses only
	Triple Crown T&O	20–35 fl oz	0.46–0.8 fl oz		Lawns, parks, athletic fields

1: NR = Not registered

Billbugs

Table 28. Insecticides registered to control billbugs in turfgrasses

Common name	Trade name	Product/A	Product/ 1,000 sq ft	Insecticide group	Comments
bifenthrin	Bifen 2 AG Gold	—	0.08–0.16 fl oz	3A	Restricted-use pesticide
	Brigade 2EC	3.5–7.0 fl oz	0.08–0.16 fl oz		Restricted use; sod farms only
	Capture LFR	4.35–8.7 fl oz	0.1–0.2 fl oz		Restricted use; sod farms only
	Fanfare ES	3.5–7.0 fl oz	0.08–0.16 fl oz		Restricted use; sod farms only
	Menace GC 7.9% Flowable	10–20 fl oz	0.25–0.5 fl oz		Restricted-use pesticide
	Pro-mate Bifenthrin	—	0.25–0.5 fl oz		—
	Sniper	3.5–7.0 fl oz	0.08–0.16 fl oz		Restricted-use pesticide
	Tailgunner	3.7–7.0 fl oz	0.08–0.16 fl oz		Restricted use; sod farms only
	Talstar GC	50–100 lb	1.5–2.3 lb		Restricted use; lawns, parks, athletic fields, sod farms, golf courses
	Talstar P	—	0.25–0.5 fl oz		Lawns, parks, athletic fields
	Talstar S Select	10–20 fl oz	0.25–0.5 fl oz		Restricted use; golf courses, sod farms only
	Up-Star GC	50–100 lb	1.15–2.3 lb		Restricted-use pesticide
	Up-Star Gold		0.25–0.5 fl oz		Lawns, parks, athletic fields
	Up-Star SC	0.25–0.5 fl oz	10–20 fl oz		Restricted-use pesticide
	Wisdom EZ	50–100 lb	1.15–2.3 lb		Lawns, parks, athletic fields
	Wisdom Flowable	10–20 oz	0.23–0.46 fl oz		Restricted-use pesticide
	Wisdom GC Granular	50–100 lb	1.15–2.3 lb		Restricted-use pesticide
	Wisdom Lawn Granular	50–100 lb	1.15–2.3 lb		Lawns, parks, athletic fields
	Wisdom TC Flowable	—	0.25–5 fl oz		Lawns, parks, athletic fields
bifenthrin + zeta-cypermethrin	Talstar XTRA GC	50–100 lb	1.15–2.3 lb	3A and 3A	Lawns, parks, athletic fields
chlorantraniliprole	Acelepryn	8.0–20 fl oz	0.184–0.46 fl oz	28	—
	Acelepryn G	50–100 lb	1.15–2.3 lb		—
chlorpyrifos	Chlorpyrifos 4E AG	1.0–2.0 qt	0.75–1.5 fl oz	1B	Restricted use; sod farms only
	Dursban 50W-WSP	2.0–4.0 lb	—		Restricted use; sod farms only
	Govern 4E	1.0–2.0 qt	0.75–1.5 fl oz		Restricted use; sod farms only
	Hatchet	1.0–2.0 qt	0.75–1.5 fl oz		Restricted use; sod farms only
	Lorsban 4E	1.0–2.0 qt	0.75–1.5 fl oz		Restricted use; sod farms only
	Lorsban 4E	1.0–2.0 qt	0.75–1.5 fl oz		Restricted use; sod farms only
	Lorsban Advanced	1.0–2.0 qt	0.75–1.5 fl oz		Restricted use; sod farms only
	Nufarm Chlorpyrifos SPC 2	2.0 qt	1.5 fl oz		Restricted use; golf courses, industrial sites, road medians only
	Nufarm Chlorpyrifos SPC 4	1.0 qt	0.75–3 fl oz		Restricted use; golf courses, industrial sites, road medians only
	Vulcan	1.0–2.0 qt	0.75–1.5 fl oz		Restricted use; golf courses, industrial sites, road medians only
	Warhawk	2.0–4.0 pt	0.75–1.5 fl oz		Restricted use; sod farms only
	Whirlwind	1.0–2.0 qt	0.75–1.5 fl oz		Restricted use; sod farms only
	Yuma 4E	1.0–2.0 qt	0.75–1.5 fl oz		Restricted use; sod farms only
clothianidin + bifenthrin	Aloft GC G	80–160 lb	1.8–3.6 lb	4A and 3A	Restricted-use pesticide
	Aloft GC SC	11.65–23.3 fl oz	0.27–0.54 fl oz		Restricted-use pesticide
	Aloft LC G	80–160 lb	1.8–3.6 lb		Restricted use; NR ¹ for golf courses, sod farms

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Table 28 continued. Insecticides registered to control billbugs in turfgrasses

Common name	Trade name	Product/A	Product/ 1,000 sq ft	Insecticide group	Comments
clothianidin + bifenthrin <i>cont.</i>	Aloft LC SC	11.65–23.3 fl oz	0.27–0.54 fl oz	4A and 3A	Restricted use; NR ¹ for golf courses, sod farms
cyantraniliprole	Ference	8–16 fl oz	0.184–0.367 fl oz	28	—
deltamethrin	Deltagard G	87–131 lb	2.0–3.0 lb	3A	NR ¹ for golf courses, sod farms
	Deltagard GC	87–131 lb	2.0–3.0 lb		Restricted-use pesticide
	Deltagard GC 5SC	26–39 fl oz	0.6–0.9 fl oz		Restricted-use pesticide
	Deltagard T&O	87–131 lb	2.0–3.0 lb		NR ¹ for golf courses, sod farms
	Deltagard T&O 5SC	26–39 fl oz	0.6–0.9 fl oz		NR ¹ for sod farms
dinotefuran	Zylam liquid	4.9 pt	1.8 fl oz	4A	—
	Zylam 20SG	2.7 lb	1 oz		—
imidacloprid (larvae only)	Amtide Imidacloprid 2F T&O	19.2–25.6 fl oz	0.45–0.6 fl oz	4A	—
	Criterion 0.5G	60–80 lb	1.4–1.8 lb		NR ¹ for sod farms
	Criterion 2F	1.25–1.6 pt	0.46–0.6 fl oz		—
	Criterion 75WSP	—	1.6 oz/8,250– 11,000 sq ft		—
	Malice 0.5G	50–80 lb	1.2–1.8 lb		NR ¹ for sod farms
	Malice 2F	1.25–1.6 pt	0.46–0.6 fl oz		NR ¹ for sod farms
	Malice 75WSP	—	1.6 oz/8,250– 11,000 sq ft		—
	Mallet 0.5G	60–80 lb	1.4–1.8 lb		NR ¹ for sod farms
	Mallet 2F T&O	1.25–1.6 pt	0.46–0.6 fl oz		—
	Mallet 75WSP	4–5.375 packets (6.4–8.6 oz)	1.6 oz/8,250– 11,000 sq ft		NR ¹ for sod farms
	Merit 0.5G	60–80 lb	1.4–1.8 lb		NR ¹ for sod farms
	Merit 2F	1.25–1.6 pt	0.46–0.6 fl oz		—
	Merit 75WP	6.4–8.6 oz	3–4 level teaspoons		—
	Merit 75WSP	—	1.6 oz/8,250– 11,000 sq ft		NR ¹ for sod farms
	Pro-Mate Merit 0.2%	150–200 lb	3.5–4.5 lb		—
	Prokoz Zenith 0.5 G	60–80 lb	1.4–1.8 lb		NR ¹ for sod farms
	Prokoz Zenith 2F	1.25–1.6 pt	0.46–0.6 fl oz		—
	Prokoz Zenith 75WSP	—	1.6 oz/8,250– 11,000 sq ft		—
imidacloprid + bifenthrin	Allectus G	75–125 lb	1.7–2.9 lb	4A and 3A	NR ¹ for golf courses, sod farms
	Allectus GC SC	2.3–4.5 pt	0.9–1.65 fl oz		Restricted use; golf courses, sod farms only
	Allectus GC	75–125 lb	1.7–2.9 lb		Restricted use; golf courses, sod farms only
	Allectus SC	1.1–4.5 pt	0.4–1.65 fl oz		NR ¹ for golf courses, sod farms
lambda-cyhalothrin	Demand G	131–176 lb	3.0–4.0 lb	3A	NR ¹ for golf courses, sod farms
thiamethoxam	Meridian 25 WG	12.7–17 oz	3–4oz/ 10,000 sq ft	4A	—
	Meridian 0.33G	60–80 lb	7–9 lb/ 5,000 sq ft		—
trichlorfon	Dylox 420 SL	300 fl oz	6.9 fl oz	1B	Golf courses, recreational turf, lawns only
	Dylox 6.2G	130 lb	3 lb		NR ¹ for sod farms
zeta-cypermethrin + bifenthrin + imidacloprid	Triple Crown Golf	10–20 fl oz	0.23–0.46 fl oz	3A and 4A	Golf courses only
	Triple Crown T&O	10–20 fl oz	0.23–0.46 fl oz		Lawns, parks, athletic fields

1: NR = Not registered

Black turfgrass ataenius

Table 29. Insecticides registered to control black turfgrass ataenius in turfgrasses

Common name	Trade name	Product/A	Product/ 1,000 sq ft	Insecticide group	Comments
acephate	Acephate 90 Prill	2.7–4.3 lb	1.0–1.6 oz	1B	Golf courses, sod farms only
	Acephate 90 WDG Insecticide	2.7–4.4 lb	1.0–1.6 oz		Golf courses only
	Acephate 97	2.5–4.1 lb	0.9–1.5 oz		Golf courses, sod farms only
	Acephate 97UP	2.5–4.12 lb	0.9–1.5 oz		Golf courses, sod farms only
	Bracket 90 WDG	2.71–4.44 lb	1.0–1.6 oz		Golf courses only
	Bracket 97	2.5–4.12 lb	0.9–1.5 oz		Golf courses, sod farms only
	Orthene-T, T&O Spray 97	2.5–4 lb	0.9–1.5 oz		Golf courses, sod farms only
	Orthene-T, T&O WSP	3.3–4 lb	1.3–1.5 oz		Golf courses, sod farms only
bifenthrin	Bifen 2 AG Gold		0.08–0.16 fl oz	3A	Restricted-use pesticide
	Brigade 2EC	3.5–7.0 fl oz	0.08–0.16 fl oz		Restricted use; sod farms only
	Bifen 2 AG Gold	—	0.08–0.16 fl oz		Restricted-use pesticide
	Brigade 2EC	3.5–7.0 fl oz	0.08–0.16 fl oz		Restricted use; sod farms only
	Capture LFR	4.35–8.7 fl oz	0.1–0.2 fl oz		Restricted use; sod farms only
	Fanfare ES	3.5–7.0 fl oz	0.08–0.16 fl oz		Restricted use; sod farms only
	Menace GC 7.9% Flowable	10–20 fl oz	0.25–0.5 fl oz		Restricted-use pesticide
	Sniper	3.5–7.0 fl oz	0.08–0.16 fl oz		Restricted-use pesticide
	Tailgunner	3.7–7.0 fl oz	0.08–0.16 fl oz		Restricted use; sod farms only
	Talstar GC	50–100 lb	1.5–2.3 lb		Restricted use; lawns, parks, athletic fields, sod farms, golf courses
	Talstar P	—	0.25–0.5 fl oz		Lawns, parks, athletic fields
	Talstar S Select	10–20 fl oz	0.25–0.5 fl oz		Restricted use; golf courses, sod farms only
	Up-Star GC	50–100 lb	1.15–2.3 lb		Restricted-use pesticide
	Up-Star Gold	—	0.18–0.25 fl oz		Lawns, parks, athletic fields
	Up-Star SC	0.25–0.5 fl oz	10–20 fl oz		Restricted-use pesticide
	Wisdom EZ	50–100 lb	1.15–2.3 lb		Lawns, parks, athletic fields
	Wisdom GC Granular	50–100 lb	1.15–2.3 lb		Restricted-use pesticide
	Wisdom Lawn Granular	50–100 lb	1.15–2.3 lb		Lawns, parks, athletic fields
	Wisdom TC Flowable	—	0.25–5 fl oz		Lawns, parks, athletic fields
bifenthrin + zeta- cypermethrin	Talstar XTRA GC	50–100 lb	1.15–2.3 lb	3A and 3A	Lawns, parks, athletic fields
chlorantraniliprole	Acelepryn	8.0–16 fl oz	0.184–0.367 fl oz	28	—
	Acelepryn G	50–100 lb	1.15–2.3 lb		—
chlorpyrifos	Chlorpyrifos 4E AG	2–4 qt	1.5–3 fl oz	1B	Restricted use; sod farms only
	Lorsban 4E	2–4 qt	1.5–3 fl oz		Restricted use; sod farms only
	Lorsban Advanced	2–4 qt	1.5–3 fl oz		Restricted use; sod farms only
	Nufarm Chlorpyrifos SPC 2	2.0 qt	1.5 fl oz		Restricted use; golf courses, industrial sites, road medians only
	Nufarm Chlorpyrifos SPC 4	1.0 qt	1.5–3 fl oz		Restricted use; golf courses, industrial sites, road medians only
	Govern 4E	2–4 qt	1.5–3 fl oz		Restricted use; sod farms only
	Hatchet	2–4 qt	1.5–3 fl oz		Restricted use; sod farms only

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Table 29 continued. Insecticides registered to control black turfgrass ataenius in turfgrasses

Common name	Trade name	Product/A	Product/ 1,000 sq ft	Insecticide group	Comments
chlorpyrifos <i>cont.</i>	Vulcan	1.0 qt	1.5–3 fl oz	1B	Restricted use; golf courses, industrial sites, road medians only
	Warhawk	4.0 pt	1.5 fl oz		Restricted use; sod farms only
	Whirlwind	2–4 qt	1.5–3 fl oz		Restricted use; sod farms only
	Yuma 4E	1.0 qt	0.75 fl oz		Restricted use; sod farms only
clothianidin + bifenthrin	Aloft GC G	80–160 lb	1.8–3.6 lb	4A and 3A	Restricted-use pesticide
	Aloft GC SC	11.65–23.3 fl oz	0.27–0.54 fl oz		Restricted-use pesticide
	Aloft LC G	80–160 lb	1.8–3.6 lb		Restricted use; NR ¹ for golf courses, sod farms
	Aloft LC SC	11.65–23.3 fl oz	0.27–0.54 fl oz		Restricted use; NR ¹ for golf courses, sod farms
cyantraniliprole	Ference	8–16 fl oz	0.184–0.367 fl oz	28	—
cyfluthrin	Tempo 20 WP-GC	—	See label	3A	Restricted-use pesticide
	Tempo SC Ultra	12 fl oz	0.27 fl oz		Landscape and recreational turf only; NR ¹ for golf courses, sod farms
	Tempo Ultra WP	15.4 oz	10 g		Landscape and recreational turf only; NR ¹ for golf courses, sod farms
	Tempo Ultra WSP	—	See label		Landscape and recreational turf only; NR ¹ for golf courses, sod farms
deltamethrin	Deltagard G	87–131 lb	2.0–3.0 lb	3A	NR ¹ for golf courses, sod farms
	Deltagard GC	87–131 lb	2.0–3.0 lb		Restricted-use pesticide
	Deltagard GC 5SC	26–39 fl oz	0.6–0.9 fl oz		Restricted-use pesticide
	Deltagard T&O	87–131 lb	2.0–3.0 lb		NR ¹ for golf courses, sod farms
	Deltagard T&O 5SC	26–39 fl oz	0.6–0.9 fl oz		NR ¹ for sod farms
	Suspend SC	26–39 fl oz	0.6–0.9 fl oz		NR ¹ for sod farms
dinotefuran	Zylam Liquid	4.9 pt	1.8 fl oz	4A	—
	Zylam 20SG	2.7 lb	1.0 oz		—
imidacloprid (larvae only)	Amtide	19.2–25.6 fl oz	0.45–0.6 fl oz	4A	—
	Imidacloprid 2F T&O				
	Criterion 0.5 G	60–80 lb	1.4–1.8 lb		NR ¹ for sod farms; Larvae only
	Criterion 2F	1.25–1.6 pt	0.46–0.6 fl oz		—
	Criterion 75WSP	—	1.6 oz/8,250–1,000 sq ft		—
	Malice 0.5G	50–80 lb	1.2–1.8 lb		NR ¹ for sod farms
	Malice 2F	1.25–1.6 pt	0.46–0.6 fl oz		NR ¹ for sod farms
	Malice 75 WSP	—	1.6 oz/8,250–1,000 sq ft		—
	Mallet 0.5G	60–80 lb	1.4–1.8 lb		NR ¹ for sod farms
	Mallet 2 F T&O	1.25–1.6 pt	0.46–0.6 fl oz		
	Mallet 75 WSP	4–5.375 packets (6.4–8.6 oz)	1.6 oz/8,250–11,000 sq ft		NR ¹ for sod farms
	Merit 0.5G	60–80 lb	1.4–1.8 lb		NR ¹ for sod farms
	Merit 2F	1.25–1.6 pt	0.46–0.6 fl oz		—
	Merit 75WP	6.4–8.6 oz	3–4 level teaspoons		—
	Merit 75WSP	—	1.6 oz/8,250–11,000 sq ft		—

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Table 29 continued. Insecticides registered to control black turfgrass ataenius in turfgrasses

Common name	Trade name	Product/A	Product/ 1,000 sq ft	Insecticide group	Comments
imidacloprid (larvae only) <i>cont.</i>	Pro-mate Merit 0.2%	150–200 lb	3.5–4.5 lb	4A	—
	Prokoz Zenith 0.5 G	60–80 lb	1.4–1.8 lb		NR ¹ for sod farms
	Prokoz Zenith 2F	1.25–1.6 pt	0.46–0.6 fl oz		—
	Prokoz Zenith 75 WSP	—	1.6 oz/8,250– 11,000 sq ft		—
imidacloprid + bifenthrin	Allectus G	100–125 lb	2.3–2.9 lb	4A and 3A	NR ¹ for golf courses, sod farms
	Allectus GC	100–125 lb	2.3–2.9 lb		Restricted use; golf courses, sod farms only
	Allectus GC SC	3.6–4.5 pt	1.32–1.65 fl oz		Restricted use; golf courses, sod farms only
	Allectus SC	3.6–4.5 pt	1.32–1.65 fl oz		NR ¹ for golf courses, sod farms
lambda-cyhalothrin	Nufarm Lambda- Cyhalothrin 1 EC	See label	See label	3A	Restricted-use pesticide
	Scimitar CS	10 fl oz	7 mL		NR ¹ for golf courses, sod farms
	Scimitar GC	10 fl oz	7 mL		Restricted-use pesticide
thiamethoxam	Meridian 25 WG	12.7–17 oz	3.0–4.0 oz/ 10,000 sq ft	4A	—
	Meridian 0.33G	60–80 lb	7–9 lb/ 5,000 sq ft		—
thiamethoxam + lambda-cyhalothrin	Tandem	See label	See label	3A and 4A	NR ¹ for sod farms
spinosad	Conserve SC	52 fl oz	1.2 fl oz	5	—
trichlorfon	Dylox 420 SL	300 fl oz	6.9 fl oz	1B	Golf courses, recreational turf, lawns only
	Dylox 6.2G	130 lb	3 lb		NR ¹ for sod farms
zeta-cypermethrin + bifenthrin + imidacloprid	Triple Crown Golf	10–20 fl oz	0.23–0.46 fl oz	3A and 4A	Golf courses only
	Triple Crown T&O	10–20 fl oz	0.23–0.46 fl oz		Lawns, parks, athletic fields

1: NR = Not registered

Chinch bugs

Table 30. Insecticides registered to control chinch bugs in turfgrasses

Common name	Trade name	Product/A	Product/ 1,000 sq ft	Insecticide group	Comments
acephate	Acephate 90 Prill	2.7–4.3 lb	1.0–1.6 oz	1B	Golf courses, sod farms only
	Acephate 90 WDG Insecticide	2.7–4.4 lb	1.0–1.6 oz		Golf courses only
	Acephate 97	2.5–4.1 lb	0.9–1.5 oz		Golf courses, sod farms only
	Acephate 97UP	2.5–4.12 lb	0.9–1.5 oz		Golf courses, sod farms only
	Bracket 90 WDG	2.71–4.44 lb	1.0–1.6 oz		Golf courses only
	Bracket 97	2.5–4.12 lb	0.9–1.5 oz		Golf courses, sod farms only
	Orthene-T, T&O Spray 97	2.5–4 lb	0.9–1.5 oz		Golf courses, sod farms only
	Orthene-T, T&O WSP	3.3–4 lb	1.3–1.5 oz		Golf courses, sod farms only
bifenthrin	Bifen 2 AG Gold	—	0.16–0.32 fl oz	3A	Restricted-use pesticide
	Brigade 2EC	7.0–14.0 fl oz	0.16–0.32 fl oz		Restricted use; sod farms only
	Capture LFR	8.7–17.42 fl oz	0.2–0.4 fl oz		Restricted use; sod farms only
	Fanfare ES	7.0–14.0 fl oz	0.16–0.32 fl oz		Restricted use; sod farms only
	Menace GC 7.9% Flowable	10–20 fl oz	0.25–0.5 fl oz		Restricted-use pesticide
	Pro-Mate Bifenthrin	—	0.5–1.0 fl oz		—
	Sniper	7.0–14.0 fl oz	0.16–0.32 fl oz		Restricted-use pesticide
	Tailgunner	7.0–14.0 fl oz	0.16–0.32 fl oz		Restricted use; sod farms only
	Talstar GC	100–200 lb	2.3–4.6 lb		Restricted use; lawns, parks, athletic fields, sod farms, golf courses
	Talstar P	—	0.5–1.0 fl oz		Lawns, parks, athletic fields
	Talstar S Select	10–20 fl oz	0.25–0.5 fl oz		Restricted use; golf courses, sod farms only
	Up-Star GC	100–200 lb	2.3–4.6 lb		Restricted-use pesticide
	Up-Star Gold	—	0.25–1 fl oz		Lawns, parks, athletic fields
	Up-Star SC	0.25–0.5 fl oz	10–20 fl oz		Restricted-use pesticide
	Wisdom EZ	100–200 lb	2.3–4.6 lb		Lawns, parks, athletic fields
	Wisdom Flowable	10–20 oz	0.23–0.46 fl oz		Restricted-use pesticide
	Wisdom GC Granular	100–200 lb	2.3–4.6 lb		Restricted-use pesticide
	Wisdom Lawn Granular	100–200 lb	2.3–4.6 lb		Lawns, parks, athletic fields
	Wisdom TC Flowable	—	0.25–5 fl oz		Lawns, parks, athletic fields
bifenthrin + zeta-cypermethrin	Talstar XTRA GC	100–200 lb	2.3–4.6 lb	3A and 3A	Lawns, parks, athletic fields
carbaryl	Carbaryl 4L	6.0–8.0 qt	4.4–6.0 fl oz	1A	Spot treatments only in residential turf
	Sevin SL	6.0–8.0 qt	4.4–6.0 fl oz		—
chlorantraniliprole	Acelepryn	8.0–20 fl oz	0.184–0.46 fl oz	28	Suppression only
	Acelepryn G	50–100 lb	1.15–2.3 lb		Suppression only
chlorpyrifos	Chlorpyrifos 4E AG	1.0 qt	0.75 fl oz	1B	Restricted use; sod farms only
	Dursban 50W-WSP	2.0 lb	—		Restricted use; sod farms only
	Govern 4E	1.0 qt	0.75 fl oz		Restricted use; sod farms only

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Table 30 continued. Insecticides registered to control chinch bugs in turfgrasses

Common name	Trade name	Product/A	Product/ 1,000 sq ft	Insecticide group	Comments
chlorpyrifos <i>cont.</i>	Hatchet	1.0 qt	0.75 fl oz	1B	Restricted use; sod farms only
	Lorsban 4E	1.0 qt	0.75 fl oz		Restricted use; sod farms only
	Lorsban Advanced	1.0 qt	0.75 fl oz		Restricted use; sod farms only
	Nufarm Chlorpyrifos SPC 2	2.0 qt.	1.5 fl oz		Restricted use; golf courses, industrial sites, road medians only
	Nufarm Chlorpyrifos SPC 4	1.0 qt	0.75 fl oz		Restricted use; golf courses, industrial sites, road medians only
	Vulcan	1.0 qt	0.75 fl oz		Restricted use; golf courses, industrial sites, road medians only
	Warhawk	2.0 pt	0.75 fl oz		Restricted use; sod farms only
	Whirlwind	1.0 qt	0.75 fl oz		Restricted use; sod farms only
	Yuma 4E	1.0 qt	0.75 fl oz		Restricted use; sod farms only
clothianidin + bifenthrin	Aloft GC G	80–160 lb	1.8–3.6 lb	4A and 3A	Restricted-use pesticide
	Aloft GC SC	11.65–23.3 fl oz	0.27–0.54 fl oz		Restricted-use pesticide
	Aloft LC G	80–160 lb	1.8–3.6 lb		Restricted use; NR ¹ for golf courses, sod farms
	Aloft LC SC	11.65–23.3 fl oz	0.27–0.54 fl oz		Restricted use; NR ¹ for golf courses, sod farms
cyfluthrin	Tempo 20 WP-GC	—	See label	3A	Restricted-use pesticide
	Tempo SC Ultra	12 fl oz	0.27 fl oz		Landscape and recreational turf only: NR ¹ for golf courses, sod farms
	Tempo Ultra WP	15.4 oz	10 g		Landscape and recreational turf only: NR ¹ for golf courses, sod farms
	Tempo Ultra WSP	—	See label		Landscape and recreational turf only: NR ¹ for golf courses, sod farms
deltamethrin	Deltagard G	87–131 lb	2.0–3.0 lb	3A	NR ¹ for golf courses, sod farms
	Deltagard GC	87–131 lb	2.0–3.0 lb		Restricted-use pesticide
	Deltagard GC 5SC	26–39 fl oz	0.6–0.9 fl oz		Restricted-use pesticide
	Deltagard T&O	87–131 lb	2.0–3.0 lb		NR ¹ for golf courses, sod farms
	Deltagard T&O 5SC	26–39 fl oz	0.6–0.9 fl oz		NR ¹ for sod farms
	Suspend SC	26–39 fl oz	0.6–0.9 fl oz		NR ¹ for sod farms
dinotefuran	Zylam 20SG	2.7 lb	1.0 oz	4A	—
	Zylam Liquid	4.9 pt	1.8 fl oz		—
imidacloprid	Amtide Imidacloprid 2F T&O	25.6 fl oz	0.6 fl oz	4A	Suppression only
	Criterion 0.5 G	80 lb	1.8 lb		NR ¹ for sod farms; suppression only
	Criterion 2F	1.6 pt	0.6 fl oz		Suppression only
	Criterion 75WSP	—	1.6 oz (1 packet)/ 8,250 sq ft		Suppression only
	Malice 0.5G	80 lb	1.8 lb		NR ¹ for sod farms; suppression only
	Malice 2F	1.6 pt	0.60 fl oz		NR ¹ for sod farms; suppression only
	Malice 75 WSP	—	1.6 oz (1 packet)/ 8,250 sq ft		Suppression only
	Mallet 0.5G	80 lb	1.8 lb		NR ¹ for sod farms; suppression only
	Mallet 2 F T&O	1.6 pt	0.60 fl oz		Suppression only
	Mallet 75 WSP	5.375 packets (8.6 oz)	1 packet (1.6oz)/ 8,250 sq ft		NR ¹ for sod farms; suppression only
	Merit 0.5G	80 lb	1.8 lb		NR ¹ for sod farms; suppression only

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Table 30 continued. Insecticides registered to control chinch bugs in turfgrasses

Common name	Trade name	Product/A	Product/ 1,000 sq ft	Insecticide group	Comments
imidacloprid <i>cont.</i>	Merit 2F	1.6 pt	0.6 fl oz	4A	Suppression only
	Merit 75WP	8.6 oz	4 level teaspoons		Suppression only
	Merit 75WSP	—	1.6oz (1 packet)/ 8,250 sq ft		Suppression only
	Pro-mate Merit 0.2%	200 lb	4.5 lb		Suppression only
	Prokoz Zenith 0.5 G	80 lb	1.8 lb		NR ¹ for sod farms; suppression only
	Prokoz Zenith 2F	1.6 pt	0.6 fl oz		Suppression only
	Prokoz Zenith 75 WSP	—	1.6oz (1 packet)/ 8,250 sq ft		Suppression only
imidacloprid + bifenthrin	Allectus G	75–125 lb	1.7–2.9 lb	4A and 3A	NR ¹ for golf courses, sod farms
	Allectus GC SC	2.3–4.5 pt	0.9–1.65 fl oz		Restricted use; golf courses, sod farms only
	Allectus GC	75–125 lb	1.7–2.9 lb		Restricted use; golf courses, sod farms only
	Allectus SC	1.1–4.5 pt	0.4–1.65 fl oz		NR ¹ for golf courses, sod farms
lambda-cyhalothrin	Nufarm Lambda- Cyhalothrin 1 EC	See label	See label	3A	Restricted-use pesticide
	Demand G	131–176 lb	3–4 lb		NR ¹ for golf courses, sod farms
	Scimitar CS	10 fl oz	7 mL		NR ¹ for golf courses, sod farms
permethrin	Permethrin 3.2 EC	—	0.4–0.8 fl oz	3A	Restricted-use pesticide
	Perm-Up 3.2 EC	—	0.4–0.8 fl oz		Restricted-use pesticide
thiamethoxam	Meridian 0.33G	60–80 lb	7–9 lb/5,000 sq ft	4A	—
	Meridian 25 WG	12.7–17 oz	3–4oz/10,000 sq ft		—
thiamethoxam + lambda-cyhalothrin	Tandem	See label	See label	4A and 3A	NR ¹ for sod farms
trichlorfon	Dylox 420 SL	300 fl oz	6.9 fl oz	1B	Golf courses, recreational turf, lawns only
	Dylox 6.2G	130 lb	3 lb		NR ¹ for sod farms
zeta-cypermethrin	Mustang	3.0–4.3 fl oz	—	3A	Restricted use; sod farms only
	Mustang Max/ Maxx	2.8–4.0 fl oz	—		Restricted use; sod farms only
zeta-cypermethrin + bifenthrin + imidacloprid	Triple Crown Golf	20–35 fl oz	0.46–0.8 fl oz	3A and 4A	Golf courses only
	Triple Crown T&O	20–35 fl oz	0.46–0.8 fl oz		Lawns, parks, athletic fields

1: NR = Not registered

Cutworms

Table 31. Insecticides registered to control cutworms in turfgrasses

Common name	Trade name	Product/A	Product/ 1,000 sq ft	Insecticide group	Comments
acephate	Acephate 90 Prill	2.7–4.3 lb	1.0–1.6 oz	1B	Golf courses, sod farms only
	Acephate 90 WDG Insecticide	2.71–4.44 lb	1.0–1.6 oz		Golf courses only
	Acephate 97	2.5–4.12 lb	0.9–1.5 oz		Golf courses, sod farms only
	Acephate 97UP	2.5–4.12 lb	0.9–1.5 oz		Golf courses, sod farms only
	Bracket 90 WDG	2.71–4.44 lb	1.0–1.6 oz		Golf courses only
	Bracket 97	2.5–4.12 lb	0.9–1.5 oz		Golf courses, sod farms only
	Orthene-T, T&O Spray 97	1.0–2.5 lb	0.4–0.9 oz		Golf courses, sod farms only
	Orthene-T, T&O WSP	1.33–3.33 lb	0.5–1.2 oz		Golf courses, sod farms only
bifenthrin	Bifen 2 AG Gold	—	0.05–0.08 fl oz	3A	Restricted-use pesticide
	Brigade 2EC	2.2–3.5 fl oz	0.05–0.08 fl oz		Restricted use; sod farms only
	Capture LFR	2.8–4.35 fl oz	0.066–0.1 fl oz		Restricted use; sod farms only
	Fanfare ES	2.2–3.5 fl oz	0.05–0.08 fl oz		Restricted use; sod farms only
	Menace GC 7.9% Flowable	10 fl oz	0.25 fl oz		Restricted-use pesticide
	Pro-Mate Bifenthrin	—	0.18–0.25 fl oz		—
	Sniper	2.2–3.5 fl oz	0.05–0.08 fl oz		Restricted-use pesticide
	Tailgunner	2.2–3.5 fl oz	0.05–0.08 fl oz		Restricted use; sod farms only
	Talstar GC	50 lb	1.15 lb		Restricted use; lawns, parks, athletic fields, sod farms, golf courses
	Talstar P	—	0.18–0.25 fl oz		Lawns, parks, athletic fields
	Talstar S Select	10 fl oz	0.25 fl oz		Restricted use; golf courses, sod farms only
	Up-Star GC	50 lb	1.15 lb		Restricted-use pesticide
	Up-Star Gold	—	0.18–0.25 fl oz		Lawns, parks, athletic fields
	Up-Star SC	0.25 fl oz	10 fl oz		Restricted-use pesticide
	Wisdom EZ	50 lb	1.15 lb		Lawns, parks, athletic fields
	Wisdom Flowable	10–20 oz	0.23–0.46 fl oz		Restricted-use pesticide
	Wisdom GC Granular	50 lb	1.15 lb		Restricted-use pesticide
	Wisdom Lawn Granular	50 lb	1.15 lb		Lawns, parks, athletic fields
	Wisdom TC Flowable	—	0.18–0.25 fl oz		Lawns, parks, athletic fields
bifenthrin + zeta-cypermethrin	Talstar XTRA GC	50–100 lb	1.15–2.3 lb	3A and 3A	Lawns, parks, athletic fields
carbaryl	Carbaryl 4L	2.0–4.0 qt	1.5–3.0 fl oz	1A	Spot treatments only in residential turf
	Sevin SL	2.0–4.0 qt	1.5–3 fl oz		—
chlorantraniliprole	Acelepryn	2.0–4.0 fl oz	0.046–0.092 fl oz	28	—
	Acelepryn G	50–100 lb	1.15–2.3 lb		—
chlorpyrifos	Chlorpyrifos 4E AG	1.0 qt	0.75 fl oz	1B	Restricted use; sod farms only
	Dursban 50W-WSP	2.0 lb	—		Restricted use; sod farms only
	Govern 4E	1.0 qt	0.75 fl oz		Restricted use; sod farms only
	Hatchet	1.0 qt	0.75 fl oz		Restricted use; sod farms only
	Lorsban 4E	1.0 qt	0.75 fl oz		Restricted use; sod farms only

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Table 31 continued. Insecticides registered to control cutworms in turfgrasses

Common name	Trade name	Product/A	Product/ 1,000 sq ft	Insecticide group	Comments
chlorpyrifos <i>cont.</i>	Lorsban Advanced	1.0 qt	0.75 fl oz	1B	Restricted use; sod farms only
	Nufarm Chlorpyrifos SPC 2	2.0 qt	1.5 fl oz		Restricted use; golf courses, industrial sites, road medians only
	Nufarm Chlorpyrifos SPC 4	1.0 qt	0.75 fl oz		Restricted use; golf courses, industrial sites, road medians only
	Vulcan	1.0 qt	0.75 fl oz		Restricted use; golf courses, industrial sites, road medians only
	Warhawk	2.0 pt	0.75 fl oz		Restricted use; sod farms only
	Whirlwind	1.0 qt	0.75 fl oz		Restricted use; sod farms only
	Yuma 4E	1.0 qt	0.75 fl oz		Restricted use; sod farms only
clothianidin + bifenthrin	Aloft GC G	80–160 lb	1.8–3.6 lb	4A and 3A	Restricted-use pesticide
	Aloft GC SC	11.65–23.3 fl oz	0.27–0.54 fl oz		Restricted-use pesticide
	Aloft LC G	80–160 lb	1.8–3.6 lb		Restricted use; NR ¹ for golf courses, sod farms
	Aloft LC SC	11.65–23.3 fl oz	0.27–0.54 fl oz		Restricted use; NR ¹ for golf courses, sod farms
cyfluthrin	Tempo 20 WP-GC	—	See label	3A	Restricted-use pesticide
	Tempo SC Ultra	6.0–12 fl oz	0.135–0.270 fl oz		Landscape and recreational turf only: NR ¹ for golf courses, sod farms
	Tempo Ultra WSP	—	See label		Landscape and recreational turf only: NR ¹ for golf courses, sod farms
	Tempo Ultra WP	7.7–15.4 oz	5–10 g		Landscape and recreational turf only: NR ¹ for golf courses, sod farms
	Tempo Ultra WP	7.7–15.4 oz	5–10 g		Landscape and recreational turf only: NR ¹ for golf courses, sod farms
cyantraniliprole	Ference	2–16 fl oz	0.046–0.367 fl oz	28	—
deltamethrin	Deltagard G	87–131 lb	2.0–3.0 lb	3A	NR ¹ for golf courses, sod farms
	Deltagard GC	87–131 lb	2.0–3.0 lb		Restricted-use pesticide
	Deltagard GC 5SC	8.75–17.5 fl oz	0.2–0.4 fl oz		Restricted-use pesticide
	Deltagard T&O	87–131 lb	2.0–3.0 lb		NR ¹ for golf courses, sod farms
	Deltagard T&O 5SC	8.75–17.5 fl oz	0.2–0.4 fl oz		NR ¹ for sod farms
	Suspend SC	17.5–26 fl oz	0.4–0.6 fl oz		NR ¹ for sod farms
dinotefuran	Zylam 20SG	2.7 lb	1.0 oz	4A	—
	Zylam Liquid	4.9 pt	1.8 fl oz		—
Imidacloprid (larvae only)	Amtide Imidacloprid 2F T&O	19.2–25.6 fl oz	0.45–0.6 fl oz	4A	Suppression only
	Criterion 0.5 G	60–80 lb	1.4–1.8 lb		NR ¹ for sod farms; suppression only
	Criterion 75WSP	—	1.6 oz/ 8,250–11,000 sq ft		Suppression only
	Malice 0.5G	50–80 lb	1.2–1.8 lb		NR ¹ for sod farms; suppression only
	Malice 2F	1.25–1.6 pt	0.46–0.6 fl oz		NR ¹ for sod farms; suppression only
	Malice 75 WSP	—	1.6oz/ 8,250–11,000 sq ft		Suppression only
	Mallet 0.5G	80 lb	1.8 lb		NR ¹ for sod farms; suppression only
	Mallet 2 F T&O	1.25–1.6 pt	0.46–0.6 fl oz		—
	Mallet 75WSP	4–5.3 packets (6.4–8.6 oz)	1 packet/ 8,250–11,000 sq ft		NR ¹ for sod farms; suppression only
	Mallet 0.5G	80 lb	1.8 lb		NR ¹ for sod farms; suppression only

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Table 31 continued. Insecticides registered to control cutworms in turfgrasses

Common name	Trade name	Product/A	Product/ 1,000 sq ft	Insecticide group	Comments
Imidacloprid (larvae only) <i>cont.</i>	Mallet 2 F T&O	1.25–1.6 pt	0.46–0.6 fl oz	4A	—
	Mallet 75WSP	4–5.3 packets (6.4–8.6 oz)	1 packet/ 8,250–11,000 sq ft		NR ¹ for sod farms; suppression only
	Merit 0.5G	60–80 lb	1.4–1.8 lb		NR ¹ for sod farms; suppression only
	Merit 2F	1.25–1.6 pt	0.46–0.6 fl oz		Suppression only
	Merit 75WP	6.4–8.6oz	3–4 level teaspoons		Suppression only
	Merit 75WSP	—	1.6 oz/8,250–11,000 sq ft		Suppression only
	Prokoz Zenith 0.5 G	60–80 lb	1.4–1.8 lb		NR ¹ for sod farms; suppression only
	Prokoz Zenith 2F	1.6 pt	0.6 fl oz		Suppression only
	Prokoz Zenith 75 WSP	—	1.6 oz/ 8,250–11,000 sq ft		Suppression only
imidacloprid + bifenthrin	Allectus G	50–125 lb	1.2–2.9 lb	4A and 3A	NR ¹ for golf courses, sod farms
	Allectus GC	50–125 lb	1.1–2.9 lb		Restricted use; golf courses, sod farms only
	Allectus GC SC	1.8–4.5 pt	0.67–1.65 fl oz		Restricted use; golf courses, sod farms only
	Allectus SC	1.1–4.5 pt	0.4–1.65 fl oz		NR ¹ for golf courses, sod farms
indoxacarb	Provaunt	2.0–4.0 oz	0.046–0.092 oz	22A	NR ¹ for sod farms
lambda-cyhalothrin	Demand G	88–131 lb	2.0–3.0 lb	3A	NR ¹ for golf courses, sod farms
	Nufarm Lambda- Cyhalothrin 1 EC	See label	See label		Restricted-use pesticide
	Scimitar CS	5–10 fl oz	3.4–7 mL		NR ¹ for golf courses, sod farms
	Scimitar GC	5–10 fl oz	3.4–7 mL		Restricted-use pesticide
spinosad	Conserve SC	35–52 fl oz	0.8–1.2 fl oz		—
thiamethoxam + lambda-cyhalothrin	Tandem	See label	See label	4A and 3A	NR ¹ for sod farms
trichlorfon	Dylox 420 SL	200–300	4.6–6.9 fl oz	1B	Golf courses, recreational turf, lawns only
	Dylox 6.2G	87 lb	2 lb		NR ¹ for sod farms
zeta-cypermethrin	Mustang	3.0–4.3 fl oz	—	3A	Restricted use; sod farms only
	Mustang Max/ Maxx	2.24–4.0 oz	—		Restricted use; sod farms only
zeta-cypermethrin + bifenthrin + imidacloprid	Triple Crown Golf	10–15 fl oz	0.23–0.34 fl oz	3A and 4A	Golf courses only
	Triple Crown T&O	20–35 fl oz	0.46–0.8 fl oz		Lawns, parks, athletic fields

1: NR = Not registered

Green June beetles

Table 32. Insecticides registered to control Green June beetles in turfgrasses

Common name	Trade name	Product/A	Product/ 1,000 sq ft	Insecticide group	Comments
carbaryl	Carbaryl 4L	2.0–4.0 qt	1.5–3.0 fl oz	1A	Spot treatments only in residential turf
	Sevin SL	2.0–4.0 qt	1.5–3.0 fl oz		—
chlorantraniliprole	Acelepryn	8.0–26.0 fl oz	0.104–0.208 fl oz	28	—
	Acelepryn G	50–100 lb	1.15–2.3 lb		—
chlorpyrifos	Chlorpyrifos 4E AG	1.0 qt	0.75 fl oz	1B	Restricted use; sod farms only
	Dursban 50W-WSP	2.0 lb	—		Restricted use; sod farms only
	Govern 4E	1.0 qt	0.75 fl oz		Restricted use; sod farms only
	Hatchet	1.0 qt	0.75 fl oz		Restricted use; sod farms only
	Lorsban 4E	1.0 qt	0.75 fl oz		Restricted use; sod farms only
	Lorsban Advanced	1.0 qt	0.75 fl oz		Restricted use; sod farms only
	Nufarm Chlorpyrifos SPC 2	2.0 qt	1.5 fl oz		Restricted use: golf courses, industrial sites, road medians only
	Nufarm Chlorpyrifos SPC 4	1.0 qt	1.5–3.0 fl oz		Restricted use: golf courses, industrial sites, road medians only
	Vulcan	1.0 qt	0.75 fl oz		Restricted use: golf courses, industrial sites, road medians only
	Warhawk	2.0 pt	0.75 fl oz		Restricted use; sod farms only
	Whirlwind	1.0 qt	0.75 fl oz		Restricted use; sod farms only
	Yuma 4E	1.0 qt	0.75 fl oz		Restricted use; sod farms only
clothianidin + bifenthrin	Aloft GC G	80–160 lb	1.8–3.6 lb	4A and 3A	Restricted-use pesticide
	Aloft GC SC	11.65–23.3 fl oz	0.27–0.54 fl oz		Restricted-use pesticide
	Aloft LC G	80–160 lb	1.8–3.6 lb		Restricted use: NR ¹ for golf courses, sod farms
	Aloft LC SC	11.65–23.3 fl oz	0.27–0.54 fl oz		Restricted use: NR ¹ for golf courses, sod farms
	Aloft GC G	80–160 lb	1.8–3.6 lb		Restricted-use pesticide
cyantraniliprole	Ference	8–16 fl oz	0.184–0.367 fl oz	28	—
dinotefuran	Zylam Liquid	4.9 pt	1.8 fl oz	4A	Suppression only
	Zylam 20SG	2.7 lb	1.0 oz		—
imidacloprid	Amtide Imidacloprid 2F T&O	19.2–25.6 fl oz	0.45–0.6 fl oz	4A	—
	Criterion 0.5 G	60–80 lb	1.4–1.8 lb		NR ¹ for sod farms
	Criterion 2F	1.25–1.6 pt	0.46–0.6 fl oz		—
	Criterion 75WSP	—	1.6 oz (1 packet)/ 8,250–11,000 sq ft		—
	Malice 0.5G	50–80 lb	1.2–1.8 lb		NR ¹ for sod farms
	Malice 2F	1.25–1.6 pt	0.46–0.6 fl oz		NR ¹ for sod farms
	Malice 75 WSP	—	1.6 oz (1 packet)/ 8,250–11,000 sq ft		—
	Mallet 0.5G	60–80 lb	1.4–1.8 lb		NR ¹ for sod farms
	Mallet 2 F T&O	1.25–1.6 pt	0.46–0.6 fl oz		—
	Mallet 75 WSP	4–5.375 packets (6.4–8.6 oz)	1.6oz (1 packet)/ 8,250–11,000 sq ft		NR ¹ for sod farms
	Merit 0.5G	60–80 lb	1.4–1.8 lb		NR ¹ for sod farms
	Merit 2F	1.25–1.6 pt	0.46–0.6 fl oz		—
	Merit 75WP	6.4–8.6 oz	3–4 level tsp		—

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Table 32 continued. Insecticides registered to control Green June beetles in turfgrasses

Common name	Trade name	Product/A	Product/ 1,000 sq ft	Insecticide group	Comments
imidacloprid <i>cont.</i>	Merit 75 WSP	—	1.6 oz (1 packet)/ 8,250–11,000 sq ft	4A	—
	Pro-mate Merit 0.2%	150–200 lb	3.5–4.5 lb		—
	Prokoz Zenith 0.5 G	60–80 lb	1.4–1.8 lb		NR ¹ for sod farms
	Prokoz Zenith 2F	1.25–1.6 pt	0.46–0.6 fl oz		—
	Prokoz Zenith 75 WSP	—	1.6 oz (1 packet)/ 8,250–11,000 sq ft		—
imidacloprid + bifenthrin	Allectus G	100–125 lb	2.3–2.9 lb	4A and 3A	NR ¹ for golf courses, sod farms
	Allectus GC	100–125 lb	2.3–2.9 lb		Restricted use; golf courses, sod farms only
	Allectus GC SC	3.6–4.5 pt	1.32–1.65 fl oz		Restricted use; golf courses, sod farms only
	Allectus SC	3.6–4.5 pt	1.32–1.65 fl oz		NR ¹ for golf courses, sod farms
lambda-cyhalothrin	Demand G	131–176 lb	3.0–4.0 lb	3A	NR ¹ for golf courses, sod farms; suppression only
	Scimitar CS	10 fl oz	7 mL		NR ¹ for golf courses, sod farms
	Scimitar GC	10 fl oz	7 mL		Restricted use; suppression only
thiamethoxam	Meridian 0.33G	60–80 lb	7–9 lb/5,000 sq ft	4A	—
	Meridian 25 WG	12.7–17 oz	3–4 oz/10,000 sq ft		—
thiamethoxam + lambda-cyhalothrin	Tandem	See label	See label	4A and 3A	NR ¹ for sod farms
trichlorfon	Dylox 420 SL	300 fl oz	6.9 fl oz	1B	Golf courses, recreational turf, lawns only
	Dylox 6.2G	130 lb	3 lb		NR ¹ for sod farms
zeta-cypermethrin + bifenthrin + imidacloprid	Triple Crown Golf	20–35 fl oz	0.46–0.8 fl oz	3A and 4A	Golf courses only

1: NR = Not registered

Mealybugs

Table 33. Insecticides registered to control mealybugs in turfgrasses

Common name	Trade name	Product/A	Product/ 1,000 sq ft	Insecticide group	Comments
bifenthrin	Bifen 2 AG Gold	—	0.08–0.16 fl oz	3A	Restricted-use pesticide
	Brigade 2EC	3.5–7.0 fl oz	0.08–0.16 fl oz		Restricted use; sod farms only
	Bifen 2 AG Gold	—	0.08–0.16 fl oz		Restricted-use pesticide
	Brigade 2EC	3.5–7.0 fl oz	0.08–0.16 fl oz		Restricted use; sod farms only
	Fanfare ES	3.5–7.0 fl oz	0.08–0.16 fl oz		Restricted use; sod farms only
	Menace GC 7.9% Flowable	10–20 fl oz	0.25–0.5 fl oz		Restricted-use pesticide
	Sniper	3.5–7.0 fl oz	0.08–0.16 fl oz		Restricted-use pesticide
	Tailgunner	3.7–7.0 fl oz	0.08–0.16 fl oz		Restricted use; sod farms only
	Talstar GC	50–100 lb	1.5–2.3 lb		Restricted use; lawns, parks, athletic fields, sod farms, golf courses
	Talstar P	—	0.25–0.5 fl oz		Lawns, parks, athletic fields
	Talstar S Select	10–20 fl oz	0.25–0.5 fl oz		Restricted use; golf courses, sod farms only
	Up-Star GC	50–100 lb	1.15–2.3 lb		Restricted-use pesticide
	Up-Star Gold	—	0.25–0.5 fl oz		Lawns, parks, athletic fields
	Up-Star SC	0.25–0.5 fl oz	10–20 fl oz		Restricted-use pesticide
	Wisdom EZ	50–100 lb	1.15–2.3 lb		Lawns, parks, athletic fields
	Wisdom GC Granular	50–100 lb	1.15–2.3 lb		Restricted-use pesticide
	Wisdom Lawn Granular	50–100 lb	1.15–2.3 lb		Lawns, parks, athletic fields
	Wisdom TC Flowable	—	0.25–0.5 fl oz		Lawns, parks, athletic fields
bifenthrin + zeta-cypermethrin	Talstar XTRA GC	50–100 lb	1.15–2.3 lb	3A and 3A	Lawns, parks, athletic fields
deltamethrin	Deltagard G	87–131 lb	2.0–3.0 lb	3A	NR ¹ for golf courses, sod farms
	Deltagard GC	87–131 lb	2.0–3.0 lb		Restricted-use pesticide
	Deltagard GC SSC	17.5–26 fl oz	0.4–0.6 fl oz		Restricted-use pesticide
	Deltagard T&O	87–131 lb	2.0–3.0 lb		NR ¹ for golf courses, sod farms
	Deltagard T&O SSC	17.5–25.6 fl oz	0.4–0.6 fl oz		NR ¹ for sod farms
	Suspend SC	17.5–26 fl oz	0.4–0.6 fl oz		NR ¹ for sod farms
	Suspend SC	17.5–26 fl oz	0.4–0.6 fl oz		NR ¹ for sod farms
imidacloprid + bifenthrin	Allectus G	75–125 lb	1.7–2.9 lb	4A and 3A	NR ¹ for golf courses, sod farms
	Allectus GC	75–125 lb	1.7–2.9 lb		Restricted use; golf courses, sod farms only
	Allectus GC SC	2.3–4.5 pt	0.9–1.65 fl oz		Restricted use; golf courses, sod farms only
	Allectus SC	1.1–4.5 pt	0.4–1.65 fl oz		NR ¹ for golf courses, sod farms
zeta-cypermethrin	Mustang	3.0–4.3 oz	—	3A	Restricted use; sod farms only
	Mustang Max/Maxx	2.8–4.0 oz	—		Restricted use; sod farms only
zeta-cypermethrin + bifenthrin + imidacloprid	Triple Crown Golf	10–20 fl oz	0.23–0.46 fl oz	3A and 4A	Golf courses only
	Triple Crown T&O	10–20 fl oz	0.23–0.46 fl oz		Lawns, parks, athletic fields

1: NR = Not registered

Mites

Table 34. Insecticides registered to control mites (see label for specific species) in turfgrasses

Common name	Trade name	Product/A	Product/ 1,000 sq ft	Insecticide group	Comments
bifenthrin	Bifen 2 AG Gold	—	0.08–0.16 fl oz	3A	Restricted-use pesticide
	Brigade 2EC	3.5–7.0 fl oz	0.08–0.16 fl oz		Restricted use; sod farms only
	Capture LFR	4.35–8.7 fl oz	0.1–0.2 fl oz		Restricted use; sod farms only
	Fanfare ES	3.5–7.0 fl oz	0.08–0.16 fl oz		Restricted use; sod farms only
	Menace GC 7.9% Flowable	10–20 fl oz	0.25–0.5 fl oz		Restricted-use pesticide
	Pro-Mate Bifenthrin	—	0.25–0.5 fl oz		—
	Sniper	3.5–7.0 fl oz	0.08–0.16 fl oz		Restricted-use pesticide
	Tailgunner	3.7–7.0 fl oz	0.08–0.16 fl oz		Restricted use; sod farms only
	Talstar P	—	0.25–0.5 fl oz		Lawns, parks, athletic fields
	Talstar S Select	10–20 fl oz	0.25–0.5 fl oz		Restricted use; golf courses, sod farms only
	Up-Star SC	10–20 fl oz	0.25–0.5 fl oz		Restricted-use pesticide
	Wisdom Flowable	10–20 fl oz	0.23–0.46 fl oz		Restricted use pesticide
	Wisdom TC Flowable	—	0.25–0.5 fl oz		Lawns, parks, athletic fields
chlorpyrifos	Chlorpyrifos 4E AG	1.0 qt.	0.75 fl oz	1B	Restricted use; sod farms only
	Dursban 50W-WSP	2.0 lb	—		Restricted use; sod farms only
	Govern 4E	1.0 qt	0.75 fl oz		Restricted use; sod farms only
	Hatchet	1.0 qt	0.75 fl oz		Restricted use; sod farms only
	Lorsban 4E	1.0 qt	0.75 fl oz		Restricted use; sod farms only
	Lorsban Advanced	1.0 qt	0.75 fl oz		Restricted use; sod farms only
	Nufarm Chlorpyrifos SPC 2	1.0 qt	1.5 fl oz		Restricted use; golf courses, industrial sites, road medians only
	Nufarm Chlorpyrifos SPC 4	1.0 qt	0.75 fl oz		Restricted use; golf courses, industrial sites, road medians only
	Vulcan	1.0 qt	0.75 fl oz		Restricted use; golf courses, industrial sites, road medians only
	Warhawk	2.0 pt	0.75 fl oz		Restricted use; sod farms only
	Whirlwind	1.0 qt	0.75 fl oz		Restricted use; sod farms only
	Yuma 4E	1.0 qt	0.75 fl oz		Restricted use; sod farms only
deltamethrin	Deltagard G	87–131 lb	2.0–3.0 lb	3A	NR ¹ for golf courses, sod farms
	Deltagard GC	87–131 lb	2.0–3.0 lb		Restricted-use pesticide
	Deltagard GC 5SC	26–39 fl oz	0.6–0.9 fl oz		Restricted use; suppression only
	Deltagard T&O	87–131 lb	2.0–3.0 lb		NR ¹ for golf courses, sod farms
	Deltagard T&O 5SC	26–39 fl oz	0.6–0.9 fl oz		NR ¹ for sod farms; suppression only
	Suspend SC	26–39 fl oz	0.6–0.9 fl oz		NR ¹ for sod farms; suppression only
dicofol	Dicofol 4-E Miticide	0.66–1 pt	0.33 or 2 tsp	UN	Sod farms only
imidacloprid + bifenthrin	Allectus GC SC	2.3–4.5 pt	0.9–1.65 fl oz	4A and 3A	Restricted use; golf courses, sod farms only
	Allectus SC	1.1–4.5 pt	0.4–1.65 fl oz		NR ¹ for golf courses, sod farms
lambda-cyhalothrin	Demand G	88–131 lb	2.0–3.0 lb	3A	NR ¹ for golf courses, sod farms
	Nufarm Lambda-Cyhalothrin 1 EC	See label	See label		Restricted-use pesticide
	Scimitar CS	5.0–10 fl oz	3.4–7 mL		NR ¹ for golf courses, sod farms
	Scimitar GC	5.0–10 fl oz	3.4–7 mL		Restricted-use pesticide
zeta-cypermethrin + bifenthrin + imidacloprid	Triple Crown Golf	10–20 fl oz	0.23–0.46 fl oz	3A and 4A	Golf courses only
	Triple Crown T&O	10–20 fl oz	0.23–0.46 fl oz		Lawns, parks, athletic fields

1: NR = Not registered

Mole crickets

Table 35. Insecticides registered to control mole crickets in turfgrasses

Common name	Trade name	Product/A	Product/ 1,000 sq ft	Insecticide group	Comments
acephate	Acephate 90 Prill	2.3–4.3 lb	0.8–1.6 oz	1B	Golf courses, sod farms only
	Acephate 90 WDG	2.22–4.44 lb	0.8–1.6 oz		Golf courses only
	Acephate 97	2.2–4 lb	0.8–1.4 oz		Golf courses, sod farms only
	Acephate 97UP	2.2–4 lb	0.8–1.4 oz		Golf courses, sod farms only
	Bracket 90 WDG	2.22–4.44 lb	0.8–1.6 oz		Golf courses only
	Bracket 97	2.2–4.0 lb	0.8–1.4 oz		Golf courses, sod farms only
	Orthene-T, T&O Spray 97	2.5–4.0 lb	0.9–1.5 oz		Golf courses, sod farms only
	Orthene-T, T&O WSP	2.66–5.33 lb	1.0–2.0 oz		Golf courses, sod farms only
bifenthrin	Bifen 2 AG Gold	—	0.16–0.32 fl oz	3A	Restricted-use pesticide
	Brigade 2EC	7.0–14.0 fl oz	0.16–0.32 fl oz		Restricted use; sod farms only
	Capture LFR	8.7–17.42 fl oz	0.2–0.4 fl oz		—
	Fanfare ES	7.0–14.0 fl oz	0.16–0.32 fl oz		Restricted use; sod farms only
	Menace GC 7.9% Flowable	10–40 fl oz	0.25–1.0 fl oz		Restricted-use pesticide
	Pro-Mate Bifenthrin	—	0.5–1.0 fl oz		—
	Sniper	7.0–14.0 fl oz	0.16–0.32 fl oz		Restricted-use pesticide
	Tailgunner	7.0–14.0 fl oz	0.16–0.32 fl oz		Restricted use; sod farms only
	Talstar GC	100–200 lb	2.3–4.6 lb		Restricted use; lawns, parks, athletic fields, sod farms, golf courses
	Talstar P	—	0.5–1 fl oz		Lawns, parks, athletic fields
	Talstar S Select	10–20 fl oz; large infestations: 40 fl oz	0.25–0.5 fl oz; large infestations: 1 fl oz		Restricted use; golf courses, sod farms only
	Up-Star GC	100–200 lb	2.3–4.6 lb		Restricted-use pesticide
	Up-Star Gold	—	0.5–1.0 fl oz		Lawns, parks, athletic fields
	Up-Star SC	0.25–0.5 fl oz	10–20 fl oz		Restricted-use pesticide
	Wisdom EZ	100–200 lb	2.3–4.6 lb		Lawns, parks, athletic fields
	Wisdom Flowable	10–20 oz	0.23–0.46 fl oz		Restricted-use pesticide
	Wisdom GC Granular	100–200 lb	2.3–4.6 lb		Restricted-use pesticide
	Wisdom Lawn Granular	100–200 lb	2.3–4.6 lb		Lawns, parks, athletic fields
	Wisdom TC Flowable	—	0.5–1 fl oz		Lawns, parks, athletic fields
bifenthrin + zeta- cypermethrin	Talstar XTRA GC	100–200 lb	2.3–4.6 lb	3A and 3A	Lawns, parks, athletic fields
chlorpyrifos	Chlorpyrifos 4E AG	2.0 qt	1.5 fl oz	1B	Restricted use; sod farms only
	Dursban 50W-WSP	2–4 lb	—		Restricted use; sod farms only
	Govern 4E	2.0 qt	1.5 fl oz		Restricted use; sod farms only
	Hatchet	2.0 qt	1.5 fl oz		Restricted use; sod farms only
	Lorsban 4E	2.0 qt	1.5 fl oz		Restricted use; sod farms only
	Lorsban Advanced	2.0 qt	1.5 fl oz		Restricted use; sod farms only
	Nufarm Chlorpyrifos SPC 2	2.0 qt	1.5 fl oz		Restricted use; golf courses, industrial sites, road medians only
	Nufarm Chlorpyrifos SPC 4	1.0 qt	1.5 fl oz		Restricted use; golf courses, industrial sites, road medians only

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Table 35 continued. Insecticides registered to control mole crickets in turfgrasses

Common name	Trade name	Product/A	Product/ 1,000 sq ft	Insecticide group	Comments
chlorpyrifos <i>cont.</i>	Vulcan	2.0 qt	1.5 fl oz	1B	Restricted use; golf courses, industrial sites, road medians only
	Warhawk	4.0 pt	1.5 fl oz		Restricted use; sod farms only
	Whirlwind	2.0 qt	1.5 fl oz		Restricted use; sod farms only
	Yuma 4E	2.0 qt	1.5 fl oz		Restricted use; sod farms only
clothianidin + bifenthrin	Aloft GC G	80–160 lb	1.8–3.6 lb	4A and 3A	Restricted-use pesticide
	Aloft GC SC	11.65–23.3 fl oz	0.27–0.54 fl oz		Restricted-use pesticide
	Aloft LC G	80–160 lb	1.8–3.6 lb		Restricted use; NR ¹ for golf courses, sod farms
	Aloft LC SC	11.65–23.3 fl oz	0.27–0.54 fl oz		Restricted use; NR ¹ for golf courses, sod farms
cyfluthrin	Tempo 20 WP-GC	—	See label	3A	Restricted-use pesticide
	Tempo SC Ultra	12 fl oz	0.27 fl oz		Landscape and recreational turf only: NR ¹ for golf courses, sod farms
	Tempo Ultra WP	15.4 oz	10 g		Landscape and recreational turf only: NR ¹ for golf courses, sod farms
	Tempo Ultra WSP	—	See label		Landscape and recreational turf only: NR ¹ for golf courses, sod farms
deltamethrin	Deltagard G	—	2.0–3.0 lb	3A	NR ¹ for golf courses, sod farms
	Deltagard GC	—	2.0–3.0 lb		Restricted-use pesticide
	Deltagard GC 5SC	26–39 fl oz	0.6–0.9 fl oz		Restricted-use pesticide
	Deltagard T&O	—	2.0–3.0 lb		NR ¹ for golf courses, sod farms
	Deltagard T&O 5SC	26–39 fl oz	0.6–0.9 fl oz		NR ¹ for sod farms
	Suspend SC	26–39 fl oz	0.6–0.9 fl oz		NR ¹ for sod farms
dinotefuran	Zylam Liquid	4.9 pt	1.8 fl oz	4A	—
	Zylam 20SG	2.7 lb	1.0 oz		—
fipronil	Chipco Choice	12.5–25 lb	4.6–9.4 oz	2B	Restricted use; Apply using slit-placement application equipment
	Topchoice	87	2		—
imidacloprid	Amtide Imidacloprid 2F T&O	25.6 fl oz	0.6 fl oz	4A	—
	Criterion 0.5 G	80 lb	1.8 lb		NR ¹ for sod farms
	Criterion 2F	1.6 pt	0.6 fl oz		—
	Criterion 75WSP	—	1.6 oz/8,250 sq ft		—
imidacloprid	Malice 0.5G	80 lb	1.8 lb	4A	NR ¹ for sod farms
	Malice 2F	1.6 pt	0.6 fl oz		NR ¹ for sod farms
	Malice 75 WSP	—	1.6 oz/8,250 sq ft		—
	Mallet 0.5G	80 lb	1.8 lb		NR ¹ for sod farms
	Mallet 2 F T&O	1.6 pt	0.60 fl oz		—
	Mallet 75 WSP	5.375 packets (8.6 oz)	1.6 oz/8,250 sq ft		NR ¹ for sod farms
	Merit 0.5G	80 lb	1.8 lb		NR ¹ for sod farms
	Merit 2F	1.6 pt	0.6 fl oz		—
	Merit 75WP	8.6 oz	4 level tsp		—
	Merit 75WSP	—	1.6 oz/8,250 sq ft		—
	Pro-mate Merit 0.2%	200 lb	4.5 lb		—
	Prokoz Zenith 0.5 G	80 lb	1.8 lb		NR ¹ for sod farms

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Table 35 continued. Insecticides registered to control mole crickets in turfgrasses

Common name	Trade name	Product/A	Product/ 1,000 sq ft	Insecticide group	Comments
imidacloprid <i>cont.</i>	Prokoz Zenith 2F	1.6 pt	0.6 fl oz	4A	—
	Prokoz Zenith 75 WSP	—	1.6 oz/8,250 sq ft		—
imidacloprid + bifenthrin	Allectus G	125 lb	2.9 lb	4A and 3A	NR ¹ for golf courses, sod farms
	Allectus GC	125 lb	2.9 lb		Restricted use; golf courses, sod farms only
	Allectus GC SC	3.6–4.5 pt	1.32–1.65 fl oz		Restricted use; golf courses, sod farms only
	Allectus SC	3.6–4.5 pt	1.32–1.65 fl oz		NR ¹ for golf courses, sod farms
indoxacarb	Provaunt	12 oz	0.275 oz	22A	NR ¹ for sod farms
	Advion Insect Granule	50–200 lb	1.15–4.6 lb		NR ¹ for sod farms
lambda-cyhalothrin	Demand G	131–176 lb	3.0–4.0 lb	3A	NR ¹ for golf courses, sod farms
	Nufarm Lambda-Cyhalothrin 1 EC	—	See label		Restricted-use pesticide
	Scimitar CS	10 fl oz	7 mL		NR ¹ for golf courses, sod farms
	Scimitar GC	10 fl oz	7 mL		Restricted-use pesticide
permethrin	Permethrin 3.2 EC	—	0.4–0.8 fl oz	3A	Restricted-use pesticide
	Perm-Up 3.2 EC	—	0.4–0.8 fl oz		Restricted-use pesticide
thiamethoxam	Meridian 25 WG	12.7–17 oz	3.0–4.0 oz/ 10,000 sq ft	4A	Suppression only
	Meridian 0.33G	60–80 lb	7–9 lb/5,000 sq ft		—
thiamethoxam + lambda-cyhalothrin	Tandem	See label	See label	4A and 3A	NR ¹ for sod farms
trichlorfon	Dylox 420 SL	300 fl oz	6.9 fl oz	1B	Golf courses, recreational turf, lawns only
	Dylox 6.2G	130 lb	3 lb		NR ¹ for sod farms
zeta-cypermethrin + bifenthrin + imidacloprid	Triple Crown Golf	20–35 fl oz	0.46–0.8 fl oz	3A and 4A	Golf courses only
	Triple Crown T&O	20–35 fl oz	0.46–0.8 fl oz		Lawns, parks, athletic fields

1: NR = Not registered

Red imported fire ants

Table 36. Insecticides registered to control red imported fire ants in turfgrasses

Common name	Trade name	Product/A	Product/ 1,000 sq ft	Insecticide group	Comments
abamectin	Award II	1.0 lb	—	6	NR ¹ for sod farms; IMT ²
	Optigard Fire Ant Bait	1.0 lb	—	6	IMT ² ; see label
acephate	Acephate 90 Prill	See label	See label	1B	IMT ² ; see label
	Acephate 90-SP	See label	See label		IMT ² ; see label
	Acephate 97	See label	See label		IMT ² ; see label
	Acephate 97 UP	See label	See label		IMT ² ; see label
	Bracket 97	See label	See label		IMT ² ; see label
	Orthene-T, T&O Spray 97	See label	See label		IMT ² ; see label
	Orthene-T, T&O WSP	See label	See label		IMT ² ; see label
bifenthrin	Bifen 2 AG Gold	—	0.16–0.32 fl oz	3A	Restricted use; IMT ² ; see label
	Brigade 2EC	7.0–14.0 fl oz	0.16–0.32 fl oz		Restricted use; sod farms only; IMT ² ; see label
	Capture LFR	8.7–17.42 fl oz	0.2–0.4 fl oz		Restricted use; sod farms only; IMT ² ; see label
	Fanfare ES	7.0–14.0 fl oz	0.16–0.32 fl oz		Restricted use; IMT ² ; see label
	Menace GC 7.9% Flowable	40 fl oz	0.5 fl oz		Restricted use; sod farms only; IMT ² ; see label
	Pro-Mate Bifenthrin	—	—		IMT ² ; see label
	Sniper	7.0–14.0 fl oz	0.16–0.32 fl oz		Restricted use; IMT ² ; see label
	Tailgunner	7.0–14.0 fl oz	0.16–0.32 fl oz		Restricted use; sod farms only; IMT ² ; see label
	Talstar GC	100–200 lb	2.3–4.6 lb		Restricted use; lawns, parks, athletic fields, sod farms, golf courses
	Talstar P	—	0.5–1 fl oz		Lawns, parks, athletic fields; IMT ² ; see label
	Talstar S Select	10–20 fl oz; large infestations: 40 fl oz	0.25–0.5 fl oz; large infestations: 1 fl oz		Restricted use; golf courses, sod farms only; IMT ² ; see label
	Up-Star GC	100–200 lb	2.3–4.6 lb		Restricted-use pesticide
	Up-Star Gold	—	1.0 fl oz		Lawns, parks, athletic fields; IMT ² ; see label
	Up-Star SC	0.5 fl oz	20 fl oz		Restricted use; IMT ² ; see label
	Wisdom EZ	100–200 lb	2.3–4.6 lb		Lawns, parks, athletic fields
	Wisdom Flowable	20–40 oz	0.46–0.92 fl oz		Restricted-use pesticide
	Wisdom GC Granular	100–200 lb	2.3–4.6 lb		Restricted-use pesticide
	Wisdom Lawn Granular	100–200 lb	2.3–4.6 lb		Lawns, parks, athletic fields
	Wisdom TC Flowable	—	0.5–1 fl oz		Lawns, parks, athletic fields
bifenthrin + zeta-cypermethrin	Talstar XTRA GC	100–200 lb	2.3–4.6 lb	3A and 3A	Lawns, parks, athletic fields
carbaryl	Carbaryl 4L	See label	See label	1A	Spot treatments only in residential turf
	Sevin SL	See label	See label		IMT ² ; see label

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Table 36 continued. Insecticides registered to control red imported fire ants in turfgrasses

Common name	Trade name	Product/A	Product/ 1,000 sq ft	Insecticide group	Comments
chlorpyrifos	Nufarm Chlorpyrifos SPC 2	2.0 qt	1.5 fl oz	1B	Restricted use; golf courses, industrial sites, road medians only; IMT ² ; see label
	Nufarm Chlorpyrifos SPC 4	1.0 qt	—		Restricted use; golf courses, road medians, industrial sites only; IMT ² ; see label
clothianidin + bifenthrin	Aloft GC SC	Control: 20 fl oz; suppression: 14.4 fl oz	Control: 0.46 fl oz; suppression: 0.33 fl oz	4A and 3A	Restricted use; IMT ² ; see label
	Aloft LC SC	Control: 20 fl oz; suppression: 14.4 fl oz	Control: 0.46 fl oz; suppression: 0.33 fl oz		Restricted use; NR ¹ for golf courses, sod farms; IMT ² ; see label
cyfluthrin	Tempo 20 WP-GC	—	See label	3A	Restricted use; aids in control only
	Tempo SC Ultra	12 fl oz	0.27 fl oz		Landscape and recreational turf only: NR ¹ for golf courses, sod farms; aids in control only
	Tempo Ultra WP	15.4 oz	10 g		Landscape and recreational turf only: NR ¹ for golf courses, sod farms; aids in control only
	Tempo Ultra WSP	—	See label		Landscape and recreational turf only: NR ¹ for golf courses, sod farms; aids in control only
deltamethrin	DeltaGard G	87–131 lb	2.0–3.0 lb	3A	NR ¹ for golf courses, sod farms; IMT ² ; see label
	DeltaGard GC	87–131 lb	2.0–3.0 lb		Restricted-use pesticide
	DeltaGard GC 5SC				Restricted use; IMT ² ; see label
	DeltaGard T&O	87–131 lb	2.0–3.0 lb		NR ¹ for golf courses, sod farms; IMT ² ; see label
	DeltaGard T&O 5SC	—	—		NR ¹ for sod farms; IMT ² ; see label
	Suspend SC	—	—		NR ¹ for sod farms; IMT ² ; see label
fenoxycarb	Award	1.0–1.5 lb	—	7B	IMT ² ; see label
fipronil	Chipco Choice	12.5–25 lb	4.6–9.4 oz	2B	Restricted use; apply using slit-placement application equipment; Can only be used in USDA APHIS fire ant quarantine areas
	Maxforce FC Fire Ant Bait	1.5–5.0 lb	0.5–1.83 oz		IMT ² ; see label
	Topchoice	87 lb	2 lb		—
hydramethylnon	Amdro Pro	1.0–1.5 lb	2.0–3.0 oz	20A	IMT ² ; see label
imidacloprid + bifenthrin	Allectus G	125 lb	2.9 lb	4A and 3A	NR ¹ for golf courses, sod farms
	Allectus GC	125 lb	2.9 lb		Restricted use; golf courses, sod farms only
	Allectus GC SC	3.6–4.5 pt	1.32–1.65 fl oz		Restricted use; golf courses, sod farms only
	Allectus SC	3.6–4.5 pt	1.32–1.65 fl oz		NR ¹ for golf courses, sod farms
indoxacarb	Advion Fire Ant Bait	1.5 lb	0.5 oz	22A	NR ¹ for sod farms; IMT ² ; see label
lambda-cyhalothrin	Nufarm Lambda-Cyhalothrin 1 EC	—	—	3A	Restricted use; IMT ² ; see label
	Scimitar CS	5.0–10 fl oz	3.4–7 mL		NR ¹ for golf courses, sod farms; IMT ² ; see label
	Scimitar GC	5.0–10 fl oz	3.4–7 mL		Restricted-use pesticide

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Table 36 continued. Insecticides registered to control red imported fire ants in turfgrasses

Common name	Trade name	Product/A	Product/ 1,000 sq ft	Insecticide group	Comments
metaflumizone	Siesta	1.0–1.5 lb	2.0–3.0 oz/ 5,000 sq ft	22B	Lawns, parks, golf courses, sod farms, others
permethrin	Permethrin 3.2 EC	—	0.4–0.8 fl oz	3A	Restricted-use pesticide
	Perm-Up 3.2 EC	—	0.4–0.8 fl oz		Restricted-use pesticide
pyriproxyfen	Distance Fire Ant Bait	1.0–1.5 lb	0.35–0.5 oz	7C	IMT ² ; see label
(S)-methoprene	Extinguish	1.0–1.5 lb	3.5 tbl	7A	IMT ² ; see label
	Extinguish Plus	1.5 lb			IMT ² ; see label
spinosad	Conserve SC	See label	See label	5	IMT ² ; see label
	Entrust/Entrust SC	See label	See label		IMT ² ; see label
thiamethoxam	Meridian 25WG	—	—	4A	IMT ² ; see label
	Meridian 0.33G	—	—		IMT ² ; see label
thiamethoxam + lambda-cyhalothrin	Tandem	See label	See label	4A and 3A	NR ¹ for sod farms; IMT ² ; see label
zeta-cypermethrin + bifenthrin + imidacloprid	Triple Crown Golf	20–35 fl oz	0.46–0.8 fl oz	3A and 4A	Golf courses only
	Triple Crown T&O	20–35 fl oz	0.46–0.8 fl oz		Lawns, parks, athletic fields

1: R = not registered

2: IMT = individual mound treatment

Sod webworms

Table 37. Insecticides registered to control sod webworms in turfgrasses

Common name	Trade name	Product/A	Product/ 1,000 sq ft	Insecticide group	Comments
acephate	Acephate 90 Prill	1.1–2.3 lb	0.4–0.8 oz	1B	Golf courses, sod farms only
	Acephate 90 WDG Insecticide	1.11–2.22 lb	0.4–0.8 oz		Golf courses only
	Acephate 97	1.0–2.2 lb	0.4–0.8 oz		Golf courses, sod farms only
	Acephate 97UP	1.0–2.2 lb	0.4–0.8 oz		Golf courses, sod farms only
	Bracket 90 WDG	1.11–2.22 lb	0.4–0.8 oz		Golf courses only
	Bracket 97	1.0–2.2 lb	0.4–0.8 oz		Golf courses, sod farms only
	Orthene-T, T&O Spray 97	1.0–2.0 lb	0.4–0.8 oz		Golf courses, sod farms only
	Orthene-T, T&O WSP	1.33–2.66 lb	0.5–1 oz		Golf courses, sod farms only
bifenthrin	Bifen 2 AG Gold	—	0.05–0.08 fl oz	3A	Restricted-use pesticide
	Brigade 2EC	2.2–3.5 fl oz	0.05–0.08 fl oz		Restricted use; sod farms only
	Capture LFR	2.8–4.35 fl oz	0.066–0.1 fl oz		Restricted use; sod farms only
	Fanfare ES	2.2–3.5 fl oz	0.05–0.08 fl oz		Restricted use; sod farms only
	Menace GC 7.9% Flowable	10 fl oz	0.25 fl oz		Restricted-use pesticide
	Pro-Mate Bifenthrin	—	0.18–0.25 fl oz		—
	Sniper	2.2–3.5 fl oz	0.05–0.08 fl oz		Restricted-use pesticide
	Tailgunner	2.2–3.5 fl oz	0.05–0.08 fl oz		Restricted use; sod farms only
	Talstar GC	50 lb	1.15 lb		Restricted use; lawns, parks, athletic fields, sod farms, golf courses

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Table 37 continued. Insecticides registered to control sod webworms in turfgrasses

Common name	Trade name	Product/A	Product/ 1,000 sq ft	Insecticide group	Comments
bifenthrin <i>cont.</i>	Talstar P	—	0.18–0.25 fl oz	3A	Lawns, parks, athletic fields
	Talstar S Select	10 fl oz	0.25 fl oz		Restricted use; golf courses, sod farms only
	Up-Star GC	50 lb	1.15 lb		Restricted-use pesticide
	Up-Star Gold	—	0.18–0.25 fl oz		Lawns, parks, athletic fields
	Up-Star SC	0.25 fl oz	10 fl oz		Restricted-use pesticide
	Wisdom EZ	50 lb	1.15 lb		Lawns, parks, athletic fields
	Wisdom Flowable	10–20 oz	0.23–0.46 fl oz		Restricted-use pesticide
	Wisdom GC Granular	50 lb	1.15 lb		Restricted-use pesticide
	Wisdom Lawn Granular	50 lb	1.15 lb		Lawns, parks, athletic fields
	Wisdom TC Flowable	—	0.18–0.25 fl oz		Lawns, parks, athletic fields
bifenthrin + zeta-cypermethrin	Talstar XTRA GC	50–100 lb	1.15–2.3 lb	3A and 3A	Lawns, parks, athletic fields
carbaryl	Carbaryl 4L	6.0–8.0 qt	4.4–6.0 fl oz	1A	Spot treatments only in residential turf
	Sevin SL	6.0–8.0 qt	4.4–6.0 fl oz		—
chlorantraniliprole	Acelepryn	2.0–4.0 fl oz	0.046–0.092 fl oz	28	—
	Acelepryn G	50–100 lb	1.15–2.3 lb		—
chlorpyrifos	Chlorpyrifos 4E AG	1.0 qt	0.75 fl oz	1B	Restricted use; sod farms only
	Dursban 50W-WSP	2.0 lb	—		Restricted use; sod farms only
	Govern 4E	1.0 qt	0.75 fl oz		Restricted use; sod farms only
	Hatchet	1.0 qt	0.75 fl oz		Restricted use; sod farms only
	Lorsban 4E	1.0 qt	0.75 fl oz		Restricted use; sod farms only
	Lorsban Advanced	1.0 qt	0.75 fl oz		Restricted use; sod farms only
	Nufarm Chlorpyrifos SPC 2	2.0 qt	1.5 fl oz		Restricted use; golf courses, industrial sites, road medians only
	Nufarm Chlorpyrifos SPC 4	1.0 qt	0.75 fl oz		Restricted use; golf courses, industrial sites, road medians only
	Vulcan	1.0 qt	0.75 fl oz		Restricted use; golf courses, industrial sites, road medians only
	Warhawk	2.0 pt	0.75 fl oz		Restricted use; sod farms only
	Whirlwind	1.0 qt	0.75 fl oz		Restricted use; sod farms only
	Yuma 4E	1.0 qt	0.75 fl oz		Restricted use; sod farms only
clothianidin + bifenthrin	Aloft GC G	80–160 lb	1.8–3.6 lb	4A and 3A	Restricted-use pesticide
	Aloft GC SC	11.65–23.3 fl oz	0.27–0.54 fl oz		Restricted-use pesticide
	Aloft LC G	80–160 lb	1.8–3.6 lb		Restricted use; NR ¹ for golf courses, sod farms
	Aloft LC SC	11.65–23.3 fl oz	0.27–0.54 fl oz		Restricted use; NR ¹ for golf courses, sod farms
cyfluthrin	Tempo 20 WP-GC	—	See label	3A	Restricted-use pesticide
	Tempo SC Ultra	6.0–12 fl oz	0.135–0.270 fl oz		Landscape and recreational turf only; NR ¹ for golf courses, sod farms
	Tempo Ultra WP	7.7–15.4 oz	5–10 g		Landscape and recreational turf only; NR ¹ for golf courses, sod farms
	Tempo Ultra WSP	—	See label		Landscape and recreational turf only; NR ¹ for golf courses, sod farms
cyantraniliprole	Ference	2–16 fl oz	0.046–0.367 fl oz	28	—

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Table 37 continued. Insecticides registered to control sod webworms in turfgrasses

Common name	Trade name	Product/A	Product/ 1,000 sq ft	Insecticide group	Comments
deltamethrin	Deltagard G	87–131 lb	2.0–3.0 lb	3A	NR ¹ for golf courses, sod farms
	Deltagard GC	87–131 lb	2.0–3.0 lb		Restricted-use pesticide
	Deltagard GC 5SC	8.75–17.5 fl oz	0.2–0.4 fl oz		Restricted-use pesticide
	Deltagard T&O	87–131 lb	2.0–3.0 lb		NR ¹ for golf courses, sod farms
	Deltagard T&O 5SC	8.75–17.5 fl oz	0.2–0.4 fl oz		NR ¹ for sod farms
	Suspend SC	17.5–26 fl oz	0.4–0.6 fl oz		NR ¹ for sod farms
dinotefuran	Zylam Liquid	4.9 pt	1.8 fl oz	4A	—
	Zylam 20SG	2.7 lb	1.0 oz		—
imidacloprid + bifenthrin	Allectus G	50–125 lb	1.2–2.9 lb	4A and 3A	NR ¹ for golf courses, sod farms
	Allectus GC	50–125 lb	1.1–2.9 lb		Restricted use; golf courses, sod farms only
	Allectus GC SC	1.8–4.5 pt	0.67–1.65 fl oz		Restricted use; golf courses, sod farms only
	Allectus SC	1.1–4.5 pt	0.4–1.65 fl oz		NR ¹ for golf courses, sod farms
indoxacarb	Provaunt	2.0–4.0 oz	0.046–0.092 oz	22A	NR ¹ for sod farms
lambda-cyhalothrin	Demand G	88–131 lb	2.0–3.0 lb	3A	NR ¹ for golf courses, sod farms
	Nufarm Lambda-Cyhalothrin 1 EC	—	See label		Restricted-use pesticide
	Scimitar CS	5.0–10 fl oz	3.4–7 mL		NR ¹ for golf courses, sod farms
	Scimitar GC	5.0–10 fl oz	3.4–7 mL		Restricted-use pesticide
methomyl	Annihilate LV Insecticide	3.0 pt	1.1 fl oz	1A	Restricted use; sod farms only
	Annihilate SP Insecticide	1.0 lb	0.4 oz		Restricted use; sod farms only
	Lannate LV Insecticide	3.0 pt	1.1 fl oz		Restricted use; sod farms only
	Lannate SP	1.0 lb	0.4 oz		Restricted use; sod farms only
permethrin	Permethrin 3.2 EC	—	0.4–0.8 fl oz	3A	Restricted-use pesticide
	Perm-Up 3.2 EC	—	0.4–0.8 fl oz		Restricted-use pesticide
spinosad	Conserve SC	10 fl oz	0.25 fl oz	5	—
	Blackhawk	1.1–2.2 oz	—		Sod farms only
	Tracer	1.0–2.0 fl oz	—		Sod farms only
thiamethoxam	Meridian 25 WG	12.7–17 oz	3.0–4.0 oz/ 10,000 sq ft	4A	—
	Meridian 0.33G	60–80 lb	7–9 lb/5,000 sq ft		—
thiamethoxam + lambda-cyhalothrin	Tandem	See label	See label	4A and 3A	NR ¹ for sod farms
trichlorfon	Dylox 420 SL	200–300	4.6–6.9 fl oz	1B	Golf courses, recreational turf, lawns only
	Dylox 6.2G	87 lb	2 lb		NR ¹ for sod farms
zeta-cypermethrin	Mustang	3.0–4.3 oz	—	3A	Restricted use; sod farms only
	Mustang Max/Maxx	2.24–4.0 oz	—		Restricted use; sod farms only
zeta-cypermethrin + bifenthrin + imidacloprid	Triple Crown Golf	10–15 fl oz	0.23–0.34 fl oz	3A and 4A	Golf courses only
	Triple Crown T&O	20–35 fl oz	0.46–0.8 fl oz		Lawns, parks, athletic fields

1: NR = Not registered

White grubs

Table 38. Insecticides registered to control white grubs in turfgrasses

Common name	Trade name	Product/A	Product/ 1,000 sq ft	Insecticide group	Comments
carbaryl	Carbaryl 4L	8.0 qt	6.0 fl oz	1A	Spot treatments only in residential turf
	Sevin SL	8.0 qt	6.0 fl oz		—
chlorantraniliprole	Acelepryn	8.0–16 fl oz	0.184–0.367 fl oz	28	—
	Acelepryn G	50–100 lb	1.15–2.3 lb		—
chlorpyrifos	Chlorpyrifos 4E AG	2.0–4.0 qt	1.5–3.0 fl oz	1B	Restricted use; sod farms only
	Dursban 50W-WSP	2.0–4.0 qt	—		Restricted use; sod farms only
	Govern 4E	2.0–4.0 qt	1.5–3.0 fl oz		Restricted use; sod farms only
	Hatchet	2.0–4.0 qt	1.5–3.0 fl oz		Restricted use; sod farms only
	Lorsban 4E	2.0–4.0 qt	1.5–3.0 fl oz		Restricted use; sod farms only
	Lorsban Advanced	2.0–4.0 qt	1.5–3.0 fl oz		Restricted use; sod farms only
	Nufarm Chlorpyrifos SPC 2	2.0 qt	1.5 fl oz		Restricted use: golf courses, industrial sites, road medians only
	Nufarm Chlorpyrifos SPC 4	1.0 qt	1.5–3.0 fl oz		Restricted use: golf courses, industrial sites, road medians only
	Vulcan	1.0 qt	1.5–3.0 fl oz		Restricted use: golf courses, industrial sites, road medians only
	Warhawk	4.0 pt	1.5 fl oz		Restricted use; sod farms only
	Whirlwind	2.0–4.0 qt	1.5–3.0 fl oz		Restricted use; sod farms only
	Yuma 4E	2.0–4.0 qt	1.5–3.0 fl oz		Restricted use; sod farms only
clothianidin + bifenthrin	Aloft GC G	80–160 lb	1.8–3.6 lb	4A and 3A	Restricted-use pesticide
	Aloft GC SC	11.65–23.3 fl oz	0.27–0.54 fl oz		Restricted-use pesticide
	Aloft LC G	80–160 lb	1.8–3.6 lb		Restricted use; NR ¹ for golf courses, sod farms
	Aloft LC SC	11.65–23.3 fl oz	0.27–0.54 fl oz		Restricted use; NR ¹ for golf courses, sod farms
cyantraniliprole	Ference	8–16 fl oz	0.184–0.367 fl oz	28	—
dinotefuran	Zylam 20SG	2.7 lb	1.0 oz	4A	—
	Zylam Liquid	4.9 pt	1.8 fl oz		Suppression only
imidacloprid	Amtide Imidacloprid 2F T&O	19.2–25.6 fl oz	0.45–0.6 fl oz	4A	—
	Criterion 0.5 G	60–80 lb	1.4–1.8 lb		NR ¹ for sod farms
	Criterion 2F	1.25–1.6 pt	0.46–0.6 fl oz		—
	Criterion 75WSP	—	1.6 oz (1 packet)/ 8,250–11,000 sq ft		—
	Malice 0.5G	50–80 lb	1.2–1.8 lb		NR ¹ for sod farms
	Malice 2F	1.25–1.6 pt	0.46–0.6 fl oz		NR ¹ for sod farms
	Malice 75 WSP	—	1.6 oz (1 packet)/ 8,250–11,000 sq ft		—
	Mallet 0.5G	60–80 lb	1.4–1.8 lb		NR ¹ for sod farms
	Mallet 2 F T&O	1.25–1.6 pt	0.46–0.6 fl oz		—
	Mallet 75 WSP	4–5.375 packets (6.4–8.6 oz)	1 packet (1.6oz)/ 8,250–11,000 sq ft		NR ¹ for sod farms
	Merit 0.5G	60–80 lb	1.4–1.8 lb		NR ¹ for sod farms
	Merit 2F	1.25–1.6 pt	0.46–0.6 fl oz		—
	Merit 75WP	6.4–8.6 oz	3–4 level teaspoons		—

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Table 38 continued. Insecticides registered to control white grubs in turfgrasses

Common name	Trade name	Product/A	Product/ 1,000 sq ft	Insecticide group	Comments
imidacloprid <i>cont.</i>	Merit 75WSP	—	1.6 oz (1 packet)/ 8,250–11,000 sq ft	4A	—
	Pro-mate Merit 0.2%	150–200 lb	3.5–4.5 lb		—
	Prokoz Zenith 0.5 G	60–80 lb	1.4–1.8 lb		NR ¹ for sod farms
	Prokoz Zenith 2F	1.25–1.6 pt	0.46–0.6 fl oz		—
	Prokoz Zenith 75 WSP	—	1.6 oz (1 packet)/ 8,250–11,000 sq ft		—
imidacloprid + bifenthrin	Allectus G	100–125 lb	2.3–2.9 lb	4A and 3A	NR ¹ for golf courses, sod farms
	Allectus GC	100–125 lb	2.3–2.9 lb		Restricted use; golf courses, sod farms only
	Allectus GC SC	3.6–4.5 pt	1.32–1.65 fl oz		Restricted use; golf courses, sod farms only
	Allectus SC	3.6–4.5 pt	1.32–1.65 fl oz		NR ¹ for golf courses, sod farms
lambda-cyhalothrin	Demand G	131–176 lb	3–4 lb	3A	NR ¹ for golf courses, sod farms; Suppression only
	Nufarm Lambda- Cyhalothrin 1 EC	—	See label		Restricted-use pesticide
	Scimitar CS	10 fl oz	7 mL		NR ¹ for golf courses, sod farms; Suppression only
	Scimitar GC	10 fl oz	7 mL		Restricted use; suppression only
thiamethoxam	Meridian 25 WG	12.7–17 oz	3–4 oz/10,000 sq ft	4A	—
	Meridian 0.33G	60–80 lb	7–9 lb/5,000 sq ft		—
trichlorfon	Dylox 420 SL	300 fl oz	6.9 fl oz	1B	Golf courses, recreational turf, lawns only
	Dylox 6.2G	130 lb	3 lb		NR ¹ for sod farms
thiamethoxam + lambda-cyhalothrin	Tandem	See label	See label	4A and 3A	NR ¹ for sod farms
zeta-cypermethrin + bifenthrin + imidacloprid	Triple Crown Golf	20–35 fl oz	0.46–0.8 fl oz	3A and 4A	Golf courses only
	Triple Crown T&O	20–35 fl oz	0.46–0.8 fl oz		Lawns, parks, athletic fields

1: NR = not registered

Diseases in Texas turfgrasses

Turfgrass diseases occur when a disease-causing microorganism (pathogen) infects a plant, giving all or part of the plant an abnormal appearance. Turfgrasses are often most vulnerable to infection when continuously exposed to environmental stresses caused by improper management, adverse weather, poor drainage, etc., so it is important to understand the cause(s) of turfgrass diseases before treating them. One way to reduce the potential for disease pressure is through cultural management strategies that promote healthy turfgrass growth. These practices include proper irrigation, adequate drainage, balanced fertility

according to soil test results, proper mowing, etc.

However, even when following proper management practices, fungicides are often still recommended and/or required for protecting high-value turf. In these cases, accurate diagnosis of causal agents and timing of the application with proper fungicides are critical. The Texas Plant Disease Diagnostic Laboratory can identify causal agents for turfgrass diseases and can be found at plantclinic.tamu.edu. Always consult the fungicide label for information regarding application timing, rate, length of residual control, etc.

Table 39. Diseases in turfgrass production and management¹

Disease	Causal agent	Occurrence
Anthraxnose	<i>Colletotrichum graminicola</i>	Occasional
Brown patch (cool-season turf)	<i>Rhizoctonia solani</i>	Common
Dollar spot	<i>Sclerotinia homoeocarpa</i>	Common
Fairy ring	Basidiomycetes	Common
Grey leaf spot	<i>Pyricularia grisea</i>	Common
Large patch (warm-season turf)	<i>Rhizoctonia solani</i>	Common
Leaf spots	Various types and causal agents	Common
Leaf and sheath spot	<i>Rhizoctonia zea</i>	Occasional
Microdochium patch	<i>Microdochium nivale</i>	Common
Pythium diseases	<i>Pythium</i> spp.	Common
Root decline/take-all root rot/take-all patch	<i>Gaeumannomyces graminis</i> var. <i>graminis</i>	Common
Spring dead spot	<i>Ophiosphaerella herpotrica</i> & <i>O. korrae</i>	Occasional
Summer patch	<i>Magnaporthe poae</i>	Occasional
Thatch collapse disease	<i>Sphaerobolus stellatus</i>	Occasional

¹: These diseases were identified by the Southern IPM Pest Management Working Group in a meeting held in College Station, TX on October 23rd, 2014.

Fungicide Mode of Action (MOA) classification

Table 40. Mode of action classifications of fungicides registered for use in turfgrasses (Source: FRAC)

FRAC code	Mode of action (MOA) ¹	Group	Common name
1	β-tubulin assembly	Benzimidazole (MBC)	thiophanate-methyl
2	Signal transduction	Dicarboximide	iprodione vinclozolin
3	Sterol biosynthesis	Demethylation Inhibitor (DMI)	difenoconazole fenarimol metconazole myclobutanil propiconazole tebuconazole triadimefon triticonazole
4	RNA polymerase	Phenylamide	mefenoxam
7	Respiration	Carboximide (SDHI)	boscalid flutolanil fluxapyroxad penthiopyrad fluopyram
11	Respiration	Strobilurin (Qol)	azoxystrobin fluoxastrobin pyraclostrobin trifloxystrobin mandestrobin
12	Signal transduction	Phenylpyrrole	fludioxonil
14	Lipid peroxidation	Aromatic hydrocarbon	chloroneb etridiazol (ethazole) PCNB
19	Chitin synthase	Polyoxin	polyoxin D zinc
21	Respiration	Quinone inside inhibitors (Qil)	cyazofamid
28	Membrane permeability	Carbamate	propamocarb
29	Respiration	Unknown	fluazinam
33	Unknown	Phosphonate	fosetyl-aluminum (Al) (aluminum tris) potassium phosphite
43	Delocalization of spectrin-like proteins	Benzamides	fluopicolide
M3	Multisite contact	Dithiocarbamate	maneb thiram mancozeb
M5	Multisite contact	Chloronitrile	chlorothalonil
P1	Host plant defense induction	Benzothiadiazole (BTH)	acibenzolar-S-methyl

1: Rotate modes of action when possible to minimize the risk of resistance development
For more information on fungicide chemistry and modes of action, see www.FRAC.info.

Fungicides registered for use in turfgrasses

Anthracnose

Table 41. Fungicides registered to control anthracnose (*Collectotrichum cerealis*) in turfgrasses

Common name	Trade name	Product/ 1,000 sq ft ¹	Application interval (days)	FRAC code
azoxystrobin	Heritage	0.2–0.4	14–28	Strobilurin (QoI, FRAC# 11)
	Heritage TL	1–2	14–28	
	Heritage G	2–4	14–28	
	Strobe 2L	0.38–0.77	14–28	
	Strobe 50WG	0.2–0.4	14–28	
azoxystrobin + acibenzolar-S-methyl	Heritage Action	0.2–0.4	14–28	Strobilurin (QoI, FRAC# 11) BTH (FRAC# P1)
azoxystrobin + chlorothalonil	Renown	2.5	7–10	Strobilurin (QoI, FRAC# 11)
		4.5	14–21	Chloronitrile (FRAC# M5)
azoxystrobin + difenoconazole	Briskway	0.3–0.725	14	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
azoxystrobin + propiconazole	Headway	1.5–3	14–28	Strobilurin (QoI, FRAC# 11)
	Headway G	2–2.5	14	DMI (FRAC# 3)
azoxystrobin + tebuconazole	Strobe T	0.75–1.5	14–21	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
chlorothalonil	Daconil Ultrex	2.75–5.03	7–14	Chloronitrile (FRAC# M5)
	Daconil Weather Stik	3–5.5	7–14	
	Daconil Zn	4.4–8	7–14	
	Echo 720	3.6–5.5	7–14	
	Echo Ultimate	3.25–5	7–14	
	Echo Zn	5	7–14	
	Chlorothalonil 720	3–5.5	7–14	
	Chlorothalonil 82.5 WDG	1.8–5	7–14	
	Chlorothalonil 500ZN	3–7.9	7–14	
	Chlorothalonil 720SFT	2.12–5.5	7–14	
	Chlorothalonil DF	5–8.8	7–14	
	Pegasus 6L	3.6–5.5	7–14	
	Pegasus DF	3.25–5	7–14	
	Pegasus DFX	3.25–5	7–14	
	Pegasus HPX	3.6–5.5	7–14	
chlorothalonil + acibenzolar-S-methyl	Daconil Action	3–3.6	7–14	Chloronitrile (FRAC# M5)
		3.6–5.4	14	BTH (FRAC# P1)
chlorothalonil + fluoxastrobin	Disarm C	3–5.9	14–28	Chloronitrile (FRAC# M5)
chlorothalonil + iprodione + thiophanate-methyl + tebuconazole	Enclave	3–4	14–21	Chloronitrile (FRAC# M5)
		7–8	28	Dicarboximide (FRAC# 2) MBC (FRAC# 1) DMI (FRAC# 3)
chlorothalonil + propiconazole	Concert	4.5–5.5	7–14	Chloronitrile (FRAC# M5)
		5.5–8.5	14–28	DMI (FRAC# 3)
chlorothalonil + propiconazole + fludioxonil	Instrata	2.75–6	14–28	Chloronitrile (FRAC# M5) DMI (FRAC# 3) Phenylpyrrole (FRAC# 12)

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Table 41 continued. Fungicides registered to control anthracnose (*Collectotrichum cerealis*) in turfgrasses

Common name	Trade name	Product/ 1,000 sq ft ¹	Application interval (days)	FRAC code
chlorothalonil + thiophanate-methyl	Peregrine	4–8	14	Chloronitrile (FRAC# M5) MBC (FRAC# 1)
	Spectro	3–5.76	14	
	TM/C	2–6	14–21	
fluazinam	Secure	0.5	14	FRAC# 29
fludioxonil	Medallion	0.25–0.5	14	Phenylpyrrole (FRAC# 12)
	Medallion SC	1–2	14	
fluoxastrobin	Disarm 480SC	0.18–0.36	14–28	Strobilurin (QoI, FRAC# 11)
	Disarm G	2.3–4.6	14–28	
	Fame	0.18–0.36	14–28	
fluopyram + trifloxystrobin	Exteris	2.135–6	14–28	SDHI (FRAC# 7) Strobilurin (QoI, FRAC# 11)
fluoxastrobin + myclobutanil	Disarm M	0.25–1	14–28	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
fluxapyroxad + pyraclostrobin	Lexicon	0.34–0.47	14–28	SDHI (FRAC# 7) Strobilurin (QoI, FRAC# 11)
fosetyl-Al	Autograph	4.6–9.2	14–21	Phosphonate (FRAC# 33)
	Fosetyl-Al	4–8	14–21	
	Signature	4–8	14–21	
	Viceroy	4.6–9.1	14–21	
iprodione	26GT	4–8	14	Dicarboximide (FRAC# 2)
	Chipco 26019 FLO	4–8	14–28	
	Iprodione Pro	4–8	14–28	
	Ipro 2SE	4–8	14–28	
	Ipro 2	4–8	14–28	
	Raven	4–8	30	
iprodione +thiophanate-methyl	26/36	2–4	14–21	Dicarboximide (FRAC# 2) MBC (FRAC# 1)
	Dovetail	1–4	14–21	
iprodione + trifloxystrobin	Interface	4–7	14	Dicarboximide (FRAC# 2) Strobilurin (QoI, FRAC# 11)
	Interface Stressgard	4–7	14	
metconazole	Tourney	0.28–0.37	14–21	DMI (FRAC# 3)
myclobutanil	Eagle	1.2	14–21	DMI (FRAC# 3)
	Myclobutanil	1.2	14–21	
	Siskin	1.2	14–21	
PCNB	Autilus	5–6	7–10	Aromatic hydrocarbon (FRAC# 14)
PCNB + tebuconazole	Oreon	6–8	14–28	Aromatic hydrocarbon (FRAC# 14) DMI (FRAC# 3)
penthiopyrad	Velista	0.3–0.5	14	SDHI (FRAC# 7)
polyoxin D	Affirm	0.88	7–14	Polyoxin (FRAC# 19)
	Endorse	4	7–14	
potassium phosphite	Appear	4–8	14	Phosphate (FRAC# 33)
propiconazole	Banner MAXX	1–2	14–28	DMI (FRAC# 3)
	Kestrel	1–2	14–28	
	Kestrel MEX	1–2	14–28	
	Propiconazole	1–2	14–28	
	Savvi	1–2	14–28	
	Strider	1–2	14–28	
pyraclostrobin	Insignia	0.5–0.9	14–28	Strobilurin (QoI, FRAC# 11)
	Insignia SC	0.4–0.7	14–28	
pyraclostrobin + boscalid	Honor	0.55–1.1	14–28	Strobilurin (QoI, FRAC# 11) SDHI (FRAC# 7)
pyraclostrobin + triticonazole	Pillar G	3	14–28	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)

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Table 41 continued. Fungicides registered to control anthracnose (*Collectotrichum cerealis*) in turfgrasses

Common name	Trade name	Product/ 1,000 sq ft ¹	Application interval (days)	FRAC code
tebuconazole	Torque	0.6	28	DMI (FRAC# 3)
	Tebuconazole	0.6	28	
	Skylark	0.6	28	
	Mirage Stressgard	1–2	14–28	
thiophanate-methyl	3336 DG Lite	3–9	14	MBC (FRAC# 1)
	3336 EG	2–6	14	
	3336 F	2–6	14	
	3336 Plus	2–8	14–28	
	3336 WP	2–6	14	
	TtoBird 4.5L	1–2	14	
	TtoBird 85WDG	0.67–1.3	14	
	TM 462	2–5.3	14	
	TM 4.5	2–5.3	14	
	TM 85WDG	1.2–3.6	14	
triademefon	Bayleton 50	1	30–45	DMI (FRAC# 3)
	Bayleton FLO	1	30–45	
triadimefon + trifloxystrobin	Armada	0.6–1.2	14–28	DMI (FRAC# 3)
	Tartan	1–2	14–28	Strobilurin (QoI, FRAC# 11)
trifloxystrobin	Compass	0.15–0.25	14–21	Strobilurin (QoI, FRAC# 11)
triticonazole	Trinity	0.5–1	14–28	DMI (FRAC# 3)
	Triton FLO	0.41–1.1	14–28	
	Triton 70WDG	0.15–0.225	14–28	

1: Product amounts represented in fl oz for liquid products and oz for granular products

Brown patch

Table 42. Fungicides registered to control brown patch (*Rhizoctonia solani*) in turfgrasses

Common name	Trade name	Product/ 1,000 sq ft ¹	Application interval (days)	FRAC code
azoxystrobin	Heritage	0.2–0.4	14–28	Strobilurin (QoI, FRAC# 11)
	Heritage TL	1–2	14–28	
	Heritage G	2–4	14–28	
	Strobe 2L	0.38–0.77	14–28	
	Strobe 50WG	0.2–0.4	14–28	
azoxystrobin + acibenzolar-S-methyl	Heritage Action	0.2–0.4	14–28	Strobilurin (QoI, FRAC# 11) BTH (FRAC# P1)
azoxystrobin + chlorothalonil	Renown	2.5	14	Strobilurin (QoI, FRAC# 11)
		4.5	14–21	Chloronitrile (FRAC# M5)
azoxystrobin + difenoconazole	Briskway	0.3–0.725	14–28	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
azoxystrobin + propiconazole	Headway	0.75–1.5	14	Strobilurin (QoI, FRAC# 11)
		1.5–3	14–28	DMI (FRAC# 3)
	Headway G	2–2.5	14	
		3.5–4	28	
azoxystrobin + tebuconazole	Strobe T	0.75–1.5	14–21	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
chloroneb	Teremec SP	3–4	10	Aromatic hydrocarbon (FRAC# 14)
	Teremec SP 2.9F	5–7	7–10	
chlorothalonil	Daconil Ultrex	1.8–3.25	7–14	Chloronitrile (FRAC# M5)
	Daconil Weather Stik	2–5.5	7–14	
	Daconil Zn	3–8	7–14	

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Table 42 continued. Fungicides registered to control brown patch (*Rhizoctonia solani*) in turfgrasses

Common name	Trade name	Product/ 1,000 sq ft ¹	Application interval (days)	FRAC code
chlorothalonil <i>cont.</i>	Echo 720	2–3.6	7–14	Chloronitrile (FRAC# M5)
	Echo Ultimate	1.82–3.25	7–14	
	Echo Zn	3–5	7–14	
	Chlorothalonil 720	2–3.6	7–14	
	Chlorothalonil 82.5 WDG	1.8–5	7–14	
	Chlorothalonil 500ZN	3–7.9	7–14	
	Chlorothalonil 720SFT	2.12–5.5	7–14	
	Chlorothalonil DF	1.8–3.2	7–14	
	Pegasus 6L	3.6–5.5	7–14	
	Pegasus DFX	1.82–3.25	7–14	
	Pegasus HPX	2–3.6	7–14	
chlorothalonil + acibenzolar-S-methyl	Daconil Action	2–3.5	7–14	Chloronitrile (FRAC# M5)
		4–5.4	14	BTH (FRAC# P1)
chlorothalonil + fluoxastrobin	Disarm C	1.5–5.9	14–28	Chloronitrile (FRAC# M5) Strobilurin (QoI, FRAC# 11)
chlorothalonil + iprodione + thiophanate-methyl + tebuconazole	Enclave	3–4	14–21	Chloronitrile (FRAC# M5)
		7–8	28	Dicarboximide (FRAC# 2)
				MBC (FRAC# 1) DMI (FRAC# 3)
chlorothalonil + propiconazole	Concert	3–5.5	7–14	Chloronitrile (FRAC# M5)
		5.5–8.5	14–28	DMI (FRAC# 3)
chlorothalonil + propiconazole + fludioxonil	Instrata	2.75–6	14–21	Chloronitrile (FRAC# M5) DMI (FRAC# 3) Phenylpyrrole (FRAC# 12)
chlorothalonil + thiophanate-methyl	Peregrine	4–8	14	Chloronitrile (FRAC# M5) MBC (FRAC# 1)
	Spectro	3–5.76	14–21	
	TM/C	2–6	14–21	
fenarimol	Rubigan	1.5	7–14	DMI (FRAC# 3)
fluazinam	Secure	0.5	14	FRAC# 29
fludioxonil	Medallion	0.2–0.5	7–14	Phenylpyrrole (FRAC# 12)
	Medallion SC	0.75–2	7–14	
fluoxastrobin	Disarm 480SC	0.09–0.36	14–28	Strobilurin (QoI, FRAC# 11)
	Disarm G	1.2–4.6	14–28	
	Fame	0.09–0.36	14–28	
fluopyram + trifloxystrobin	Exteris	2.135–6	14–28	SDHI (FRAC# 7) Strobilurin (QoI, FRAC# 11)
fluoxastrobin + myclobutanil	Disarm M	0.25–1	14–28	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
flutolanil	Prostar	1.5–3	14–21	SDHI (FRAC# 7)
fluxapyroxad	Xzemplar	0.21–0.26	14–21	SDHI (FRAC# 7)
fluxapyroxad + pyraclostrobin	Lexicon	0.34–0.47	14–28	SDHI (FRAC# 7) Strobilurin (QoI, FRAC# 11)
iprodione	26GT	3–4	14–28	Dicarboximide (FRAC# 2)
	Chipco 26019 FLO	3–4	14–28	
	Iprodione Pro	2–4	14–28	
	Iprodione SPC	3–4	30	
	Ipro 2SE	3–4	14–28	
	Ipro 2	3–4	14–28	
	Raven	3–4	30	
iprodione + thiophanate-methyl	26/36	2–4	14–21	Dicarboximide (FRAC# 2) MBC (FRAC# 1)
	Dovetail	1–4	14–21	
iprodione + trifloxystrobin	Interface	3–5	14–28	Dicarboximide (FRAC# 2) Strobilurin (QoI, FRAC# 11)
	Interface Stressgard	3–5	14–28	

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Table 42 continued. Fungicides registered to control brown patch (*Rhizoctonia solani*) in turfgrasses

Common name	Trade name	Product/ 1,000 sq ft ¹	Application interval (days)	FRAC code
mancozeb	Fore	4	7	Dithiocarbamate (FRAC# M3)
	Dithane	4	10	
	Protect	4	7–14	
mandestrobin	Pinpoint	0.31	14	Strobilurin (QoI, FRAC# 11)
metconazole	Tourney	0.28–0.37	14–21	DMI (FRAC# 3)
myclobutanil	Eagle	1.2	14–21	DMI (FRAC# 3)
	Myclobutanil	1.2	14–21	
	Siskin	1.2	14–21	
PCNB	Turfcide 10G	2–2.5	7–10	Aromatic hydrocarbon (FRAC# 14)
	Turfcide 400	5–6	7–10	
PCNB + tebuconazole	Oreon	6–8	14–28	Aromatic hydrocarbon (FRAC# 14) DMI (FRAC# 3)
penthiopyrad	Velista	0.3–0.5	14–21	SDHI (FRAC# 7)
polyoxin D	Affirm	0.88	7–14	Polyoxin (FRAC# 19)
	Endorse	4	7–14	
propiconazole	Banner MAXX	1–2	14–28	DMI (FRAC# 3)
	Kestrel	1–2	14–28	
	Kestrel MEX	1–2	14–28	
	Propiconazole	1–2	14–28	
	Savvi	1–2	14–28	
	Strider	1–2	14–28	
pyraclostrobin	Insignia	0.5–0.9	14–28	Strobilurin (QoI, FRAC# 11)
	Insignia SC	0.4–0.7	14–28	
pyraclostrobin + boscalid	Honor	0.55–1.1	14–28	Strobilurin (QoI, FRAC# 11) SDHI (FRAC# 7)
pyraclostrobin + triticonazole	Pillar G	3	14–28	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
tebuconazole	Torque	0.6	28	DMI (FRAC# 3)
	Tebuconazole	0.6	28	
	Skylark	0.6	28	
	Siskin	1.2	14–21	
	Mirage Stressgard	1–2	14–28	
thiophanate-methyl	3336 DG Lite	1.5–6	14	MBC (FRAC# 1)
	3336 EG	2–4	14	
	3336 F	2–4	14	
	3336 Plus	2–8	14–28	
	3336 WP	2–6	14	
	TtoBird 4.5L	1–2	14	
	TtoBird 85WDG	0.67–1.3	14	
	TM 462	2–3.5	14	
	TM 4.5	2–3.5	14	
	TM 85WDG	1.2–2.4	14	
triademefon	Bayleton 50	0.5–1	15–30	DMI (FRAC# 3)
	Bayleton FLO	0.5–1	15–30	
triadimefon + trifloxystrobin	Armada	0.6–1.2	14–28	DMI (FRAC# 3)
	Tartan	1–2	14–28	Strobilurin (QoI, FRAC# 11)
trifloxystrobin	Compass	0.15–0.25	14–21	Strobilurin (QoI, FRAC# 11)
triticonazole	Trinity	0.5–1	14–28	DMI (FRAC# 3)
	Triton FLO	0.41–1.1	14–28	
	Triton 70WDG	0.15–0.6	14–28	
vinclozolin	Curalan	1	14–28	Dicarboximide (FRAC# 2)
	Touche	1	14–28	

1: Product amounts in fl oz for liquid products and oz for granular products

Dollar spot

Table 43. Fungicides registered to control dollar spot (*Sclerotinia homoeocarpa*) in turfgrasses

Common name	Trade name	Product/ 1,000 sq ft ¹	Application interval (days)	FRAC code
azoxystrobin + chlorothalonil	Renown	2.5–4.5	7–14	Strobilurin (QoI, FRAC# 11) Chloronitrile (FRAC# M5)
azoxystrobin + difenoconazole	Briskway	0.3–0.725	14–21	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
azoxystrobin + propiconazole	Headway	0.75–1.5	14–21	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
		1.5–3	7–14	
	Headway G	2–2.5	14	
		3.5–4	28	
azoxystrobin + tebuconazole	Strobe T	0.75–1.5	14–21	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
boscalid	Emerald	0.18	14	SDHI (FRAC# 7)
chlorothalonil	Daconil Ultrex	1–5.03	7–21	Chloronitrile (FRAC# M5)
	Daconil Weather Stik	1–5.5	7–21	
	Daconil Zn	1.5–8	7–21	
	Chlorothalonil 720	1–3.6	7–21	
	Chlorothalonil 82.5 WDG	1–5	7–21	
	Chlorothalonil 500ZN	3–7.9	7–14	
	Chlorothalonil 720SFT	2.12–5.5	7–14	
	Chlorothalonil DF	0.9–3.2	7–21	
	Echo 720	2–3.6	7–14	
	Echo Ultimate	1.82–3.25	7–14	
	Echo Zn	3–5	7–14	
	Pegasus 6L	3.6–5.5	7–14	
	Pegasus DFX	1.82–3.25	7–14	
	Pegasus HPX	3.6–5.5	7–14	
chlorothalonil + acibenzolar-S-methyl	Daconil Action	1–2	7–10	Chloronitrile (FRAC# M5) BTH (FRAC# P1)
		2–3.5	7–21	
		4–5.4	14	
chlorothalonil + fluoxastrobin	Disarm C	3–5.9	14–21	Chloronitrile (FRAC# M5) Strobilurin (QoI, FRAC# 11)
chlorothalonil + iprodione + thiophanate-methyl + tebuconazole	Enclave	3–4	14–21	Chloronitrile (FRAC# M5) Dicarboximide (FRAC# 2) MBC (FRAC# 1) DMI (FRAC# 3)
		7–8	28	
chlorothalonil + propiconazole	Concert	1.5–3	7–10	Chloronitrile (FRAC# M5) DMI (FRAC# 3)
		3–5.5	14–21	
		5.5–8.5	14–28	
chlorothalonil + propiconazole + fludioxonil	Instrata	2.75–7	21–28	Chloronitrile (FRAC# M5) DMI (FRAC# 3) Phenylpyrrole (FRAC# 12)
chlorothalonil + thiophanate-methyl	Peregrine	4–8	14	Chloronitrile (FRAC# M5) MBC (FRAC# 1)
	Spectro	3.72–5.76	14–21	
	TM/C	2–6	14–21	
fenarimol	Rubigan	0.75–1.5	10–28	DMI (FRAC# 3)
fluazinam	Secure	0.5	14	FRAC# 29
fluopyram + trifloxystrobin	Exteris	1.5–4.135	7–28	SDHI (FRAC# 7) Strobilurin (QoI, FRAC# 11)
fluoxastrobin	Fame	0.18–0.36	14–21	Strobilurin (QoI, FRAC# 11)
fluoxastrobin + myclobutanil	Disarm M	0.25–1	14–21	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
fluxapyroxad	Xzemplar	0.16–0.26	14–28	SDHI (FRAC# 7)

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Table 43 continued. Fungicides registered to control dollar spot (*Sclerotinia homoeocarpa*) in turfgrasses

Common name	Trade name	Product/ 1,000 sq ft ¹	Application interval (days)	FRAC code
fluxapyroxad + pyraclostrobin	Lexicon	0.34–0.47	14–28	SDHI (FRAC# 7) Strobilurin (QoI, FRAC# 11)
iprodione	26GT	2–4	14–28	Dicarboximide (FRAC# 2)
	Chipco 26019 FLO	2–4	14–28	
	Iprodione Pro	3–4	14–28	
	Iprodione SPC	2–4	30	
	Ipro 2SE	2–4	14–28	
	Ipro 2	2–4	14–28	
	Raven	2–4	30	
iprodione + thiophanate-methyl	26/36	2–4	14–21	Dicarboximide (FRAC# 2) MBC (FRAC# 1)
	Dovetail	1–4	14–21	
iprodione + trifloxystrobin	Interface	3–5	14–28	Dicarboximide (FRAC# 2) Strobilurin (QoI, FRAC# 11)
	Interface Stressgard	3–5	14–28	
mancozeb	Fore	6–8	7–14	Dithiocarbamate (FRAC# M3)
	Dithane	6–8	10	
	Pentathlon DF	6–8	7–14	
	Pentathlon LF	10–14	7–14	
	Protect	6–8	7–14	
	Wingman	6–8	7–14	
	Wingman 4L	9.6–12.8	7–14	
mandestrobin	Pinpoint	0.17–0.31	14–21	Strobilurin (QoI, FRAC# 11)
metconazole	Tourney	0.18–0.37	14–21	DMI (FRAC# 3)
myclobutanil	Eagle	0.5–2.4	7–28	DMI (FRAC# 3)
	Myclobutanil	0.5–2.4	7–28	
	Siskin	0.5–2.4	7–28	
PCNB	Turfcide 10G	5–7.5	21–28	Aromatic hydrocarbon (FRAC# 14)
	Turfcide 400	11–16	21–28	
PCNB + tebuconazole	Oreon	6–8	14–28	Aromatic hydrocarbon (FRAC# 14) DMI (FRAC# 3)
penthiopyrad	Velista	0.3–0.5	14–21	SDHI (FRAC# 7)
propiconazole	Banner MAXX	0.5–2	7–28	DMI (FRAC# 3)
	Kestrel	0.5–2	7–28	
	Kestrel MEX	0.5–2	7–28	
	Propiconazole	0.5–2	7–28	
	Savvi	0.5–2	7–28	
	Strider	0.5–2	7–28	
pyraclostrobin + boscalid	Honor	0.83–1.1	14–21	Strobilurin (QoI, FRAC# 11) SDHI (FRAC# 7)
pyraclostrobin + triticonazole	Pillar G	3	14–28	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
tebuconazole	Torque	0.6	28	DMI (FRAC# 3)
	Tebuconazole	0.6	28	
	Skylark	0.6	28	
	Mirage Stressgard	1–2	14–28	
thiophanate-methyl	3336 DG Lite	1.5–6	14	MBC (FRAC# 1)
	3336 EG	2–4	14	
	3336 F	2–4	14	
	3336 Plus	2–4	14–28	
	3336 WP	2–4	14	
	TtoBird 4.5L	1–2	14	
	TtoBird 85WDG	0.67–1.3	14	
	TM 462	2–3.5	14	
	TM 4.5	2–3.5	14	
	TM 85WDG	1.2–2.4	14	

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Table 43 continued. Fungicides registered to control dollar spot (*Sclerotinia homoeocarpa*) in turfgrasses

Common name	Trade name	Product/ 1,000 sq ft ¹	Application interval (days)	FRAC code
thiram	Spotrete	3.75–7.5	3–10	Dithiocarbamate (FRAC# M3)
triademefon	Bayleton 50	0.25–1	14–30	DMI (FRAC# 3)
	Bayleton FLO	0.25–1	14–30	
triadimefon + trifloxystrobin	Armada	0.6–1.2	14–28	DMI (FRAC# 3)
	Tartan	1–2	14–28	Strobilurin (QoI, FRAC# 11)
	Tartan Stressgard	1–2	14–28	
triticonazole	Trinity	1–2	14–28	DMI (FRAC# 3)
	Triton FLO	0.28–1.1	14–28	
	Triton 70WDG	0.15–0.3	14–28	
vinclozolin	Curalan	1	14–28	Dicarboximide (FRAC# 2)
	Touche	1	21–28	

1: Product amounts in fl oz for liquid products and oz for granular products

Fairy ring

Table 44. Fungicides registered to control fairy ring (*Basidiomycetes*) in turfgrasses

Common name	Trade name	Product/ 1,000 sq ft ¹	Application interval (days)	FRAC code
azoxystrobin	Heritage	0.4	28	Strobilurin (QoI, FRAC# 11)
	Heritage TL	2	28	
	Heritage G	2–4	14–28	
	Strobe 50WG	0.4	28	
azoxystrobin + acibenzolar-S-methyl	Heritage Action	0.4	28	Strobilurin (QoI, FRAC# 11) BTH (FRAC# P1)
azoxystrobin + difenoconazole	Briskway	0.5–0.725	14–28	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
azoxystrobin + propiconazole	Headway	1.5–3	14–28	Strobilurin (QoI, FRAC# 11)
	Headway G	2–2.5	14	DMI (FRAC# 3)
		3.5–4	28	
azoxystrobin + tebuconazole	Strobe T	0.75–1.5	28	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
chlorothalonil + fluoxastrobin	Disarm C	4.5–5.9	21–28	DMI (FRAC# 3)
fluoxastrobin	Disarm 480SC	0.28–0.36	21–28	Strobilurin (QoI, FRAC# 11)
	Disarm G	2.3–4.6	28	
	Fame	0.28–0.36	21–28	
fluoxastrobin + myclobutanil	Disarm M	0.5–1	21–28	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
flutolanil	Prostar	2.2–4.5	21–30	SDHI (FRAC# 7)
fluxapyroxad + pyraclostrobin	Lexicon	0.47	28	SDHI (FRAC# 7)
				Strobilurin (QoI, FRAC# 11)
mandestrobin	Pinpoint	0.31	14	Strobilurin (QoI, FRAC# 11)
metconazole	Tourney	0.37	21	DMI (FRAC# 3)
penthiopyrad	Velista	0.5–0.7	14–28	SDHI (FRAC# 7)
polyoxin D	Affirm	1	7	Polyoxin (FRAC# 19)
	Endorse	4	7	
pyraclostrobin + triticonazole	Pillar G	3	14–28	Strobilurin (QoI, FRAC# 11)
pyraclostrobin + boscalid	Honor	1.1	28	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
pyraclostrobin + trifloxystrobin	Pillar G	3	14–28	Strobilurin (QoI, FRAC# 11)
tebuconazole	Mirage Stressgard	1–2	28	DMI (FRAC# 3)
triadimefon + trifloxystrobin	Tartan	1–2	14–28	DMI (FRAC# 3)
	Tartan Stressgard	1–2	14–28	Strobilurin (QoI, FRAC# 11)

1: Product amounts in fl oz for liquid products and oz for granular products

Gray leaf spot

Table 45. Fungicides registered to control gray leaf spot (*Pyricularia grisea*) in turfgrasses

Common name	Trade name	Product/ 1,000 sq ft ¹	Application interval (days)	FRAC code
azoxystrobin	Heritage	0.2–0.4	14–28	Strobilurin (QoI, FRAC# 11)
	Heritage TL	1–2	14–28	
	Heritage G	2–4	14–28	
	Strobe 2L	0.38–0.77	14–28	
	Strobe 50WG	0.2–0.4	14–28	
azoxystrobin + acibenzolar-S-methyl	Heritage Action	0.2–0.4	14–28	Strobilurin (QoI, FRAC# 11) BTH (FRAC# P1)
azoxystrobin + chlorothalonil	Renown	2.5–4.5	10–14	Strobilurin (QoI, FRAC# 11) Chloronitrile (FRAC# M5)
azoxystrobin + difenoconazole	Briskway	0.5–0.725	14–21	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
azoxystrobin + propiconazole	Headway	1.5–3	14–28	Strobilurin (QoI, FRAC# 11)
	Headway G	2–2.5	14	DMI (FRAC# 3)
		3.5–4	28	
azoxystrobin + tebuconazole	Strobe T	0.75–1.5	14–21	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
chlorothalonil	Daconil Ultrex	1.8–5.03	7–14	Chloronitrile (FRAC# M5)
	Daconil Weather Stik	2–5.5	7–14	
	Daconil Zn	3–8	7–14	
	Echo 720	2–3.6	7–14	
	Echo Ultimate	1.82–3.25	7–14	
	Echo Zn	3–5	7–14	
	Chlorothalonil 720	2–3.6	7–10	
	Chlorothalonil 82.5 WDG	1.8–5	7–14	
	Chlorothalonil 500ZN	3–7.9	7–10	
	Chlorothalonil 720SFT	2.12–5.5	7–10	
	Chlorothalonil DF	1.8–3.2	7–10	
	Pegasus 6L	2–3.6	7–14	
	Pegasus DFX	1.82–3.25	7–14	
	Pegasus HPX	2–3.6	7–14	
chlorothalonil + acibenzolar-S-methyl	Daconil Action	2–3.5	7–10	Chloronitrile (FRAC# M5) BTH (FRAC# P1)
		4–5.4	14	
chlorothalonil + fluoxastrobin	Disarm C	3–5.9	14–28	Chloronitrile (FRAC# M5) Strobilurin (QoI, FRAC# 11)
chlorothalonil + propiconazole	Concert	3–5.5	7–14	Chloronitrile (FRAC# M5) DMI (FRAC# 3)
		5.5–8.5	14–21	
chlorothalonil + propiconazole + fludioxonil	Instrata	2.75–6	14	Chloronitrile (FRAC# M5) DMI (FRAC# 3) Phenylpyrrole (FRAC# 12)
chlorothalonil + thiophanate-methyl	Peregrine	4–8	14	Chloronitrile (FRAC# M5) MBC (FRAC# 1)
	Spectro	3.72–5.76	14	
	TM/C	2–6	14–21	
fludioxonil	Medallion	0.25–0.5	14	Phenylpyrrole (FRAC# 12)
	Medallion SC	1–2	14	
fluopyram + trifloxystrobin	Exteris	2.135–6	14–28	SDHI (FRAC# 7) Strobilurin (QoI, FRAC# 11)
fluoxastrobin	Disarm 480SC	0.18–0.36	14–28	Strobilurin (QoI, FRAC# 11)
	Disarm G	2.3–4.6	14–28	
	Fame	0.18–0.36	14–28	

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Table 45 continued. Fungicides registered to control gray leaf spot (*Pyricularia grisea*) in turfgrasses

Common name	Trade name	Product/ 1,000 sq ft ¹	Application interval (days)	FRAC code
fluoxastrobin + myclobutanil	Disarm M	0.25–1	14–28	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
fluxapyroxad + pyraclostrobin	Lexicon	0.34–0.47	14–28	SDHI (FRAC# 7) Strobilurin (QoI, FRAC# 11)
mancozeb	Fore	8	7–14	Dithiocarbamate (FRAC# M3)
	Dithane	6.4–12.8	7–14	
	Pentathlon DF	8	7	
	Pentathlon LF	9–14	5	
	Wingman	8	7	
	Wingman 4L	9–14	10	
metconazole	Tourney	0.37	14	DMI (FRAC# 3)
myclobutanil	Eagle	1.2–2.4	14	DMI (FRAC# 3)
	Myclobutanil	1.2–2.4	14	
	Siskin	1.2–2.4	14	
penthiopyrad	Velista	0.7		SDHI (FRAC# 7)
propiconazole	Banner MAXX	1–2	14	DMI (FRAC# 3)
	Kestrel	1–2	14	
	Kestrel MEX	1–2	14	
	Propiconazole	1–2	14	
	Savvi	1–2	14	
	Strider	1–2	14	
pyraclostrobin	Insignia	0.5–0.9	14–28	Strobilurin (QoI, FRAC# 11)
	Insignia SC	0.4–0.7	14–28	
pyraclostrobin + boscalid	Honor	0.55–1.1	14–28	Strobilurin (QoI, FRAC# 11) SDHI (FRAC# 7)
pyraclostrobin + triticonazole	Pillar G	3	14–28	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
tebuconazole	Torque	0.6–1.1	21	DMI (FRAC# 3)
	Tebuconazole	0.6	28	
	Skylark	0.6	28	
	Mirage Stressgard	1–2	14–28	
thiophanate-methyl	3336 DG Lite	6–9	14	MBC (FRAC# 1)
	3336 EG	4–6	14	
	3336 F	4–6	14	
	3336 Plus	4–8	14–28	
	3336 WP	4–6	14	
	TtoBird 4.5L	1–2	14	
	TtoBird 85WDG	2.35–3.53	14	
	TM 462	3.5–5.3	14	
	TM 4.5	3.5–5.3	14	
	TM 85WDG	2.4–3.6	14	
triademefon	Bayleton 50	0.5–1	14	DMI (FRAC# 3)
	Bayleton FLO	0.5–1	14	
triadimefon + trifloxystrobin	Armada	0.6–1.2	14–28	DMI (FRAC# 3) Strobilurin (QoI, FRAC# 11)
	Tartan	1–2	14–28	
	Tartan Stessgard	1–2	14–28	
trifloxystrobin	Compass	0.15–0.25	14–21	Strobilurin (QoI, FRAC# 11)

1: Product amounts in fl oz for liquid products and oz for granular products

Large patch

Table 46. Fungicides registered to control large patch (*Rhizoctonia solani*) in turfgrasses

Common name	Trade name	Product/ 1,000 sq ft ¹	Application interval (days)	FRAC code
azoxystrobin	Heritage	0.2–0.4	14–28	Strobilurin (QoI, FRAC# 11)
	Heritage TL	2	14–28	
	Heritage G	2–4	14–28	
	Strobe 2L	0.38–0.77	28	
	Strobe 50WG	0.2–0.4	14–28	
azoxystrobin + acibenzolar-S-methyl	Heritage Action	0.2–0.4	14–28	Strobilurin (QoI, FRAC# 11) BTH (FRAC# P1)
azoxystrobin + chlorothalonil	Renown	2.5	14	Strobilurin (QoI, FRAC# 11)
		4.5	14–21	Chloronitrile (FRAC# M5)
azoxystrobin + difenoconazole	Briskway	0.3–0.725	14–28	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
azoxystrobin + propiconazole	Headway	1.5–3	14–28	Strobilurin (QoI, FRAC# 11)
	Headway G	2–2.5	14	DMI (FRAC# 3)
		3.5–4	28	
azoxystrobin + tebuconazole	Strobe T	0.75–1.5	14–21	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
chloroneb	Teremec SP	5	21–28	Aromatic hydrocarbon (FRAC# 14)
	Teremec SP 2.9F	9	21–28	
chlorothalonil + fluoxastrobin	Disarm C	3–5.9	14–28	Chloronitrile (FRAC# M5) Strobilurin (QoI, FRAC# 11)
chlorothalonil + iprodione + thiophanate-methyl + tebuconazole	Enclave	3–4	14–21	Chloronitrile (FRAC# M5) Dicarboximide (FRAC# 2) MBC (FRAC# 1) DMI (FRAC# 3)
chlorothalonil + thiophanate-methyl	Peregrine	4–8	14	Chloronitrile (FRAC# M5)
	Spectro	3–5.76	14–21	MBC (FRAC# 1)
fluoxastrobin	Disarm 480SC	0.28–0.36	14–28	Strobilurin (QoI, FRAC# 11)
	Disarm G	2.3–4.6	14–28	
	Fame	0.28–0.36	14–28	
fluoxastrobin + myclobutanil	Disarm M	0.5–1	21–28	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
flutolanil	Prostar	2.2	30	SDHI (FRAC# 7)
fluxapyroxad	Xzemplar	0.21–0.26	14–28	SDHI (FRAC# 7)
fluxapyroxad + pyraclostrobin	Lexicon	0.34–0.47	14–28	SDHI (FRAC# 7) Strobilurin (QoI, FRAC# 11)
iprodione	26GT	4	14–21	Dicarboximide (FRAC# 2)
	Chipco 26019 FLO	4	14–28	
	Iprodione Pro	4	14–21	
	Iprodione SPC	4	30	
	Ipro 2SE	4	14–21	
	Ipro 2	4	14–21	
	Raven	4	30	
iprodione + thiophanate-methyl	26/36	2–4	14–21	Dicarboximide (FRAC# 2)
	Dovetail	1–4	14–21	MBC (FRAC# 1)
iprodione + trifloxystrobin	Interface	4	14–21	Dicarboximide (FRAC# 2)
	Interface Stressgard	4	14–21	Strobilurin (QoI, FRAC# 11)
metconazole	Tourney	0.37	14	DMI (FRAC# 3)

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Table 46 continued. Fungicides registered to control large patch (*Rhizoctonia solani*) in turfgrasses

Common name	Trade name	Product/ 1,000 sq ft ¹	Application interval (days)	FRAC code
myclobutanil	Eagle	2.4	28	DMI (FRAC# 3)
	Myclobutanil	2.4	28	
	Siskin	2.4	28	
PCNB	Turfcide 10G	7.5	21–28	Aromatic hydrocarbon (FRAC# 14)
	Turfcide 400	16–24	21–28	
PCNB + tebuconazole	Oreon	6–8	14–28	Aromatic hydrocarbon (FRAC# 14) DMI (FRAC# 3)
penthiopyrad	Velista	0.7	14–28	SDHI (FRAC# 7)
polyoxin D	Affirm	0.88	7–14	Polyoxin (FRAC# 19)
	Endorse	4	7–14	
propiconazole	Banner MAXX	3–4	14–28	DMI (FRAC# 3)
	Kestrel	3–4	14–28	
	Kestrel MEX	3–4	14–28	
	Propiconazole	3–4	14–28	
	Savvi	3–4	14–28	
	Strider	3–4	14–28	
pyraclostrobin	Insignia	0.5–0.9	14–28	Strobilurin (QoI, FRAC# 11)
	Insignia SC	0.4–0.7	14–28	
pyraclostrobin + boscalid	Honor	1.1	14–28	Strobilurin (QoI, FRAC# 11) SDHI (FRAC# 7)
pyraclostrobin + triticonazole	Pillar G	3	14–28	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
tebuconazole	Torque	0.6–1.1	21	DMI (FRAC# 3)
	Tebuconazole	0.6	28	
	Skylark	0.6	28	
	Mirage Stressgard	1–2	28	
thiophanate-methyl	3336 DG Lite	1.5–6	14	MBC (FRAC# 1)
	3336 EG	2–4	14	
	3336 F	2–4	14	
	3336 Plus	2–4	14–28	
	3336 WP	2–4	14	
	TtoBird 4.5L	1–2	14	
	TtoBird 85WDG	0.67–1.3	14	
	TM 462	2–3.5	14	
	TM 4.5	2–3.5	14	
	TM 85WDG	1.2–2.4	14	
triademefon	Bayleton 50	1–2	Early fall, early spring	DMI (FRAC# 3)
	Bayleton FLO	1–2	Early fall, early spring	
triticonazole	Trinity	1–2	14–28	DMI (FRAC# 3)
	Triton FLO	0.55–1.1	14–28	
	Triton 70WDG	0.15–0.3	14–28	

1: Product amounts in fl oz for liquid products and oz for granular products

Leaf spot/melting out

Table 47. Fungicides registered to control leaf spot/melting out (*Curvularia* spp., *Exserohilum* spp.) in turfgrasses

Common name	Trade name	Product/ 1,000 sq ft ¹	Application interval (days)	FRAC code
azoxystrobin	Heritage	0.2–0.4	14–21	Strobilurin (QoI, FRAC# 11)
	Heritage TL	1–2	14–21	
	Heritage G	2–4	14–21	
	Strobe 2L	0.38–0.77	14–21	
	Strobe 50WG	0.2–0.4	14–21	
azoxystrobin + acibenzolar-S-methyl	Heritage Action	0.2–0.4	14–21	Strobilurin (QoI, FRAC# 11) BTH (FRAC# P1)
azoxystrobin + chlorothalonil	Renown	2.5–4.5	14–21	Strobilurin (QoI, FRAC# 11) Chloronitrile (FRAC# M5)
azoxystrobin + difenoconazole	Briskway	0.5–0.725	14–21	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
azoxystrobin + propiconazole	Headway	1.5–3	14–21	Strobilurin (QoI, FRAC# 11)
	Headway G	2–2.5	14	DMI (FRAC# 3)
		3.5–4	28	
azoxystrobin + tebuconazole	Strobe T	0.75–1.5	14–21	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
chlorothalonil	Daconil Ultrex	1.8–5	7–21	Chloronitrile (FRAC# M5)
	Daconil Weather Stik	2–5.5	7–21	
	Daconil ZN	3–8	7–21	
	Echo 720	2–3.6	7–14	
	Echo Ultimate	1.82–3.25	7–14	
	Echo Zn	3–5	7–14	
	Chlorothalonil 720	2–3.6	7–21	
	Chlorothalonil 82.5 WDG	1.8–5	7–21	
	Chlorothalonil 500ZN	3–7.9	14	
	Chlorothalonil 720 SFT	2.12–3.5	7–10	
	Chlorothalonil DF	1.8–3.2	7–21	
	Pegasus 6L	2–3.6	7–14	
	Pegasus DFX	1.82–3.25	7–14	
	Pegasus HPX	2–3.6	7–14	
chlorothalonil + acibenzolar-S-methyl	Daconil Action	2	7–10	Chloronitrile (FRAC# M5) BTH (FRAC# P1)
		2–3.5	7–21	
		4–5.4	14	
chlorothalonil + fluoxastrobin	Disarm C	3–5.9	14–21	Chloronitrile (FRAC# M5) Strobilurin (QoI, FRAC# 11)
chlorothalonil + propiconazole	Concert	3–5.5	7–14	Chloronitrile (FRAC# M5)
		5.5–8.5	14–21	DMI (FRAC# 3)
chlorothalonil + propiconazole + fludioxonil	Instrata	2.75–6	14–21	Chloronitrile (FRAC# M5) DMI (FRAC# 3) Phenylpyrrole (FRAC# 12)
chlorothalonil + thiophanate-methyl	Peregrine	4–8	14	Chloronitrile (FRAC# M5) MBC (FRAC# 1)
	Spectro	3.72–5.76	14	
	TM/C	2–6	14–21	
fluazinam	Secure	0.5	14	FRAC# 29
fludioxonil	Medallion	0.25–0.5	14–21	Phenylpyrrole (FRAC# 12)
	Medallion SC	1–2	14–21	
fluoxastrobin	Disarm 480SC	0.18–0.36	14–21	Strobilurin (QoI, FRAC# 11)
	Disarm G	2.3–4.6	14–21	
	Fame	0.18–0.36	14–21	
fluoxastrobin + myclobutanil	Disarm M	0.25–1	14–28	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)

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Table 47 continued. Fungicides registered to control leaf spot/melting out (*Curvularia* spp., *Exserohilum* spp.) in turfgrasses

Common name	Trade name	Product/ 1,000 sq ft ¹	Application interval (days)	FRAC code
fluxapyroxad + pyraclostrobin	Lexicon	0.34–0.47	14–28	SDHI (FRAC# 7) Strobilurin (QoI, FRAC# 11)
iprodione	26GT	3–4	14–28	Dicarboximide (FRAC# 2)
	Chipco 26019 FLO	3–4	14–28	
	Iprodione Pro	2–4	14–28	
	Iprodione SPC	3–4	30	
	Ipro 2SE	3–4	14–28	
	Ipro 2	3–4	14–28	
	Raven	3–4	30	
iprodione + thiophanate-methyl	26/36	2–4	14–21	Dicarboximide (FRAC# 2) MBC (FRAC# 1)
	Dovetail	1–4	14–21	
iprodione + trifloxystrobin	Interface	3–5	14–28	Dicarboximide (FRAC# 2) Strobilurin (QoI, FRAC# 11)
	Interface Stressgard	3–5	14–28	
mancozeb	Fore	4	7–14	Dithiocarbamate (FRAC# M3)
	Dithane	4	10	
	Pentathlon DF	6–8	7–14	
	Pentathlon LF	10–14	7–14	
	Protect	6–8	7–14	
mancozeb	Wingman	6–8	7–14	Dithiocarbamate (FRAC# M3)
	Wingman 4L	9.6–12.8	7–14	
myclobutanil	Eagle	1.2	14	DMI (FRAC# 3)
	Myclobutanil	1.2	14	
	Siskin	1.2	14	
PCNB	Turfcide 10G	5–7.5	21–28	Aromatic hydrocarbon (FRAC# 14)
	Turfcide 400	11–16	21–28	
penthiopyrad	Velista	0.3–0.5	14	SDHI (FRAC# 7)
polyoxin D	Affirm	0.88	7–14	Polyoxin (FRAC# 19)
	Endorse	4	7–14	
propiconazole	Banner MAXX	1–2	14	DMI (FRAC# 3)
	Kestrel	1–2	14	
	Kestrel MEX	1–2	14	
	Propiconazole	1–2	14	
	Savvi	1–2	14	
	Strider	1–2	14	
pyraclostrobin	Insignia	0.5–0.9	14–28	Strobilurin (QoI, FRAC# 11)
	Insignia SC	0.4–0.7	14–28	
pyraclostrobin + boscalid	Honor	0.55–1.1	14–28	Strobilurin (QoI, FRAC# 11) SDHI (FRAC# 7)
thiophanate-methyl	3336 DG Lite	6–9	14	MBC (FRAC# 1)
	3336 EG	4–6	14	
	3336 F	4–6	14	
	3336 Plus	4–8	14–28	
	3336 WP	4–6	14	
thiram	Spotrete	3.75–7.5	3–10	Dithiocarbamate (FRAC# M3)
triadimefon + trifloxystrobin	Armada	0.6	14	DMI (FRAC# 3) Strobilurin (QoI, FRAC# 11)
	Tartan	1–2	14–28	
	Tartan Stressgard	1–2	14–28	
trifloxystrobin	Compass	0.7–0.25	14–28	Strobilurin (QoI, FRAC# 11)
vinclozolin	Curalan	1	14–28	Dicarboximide (FRAC# 2)
	Touche	1	14–28	

1: Product amounts represented in fl oz for liquid products and oz for granular products

Microdochium patch

Table 48. Fungicides registered to control microdochium patch (*Microdochium nivale*) in turfgrasses

Common name	Trade name	Product/ 1,000 sq ft ¹	Application interval (days)	FRAC code
azoxystrobin	Heritage	0.2–0.4	10–28	Strobilurin (QoI, FRAC# 11)
	Heritage TL	2	10–28	
	Heritage G	4	10–28	
	Strobe 2L	0.38–0.77	14–28	
	Strobe 50WG	0.2–0.4	14–28	
azoxystrobin + acibenzolar-S-methyl	Heritage Action	0.2–0.4	14–28	Strobilurin (QoI, FRAC# 11) BTH (FRAC# P1)
azoxystrobin + chlorothalonil	Renown	2.5–4.5	14–21	Strobilurin (QoI, FRAC# 11) Chloronitrile (FRAC# M5)
azoxystrobin + difenoconazole	Briskway	0.5–0.725	14–28	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
azoxystrobin + propiconazole	Headway	1.5–3	14–28	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
	Headway G	2–2.5	14	
		3.5–4	28	
azoxystrobin + tebuconazole	Strobe T	0.75–1.5	14–21	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
chlorothalonil	Daconil Ultrex	1.8–5.03	21–28	Chloronitrile (FRAC# M5)
	Chlorothalonil 720	5.5	21–28	
	Chlorothalonil 82.5 WDG	5	21–28	
	Echo 720	5.5	21–28	
	Echo Ultimate	5	21–28	
	Echo Zn	8	21–28	
chlorothalonil + acibenzolar-S-methyl	Daconil Action	5.4	21–28	Chloronitrile (FRAC# M5) BTH (FRAC# P1)
chlorothalonil + propiconazole	Concert	8.5	14–28	Chloronitrile (FRAC# M5) DMI (FRAC# 3)
chlorothalonil + thiophanate-methyl	Peregrine	6–8	14	Chloronitrile (FRAC# M5) MBC (FRAC# 1) BTH (FRAC# P1) DMI (FRAC# 3)
	Spectro	3.72–5.76	14	
	TM/C	6–8	Fall before dormancy	
chlorothalonil + iprodione + thiophanate-methyl + tebuconazole	Enclave	7–8	28	Chloronitrile (FRAC# M5) Dicarboximide (FRAC# 2) MBC (FRAC# 1) DMI (FRAC# 3)
fenarimol	Rubigan	4	30	DMI (FRAC# 3)
fluzinam	Secure	0.5	14	FRAC# 29
fludioxonil	Medallion	0.5	Fall before dormancy	Phenylpyrrole (FRAC# 12)
	Medallion SC	2		
fluopyram + trifloxystrobin	Exteris	4.135–12.6	10–14	SDHI (FRAC# 7) Strobilurin (QoI, FRAC# 11)
fluoxastrobin	Disarm 480SC	0.18–0.36	14–28	Strobilurin (QoI, FRAC# 11)
	Disarm G	2.3–4.6	14–28	
	Fame	0.18–0.36	14–28	
fluoxastrobin + myclobutanil	Disarm M	0.5–1	21–28	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
fluxapyroxad + pyraclostrobin	Lexicon	0.34–0.47	14–28	SDHI (FRAC# 7) Strobilurin (QoI, FRAC# 11)

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Table 48 continued. Fungicides registered to control microdochium patch (*Microdochium nivale*) in turfgrasses

Common name	Trade name	Product/ 1,000 sq ft ¹	Application interval (days)	FRAC code
iprodione	26GT	4–8	Fall before dormancy	Dicarboximide (FRAC# 2)
	Chipco 26019 FLO	4–8	14–21	
	Iprodione Pro	4–8	Fall before dormancy	
	Iprodione SPC	4–8		
	Ipro 2SE	4–8	14–21	
	Ipro 2	4–8	14–21	
	Raven	4–8	30	
iprodione + thiophanate-methyl	26/36	2–4	14–21	Dicarboximide (FRAC# 2) MBC (FRAC# 1)
	Dovetail	1–4	14–21	
iprodione + trifloxystrobin	Interface	4–7	14–21	Dicarboximide (FRAC# 2)
	Inteface Stressgard	4–7	14–21	Strobilurin (QoI, FRAC# 11)
mancozeb	Fore	6–8	14–42	Dithiocarbamate (FRAC# M3)
	Dithane	6–8	14–42	
	Pentathlon DF	6–8	14–42	
	Pentathlon LF	10–14	14–42	
	Protect	6–8	7–14	
	Wingman	6–8	14–42	
	Wingman 4L	10–14	14–42	
	Disarm G	2.3–4.6	14–28	
metconazole	Tourney	0.37–0.44	Fall before dormancy	DMI (FRAC# 3)
myclobutanil	Eagle	1.2–2.4	Fall before dormancy	DMI (FRAC# 3)
	Myclobutanil	1.2–2.4		
	Siskin	1.2–2.4		
PCNB	Turfcide 10G	5–7.5	Fall before dormancy	Aromatic hydrocarbon (FRAC# 14)
	Turfcide 400	12–16		
PCNB + tebuconazole	Oreon	6–8	14–28	Aromatic hydrocarbon (FRAC# 14) DMI (FRAC# 3)
polyoxin D	Affirm	0.88	7–14	Polyoxin (FRAC# 19)
	Endorse	4	7–14	
propiconazole	Banner MAXX	2–4	Fall before dormancy	DMI (FRAC# 3)
	Kestrel	2–4		
	Kestrel MEX	2–4		
	Propiconazole	2–4		
	Savvi	2–4		
	Strider	2–4		
pyraclostrobin	Insignia	0.5–0.9	14–28	Strobilurin (QoI, FRAC# 11)
	Insignia SC	0.7	14–28	
pyraclostrobin + boscalid	Honor	0.55–1.1	14–28	Strobilurin (QoI, FRAC# 11) SDHI (FRAC# 7)
pyraclostrobin + triticonazole	Pillar G	3	28	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
tebuconazole	Torque	0.6–1.1	Fall before dormancy	DMI (FRAC# 3)
	Tebuconazole	0.6		
	Skylark	0.6		
	Mirage Stressgard	1–2		

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Table 48 continued. Fungicides registered to control microdochium patch (*Microdochium nivale*) in turfgrasses

Common name	Trade name	Product/ 1,000 sq ft ¹	Application interval (days)	FRAC code
thiophanate-methyl	3336 DG Lite	3–6	14	MBC (FRAC# 1)
	3336 EG	2–4	14	
	3336 F	2–4	14	
	3336 Plus	2–4	14–28	
	3336 WP	2–4	14	
	TtoBird 4.5L	1–2	14	
	TtoBird 85WDG	0.67–1.3	14	
	TM 462	2–3.5	14	
	TM 4.5	2–3.5	14	
	TM 85WDG	1.2–2.4	14	
triademefon	Bayleton 50	1–2	60–90	DMI (FRAC# 3)
	Bayleton FLO	1–2	60–90	
triadimefon + trifloxystrobin	Armada	1.2	Fall before dormancy	DMI (FRAC# 3) Strobilurin (QoI, FRAC# 11)
	Tartan	2		
	Tartan Stressgard	2		
trifloxystrobin	Compass	0.2–0.25	Fall before dormancy	Strobilurin (QoI, FRAC# 11)
triticonazole	Trinity	0.5–2	14–28	DMI (FRAC# 3)
	Triton FLO	0.28–1.1	10–14	
	Triton 70WDG	0.15–0.3	Fall before dormancy	
vinclozolin	Curalan	1	10–21	Dicarboximide (FRAC# 2)

1: Product amounts in fl oz for liquid products and oz for granular products

Pythium

Table 49. Fungicides registered to control pythium (*Pythium* spp.) in turfgrasses

Common name	Trade name	Product/ 1,000 sq ft ¹	Application interval (days)	FRAC code
azoxystrobin	Heritage	0.4	10–14	Strobilurin (QoI, FRAC# 11)
	Heritage TL	2	10–14	
	Heritage G	2–4	10–14	
	Strobe 2L	0.38–0.77	10–14	
	Strobe 50WG	0.2–0.4	10–14	
	Heritage Action	0.2–0.4	10–14	
azoxystrobin + acibenzolar-S-methyl	Heritage Action	0.2–0.4	10–14	Strobilurin (QoI, FRAC# 11) BTH (FRAC# P1)
	Headway	3	10–14	
	Headway G	2–2.5	14	
azoxystrobin + propiconazole	Headway G	3.5–4	28	DMI (FRAC# 3)
azoxystrobin + tebuconazole	Strobe T	0.75–1.5	14–21	
chloroneb	Teremec SP	4	5–7	Aromatic hydrocarbon (FRAC# 14)
	Teremec SP 2.9F	7	5–7	
chlorothalonil + fluoxastrobin	Disarm C	3–5.9	7–14	Chloronitrile (FRAC# M5) Strobilurin (QoI, FRAC# 11)
cyazofamid	Segway	0.45–0.9	14–21	Qil (FRAC# 21)
etridiazole	Koban	2–4.5	10	Aromatic hydrocarbon (FRAC# 14)
	Terrazole	2–4	10–14	
fluopicolide + propamocarb	Stellar	1.2	14	Benzamide (FRAC# 43) Carbamate (FRAC# 28)
fluoxastrobin	Fame	0.18–0.36	7–14	Strobilurin (QoI, FRAC #11)

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Table 49 continued. Fungicides registered to control pythium (*Pythium* spp.) in turfgrasses

Common name	Trade name	Product/ 1,000 sq ft ¹	Application interval (days)	FRAC code
fluoxastrobin + myclobutanil	Disarm M	0.5–1	14	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
fluxapyroxad + pyraclostrobin	Lexicon	0.47	14	SDHI (FRAC# 7) Strobilurin (QoI, FRAC# 11)
fosetyl-Al	Autograph	4.6–9.2	14–21	Phosphate (FRAC# 33)
	Fosetyl-Al	4–8	14–21	
	Signature	4–8	14–21	
	Signature Xtra	2–6	7–21	
	Viceroy	4.6–9.1	14–21	
mancozeb	Fore	8	5–14	Dithiocarbamate (FRAC# M3)
	Dithane	8	10	
	Pentathlon DF	8	5	
	Pentathlon LF	14	5	
mancozeb <i>cont.</i>	Protect	8	7	Dithiocarbamate (FRAC# M3)
	Wingman	8	5	
	Wingman 4L	14	10	
mefenoxam	Subdue GR	12.5–25	10–14	Phenylamide (FRAC# 4)
	Subdue MAXX	0.5–1	10–21	
	Quell	0.5–1	10–21	
	Fenox	0.2–1	10–21	
	Mefenoxam	0.2–1	10–21	
potassium phosphite	Appear	3–8	7–14	Phosphate (FRAC# 33)
	Quali-Phite F	3.5–5	7	
	Fiata Stressgard	5–15	14–28	
propamocarb	Banol	1.3–4	7–21	Carbamate (FRAC# 28)
pyraclostrobin	Insignia	0.9	14–28	Strobilurin (QoI, FRAC# 11)
	Insignia SC	0.7	10–14	
pyraclostrobin + boscalid	Honor	1.1	10–28	Strobilurin (QoI, FRAC# 11) SDHI (FRAC# 7)
pyraclostrobin + triticonazole	Pillar G	3	14	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)

1: Product amounts in fl oz for liquid products and oz for granular products

Rhizoctonia leaf and sheath spot

Table 50. Fungicides registered to control rhizoctonia leaf and sheath spot (*Rhizoctonia zeae* and *R. oryzae*) in turfgrasses

Common name	Trade name	Product/ 1,000 sq ft ¹	Application interval (days)	FRAC code
azoxystrobin	Heritage	0.2–0.4	14–28	Strobilurin (QoI, FRAC# 11)
	Heritage TL	1–2	14–28	
	Heritage G	2–4	14–28	
azoxystrobin + acibenzolar-S-methyl	Heritage Action	0.2–0.4	14–28	Strobilurin (QoI, FRAC# 11) BTH (FRAC# P1)
azoxystrobin + chlorothalonil	Renown	2.5	14	Strobilurin (QoI, FRAC# 11)
		4.5	14–21	Chloronitrile (FRAC# M5)
azoxystrobin + difenoconazole	Briskway	0.5–0.725	14–28	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
azoxystrobin + propiconazole	Headway	1.5–3	14–28	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
	Headway G	2–2.5	14	
		3.5–4	28	

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Table 50 continued. Fungicides registered to control rhizoctonia leaf and sheath spot (*Rhizoctonia zeae* and *R. oryzae*) in turfgrasses

Common name	Trade name	Product/ 1,000 sq ft ¹	Application interval (days)	FRAC code
azoxystrobin + tebuconazole	Strobe T	0.75–1.5	14–21	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
chloroneb	Teremec SP	3–4	10	Aromatic hydrocarbon (FRAC# 14)
	Teremec SP 2.9F	5–7	7–10	
chlorothalonil	Daconil Ultrex	1.8–3.25	7–14	Chloronitrile (FRAC# M5)
	Daconil Weather Stik	2–5.5	7–14	
	Daconil Zn	3–8	7–14	
	Chlorothalonil 720	2–3.6	7–14	
	Chlorothalonil 82.5 WDG	1.8–5	7–14	
	Chlorothalonil 500ZN	3–7.9	7–14	
	Chlorothalonil 720SFT	2.12–5.5	7–14	
chlorothalonil cont.	Chlorothalonil DF	1.8–3.2	7–14	Chloronitrile (FRAC# M5)
	Pegasus 6L	3.6–5.5	7–14	
	Pegasus DFX	1.82–3.25	7–14	
	Pegasus HPX	2–3.6	7–14	
fenarimol	Rubigan	1.5	7–14	DMI (FRAC# 3)
fludioxonil	Medallion	0.2–0.5	7–14	Phenylpyrrole (FRAC# 12)
	Medallion SC	0.75–2	7–14	
fluoxastrobin	Disarm 480SC	0.09–0.36	14–28	Strobilurin (QoI, FRAC# 11)
	Disarm G	1.2–4.6	14–28	
fluoxastrobin + myclobutanil	Disarm M	0.25–1	14–28	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
fluxapyroxad + pyraclostrobin	Lexicon	0.34–0.47	14–28	SDHI (FRAC# 7)
				Strobilurin (QoI, FRAC# 11)
flutolanil	Prostar	1.5–3	14–21	SDHI (FRAC# 7)
metconazole	Tourney	0.28–0.37	14–21	DMI (FRAC# 3)
myclobutanil	Eagle	1.2	14–21	DMI (FRAC# 3)
	Myclobutanil	1.2	14–21	
	Siskin	1.2	14–21	
penthiopyrad	Velista	0.3–0.5	14	SDHI (FRAC# 7)
polyoxin D	Affirm	0.88	7–14	Polyoxin (FRAC# 19)
	Endorse	4	7–14	
propiconazole	Banner MAXX	1–2	14–28	DMI (FRAC# 3)
	Kestrel	1–2	14–28	
	Kestrel MEX	1–2	14–28	
	Propiconazole	1–2	14–28	
	Savvi	1–2	14–28	
	Strider	1–2	14–28	
pyraclostrobin	Insignia	0.5–0.9	14–28	Strobilurin (QoI, FRAC# 11)
	Insignia SC	0.4–0.7	14–28	
pyraclostrobin + boscalid	Honor	1.1	14–28	Strobilurin (QoI, FRAC# 11) SDHI (FRAC# 7)
pyraclostrobin + triticonazole	Pillar G	3	28	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
tebuconazole	Torque	0.6	28	DMI (FRAC# 3)
	Tebuconazole	0.6	28	
	Skylark	0.6	28	

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Table 50 continued. Fungicides registered to control rhizoctonia leaf and sheath spot (*Rhizoctonia zeae* and *R. oryzae*) in turfgrasses

Common name	Trade name	Product/ 1,000 sq ft ¹	Application interval (days)	FRAC code
thiophanate-methyl	3336 DG Lite	1.5–6	14	MBC (FRAC# 1)
	3336 EG	2–4	14	
	3336 F	2–4	14	
	3336 Plus	2–8	14–28	
	3336 WP	2–6	14	
	TtoBird 4.5L	1–2	14	
	TtoBird 85WDG	0.67–1.3	14	
	TM 462	2–3.5	14	
	TM 4.5	2–3.5	14	
	TM 85WDG	1.2–2.4	14	
triademefon	Bayleton 50	0.5–1	15–30	DMI (FRAC# 3)
	Bayleton FLO	0.5–1	15–30	
trifloxystrobin	Compass	0.15–0.25	14–21	Strobilurin (QoI, FRAC# 11)
triticonazole	Trinity	0.5–1	14–28	DMI (FRAC# 3)
	Triton FLO	0.41–1.1	14–28	
	Triton 70WDG	0.15–0.6	14–28	

1: Product amounts in fl oz for liquid products and oz for granular products

Root decline/take-all root rot/take-all patch

Table 51. Fungicides registered to control root decline/take-all root rot/take-all patch (*Gaeumannomyces graminis* var. *graminis*) in turfgrasses

Common name	Trade name	Product/ 1,000 sq ft ¹	Application interval (days)	FRAC code
azoxystrobin	Heritage	0.4	28	Strobilurin (QoI, FRAC# 11)
	Heritage TL	2	28	
	Heritage G	2–4	28	
	Strobe 2L	0.38–0.77	14–28	
	Strobe 50WG	0.2–0.4	28	
azoxystrobin + acibenzolar-S-methyl	Heritage Action	0.2–0.4	28	Strobilurin (QoI, FRAC# 11) BTH (FRAC# P1)
azoxystrobin + difenoconazole	Briskway	0.5–0.725	28	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
azoxystrobin + propiconazole	Headway	3	28	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
	Headway G	3.5–4	28	
chlorothalonil + fluoxastrobin	Disarm C	5.9	28	Chloronitrile (FRAC# M5) Strobilurin (QoI, FRAC# 11)
fenarimol	Rubigan	4–8	30	DMI (FRAC# 3)
fluoxastrobin	Disarm 480SC	0.36	28	Strobilurin (QoI, FRAC# 11)
	Disarm G	2.3–4.6	28	
	Fame	0.36	28	
fluoxastrobin + myclobutanil	Disarm M	0.5–1	28	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
fluxapyroxad + pyraclostrobin	Lexicon	0.34–0.47	14–28	SDHI (FRAC# 7) Strobilurin (QoI, FRAC# 11)
mandestrobin	Pinpoint	0.31	14	Strobilurin (QoI, FRAC# 11)

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Table 51 continued. Fungicides registered to control root decline/take-all root rot/take-all patch (*Gaeumannomyces graminis* var. *graminis*) in turfgrasses

Common name	Trade name	Product/ 1,000 sq ft ¹	Application interval (days)	FRAC code
metconazole	Tourney	0.37	14	DMI (FRAC# 3)
myclobutanil	Eagle	2.4	28	DMI (FRAC# 3)
	Myclobutanil	2.4	28	
	Siskin	2.4	28	
propiconazole	Banner MAXX	2–4	Spring and fall	DMI (FRAC# 3)
	Kestrel	2–4		
	Kestrel MEX	2–4		
	Propiconazole	2–4		
	Savvi	2–4		
	Strider	2–4		
pyraclostrobin	Insignia	0.9	28	Strobilurin (QoI, FRAC# 11)
	Insignia SC	0.7	28	
pyraclostrobin + boscalid	Honor	1.1	28	Strobilurin (QoI, FRAC# 11) SDHI (FRAC# 7)
pyraclostrobin + triticonazole	Pillar G	3	28	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
tebuconazole	Torque	0.6–1.1	Spring and fall	DMI (FRAC# 3)
	Tebuconazole	0.6		
	Skylark	0.6		
	Mirage Stressgard	1–2		
thiophanate-methyl	3336 DG Lite	6–9	14	MBC (FRAC# 1)
	3336 EG	4–6	14	
	3336 F	4–6	14	
	3336 Plus	4–8	14–28	
	3336 WP	4–6	14	
triademefon	Bayleton 50	1–2	21–28	DMI (FRAC# 3)
	Bayleton FLO	1–2	21–28	
triadimefon + trifloxystrobin	Armada	1.2	28	DMI (FRAC# 3)
	Tartan Stressgard	1.5–2	28	Strobilurin (QoI, FRAC# 11)
triticonazole	Trinity	1–2	14–28	DMI (FRAC# 3)
	Triton FLO	0.55–1.1	14–28	
	Triton 70WDG	0.15–0.3	14–28	

1: Product amounts in fl oz for liquid products and oz for granular products

Spring dead spot

Table 52. Fungicides registered to control spring dead spot (*Ophiosphaerella narmari*, *O. korrea*, and *O. herpotricha*) in turfgrasses

Common name	Trade name	Product/ 1,000 sq ft ¹	Application interval (days)	FRAC code
azoxystrobin	Heritage	0.4	14–28	Strobilurin (QoI, FRAC# 11)
	Heritage TL	2	14–28	
	Strobe 2L	0.38–0.77	28	
	Strobe 50WG	0.2–0.4	14–28	
azoxystrobin + acibenzolar-S-methyl	Heritage Action	0.2–0.4	14–28	Strobilurin (QoI, FRAC# 11) BTH (FRAC# P1)
azoxystrobin + propiconazole	Headway	3	14–28	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
	Headway G	2–2.5	14	
		3.5–4	28	
azoxystrobin + tebuconazole	Strobe T	1.5	14–21	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
chlorothalonil + iprodione + thiophanate-methyl + tebuconazole	Enclave	3–4	14–21	Chloronitrile (FRAC# M5) Dicarboximide (FRAC# 2) MBC (FRAC# 1) DMI (FRAC# 3)
		7–8	28	
chlorothalonil + fluoxastrobin	Disarm C	5.9	14–28	Chloronitrile (FRAC# M5) Strobilurin (QoI, FRAC# 11)
fenarimol	Rubigan	4	14–30	DMI (FRAC# 3)
fluoxastrobin	Disarm 480SC	0.36	14–28	Strobilurin (QoI, FRAC# 11)
	Disarm G	2.3–4.6	14–28	
	Fame	0.36	14–28	
fluoxastrobin + myclobutanil	Disarm M	0.5–1	14–28	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
metconazole	Tourney	0.37	14	DMI (FRAC# 3)
myclobutanil	Eagle	2.4	28	DMI (FRAC# 3)
	Myclobutanil	2.4	28	
	Siskin	2.4	28	
penthiopyrad	Velista	0.7	28	SDHI (FRAC# 7)
propiconazole	Banner MAXX	4	30	DMI (FRAC# 3)
	Kestrel	4	30	
	Kestrel MEX	4	30	
	Propiconazole	4	30	
	Savvi	4	30	
	Strider	4	30	
tebuconazole	Torque	0.6–1.1	21	DMI (FRAC# 3)
	Tebuconazole	0.6	28	
	Skylark	0.6	28	
	Mirage Stressgard	2	28	
thiophanate-methyl	3336 DG Lite	6–9	14	MBC (FRAC# 1)
	3336 EG	4–6	14	
	3336 F	4–6	14	
	3336 Plus	4–6	14	
	3336 WP	4–6	14	
	TM 462	3.5–5.3	14	
	TM 4.5	3.5–5.3	14	
	TM 85WDG	2.4–3.6	14	

¹: Product amounts represented in fl oz for liquid products and oz for granular products

Summer patch

Table 53. Fungicides registered to control summer patch (*Magnaportha poae*) in turfgrasses

Common name	Trade name	Product/ 1,000 sq ft ¹	Application interval (days)	FRAC code
azoxystrobin	Heritage	0.2–0.4	14–28	Strobilurin (QoI, FRAC# 11)
	Heritage TL	1–2	14–28	
	Heritage G	2–4	14–28	
	Strobe 2L	0.38–0.77	14–28	
	Strobe 50WG	0.2–0.4	14–28	
azoxystrobin + acibenzolar-S-methyl	Heritage Action	0.2–0.4	14–28	Strobilurin (QoI, FRAC# 11) BTH (FRAC# P1)
azoxystrobin + difenoconazole	Briskway	0.5–0.725	14–21	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
azoxystrobin + propiconazole	Headway	1.5–3	14–28	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
	Headway G	2–2.5	14	
		3.5–4	28	
chlorothalonil + fluoxastrobin	Disarm C	3–5.9	14–28	Chloronitrile (FRAC# M5) Strobilurin (QoI, FRAC# 11)
chlorothalonil + propiconazole + fludioxonil	Instrata	6	14	Chloronitrile (FRAC# M5) DMI (FRAC# 3)
		11	28	Phenylpyrrole (FRAC# 12)
chlorothalonil + iprodione + thiophanate-methyl + tebuconazole	Enclave	3–4	14–21	Chloronitrile (FRAC# M5) Dicarboximide (FRAC# 2)
		7–8	28	MBC (FRAC# 1) DMI (FRAC# 3)
fenarimol	Rubigan	2–4	30	DMI (FRAC# 3)
fluoxastrobin	Disarm 480SC	0.18–0.36	14–28	Strobilurin (QoI, FRAC# 11)
	Disarm G	2.3–4.6	14–28	
	Fame	0.18–0.36	14–28	
fluoxastrobin + myclobutanil	Disarm M	0.25–1	14–28	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
fluxapyroxad	Xzemplar	0.26	14–28	SDHI (FRAC# 7)
fluxapyroxad + pyraclostrobin	Lexicon	0.34–0.47	14–28	SDHI (FRAC# 7) Strobilurin (QoI, FRAC# 11)
metconazole	Tourney	0.37	14	DMI (FRAC# 3)
myclobutanil	Eagle	1.2–2.4	14–28	DMI (FRAC# 3)
	Myclobutanil	1.2–2.4	14–28	
	Siskin	1.2–2.4	14–28	
penthiopyrad	Velista	0.3–0.5	14–28	SDHI (FRAC# 7)
propiconazole	Banner MAXX	2–4	14–28	DMI (FRAC# 3)
	Kestrel	2–4	14–28	
	Kestrel MEX	2–4	14–28	
	Propiconazole	2–4	14–28	
	Savvi	2–4	14–28	
	Strider	2–4	14–28	
pyraclostrobin + triadimefon	Tartan	2	21–28	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)
pyraclostrobin + triticonazole	Pillar G	3	28	Strobilurin (QoI, FRAC# 11) DMI (FRAC# 3)

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Table 53 continued. Fungicides registered to control summer patch (*Magnaportha poae*) in turfgrasses

Common name	Trade name	Product/ 1,000 sq ft ¹	Application interval (days)	FRAC code
tebuconazole	Torque	0.6–1.1	21	DMI (FRAC# 3)
	Tebuconazole	0.6	28	
	Skylark	0.6	28	
	Mirage Stressgard	1–2	14–28	
thiophanate-methyl	3336 DG Lite	6–9	14–21	MBC (FRAC# 1)
	3336 EG	4–6	14–21	
	3336 F	4–6	14–21	
	3336 Plus	4–8	14–28	
	3336 WP	4–6	14–21	
	TtoBird 4.5L	5	14	
	TtoBird 85WDG	3.53	14	
	TM 462	3.5 to5.3	14	
	TM 4.5	3.5 to5.3	14	
	TM 85WDG	2.4–3.6	14–21	
triademefon	Bayleton 50	1–2	30	DMI (FRAC# 3)
	Bayleton FLO	1–2	30	
trifloxystrobin	Compass	0.2–0.25	21–28	Strobilurin (QoI, FRAC# 11)
triadimefon + trifloxystrobin	Tartan	2	21–28	DMI (FRAC# 3)
	Tartan Stressgard	2	21–28	Strobilurin (QoI, FRAC# 11)
triticonazole	Trinity	1–2	14–28	DMI (FRAC# 3)
	Triton FLO	0.55–1.1	14–28	
	Triton 70WDG	0.3–0.6	14–28	

1: Product amounts in fl oz for liquid products and oz for granular products

Nematicides registered for use in turfgrass

Nematodes are microscopic round worms that are approximately 0.02 to 0.08 inches long and can be parasitic to plants by constricting or feeding on turfgrass roots. Plant parasitic nematode problems in turfgrass occur primarily on golf courses, especially on ultra-dwarf bermudagrass putting greens or hybrid bermudagrass fairways that are constructed on sandy soil. Nematodes are also more of an issue in turf that is more intensively managed, mowed at lower heights, and is subjected to significant foot and equipment traffic. Nematode populations fluctuate seasonally and injury is often difficult to diagnose because the symptoms can be similar to drought stress, nutrient deficiencies, or several turfgrass diseases. Affected areas may appear yellow, lose density, and not respond appropriately to irrigation or fertilization. Further-

more, because nematodes impact turfgrass roots, injury is often not apparent until significant root system damage has already occurred. Upon closer inspection, turfgrass roots may be stunted, swollen, or blackened. When found and already established in turf, nematodes can cause significant damage and this is especially true under stressful environmental conditions. As a result, it is important to collect and send soil samples off to a reputable turfgrass disease and/or nematode laboratory for proper identification of nematode species and populations as soon as injury is suspected. A list of reputable laboratories can be found on page 2 of this publication. If nematodes are present above thresholds that warrant treatment, please refer to Table 54 below for information on available nematicides registered for use in turfgrasses.

Table 54. Nematicides registered for control of nematodes in turfgrass (consult labels for specific species, use sites, and restrictions).

Common name	Trade name (Product/A)	Namatodes labeled for application	Use site	Comments
abamectin	Avid 0.15 EC (57 fl oz)	Sting nematode (<i>Belonolaimus longicaudatus</i>) Ring nematode (<i>Macroposthonia</i> sp.)	Golf course putting greens only (see comments)	Existing stocks may be applied to golf course putting greens under a 24(c) supplemental label until June 30, 2017. Application is prohibited after that date.
abamectin	Divanem (3.125 to 12.2 fl oz)	Turf-parasitic nematodes	Golf course putting greens, tees, and fairways only	Texas registration is pending. Consult distributor or Syngenta representatives for updates. Apply to wet turf (dew or 0.1 inches of irrigation) and irrigate within 1 hour of application to move product through the thatch. Consult label for nozzle recommendations, spray volume, and maximum use rates

continued on next page

Table 54 continued. Nematicides registered for control of nematodes in turfgrass (consult labels for specific species, use sites, and restrictions).

Common name	Trade name	Product/ 1,000 sq ft ¹	Application interval (days)	FRAC code
Bacillus firmus (strain I-1582)	Nortica 10WP (17.5 to 50 lbs)	Soil-inhabiting plant parasitic nematodes including Cyst, Lance, Lesion Ring, Root-knot, Sheath, Spiral, Sting, and Stunt.	Sod production, lawns, sports fields, and golf courses (tees, greens, fairways and rough)	Make initial applications at 35-50 lbs/acre and then consult label for sequential rates at 4, 6, or 8 week intervals. Deliver a minimum of 70 lbs/acre/year. For optimal results, irrigate the turf thoroughly to wash product from foliage to targeted root zone.
dazomet	Basamid (218 to 525 lbs)	Many; consult label for specific species	Golf courses, sports fields, commercial turf, residential lawns, and sod farms	Restricted Use Pesticide. Pre-plant control only. Rate depends on soil texture, fumigation method, pests, etc. Consult label for specific information.
fluensulfone	Nimitz Pro G (60 to 120 lbs)	Root-rot, Sting, Lance, and Lesion nematodes	Golf courses, athletic fields, residential and commercial turf, and sod production	Treated areas should be irrigated after application to move active ingredient into the root zone. Aerification prior to application has been shown to improve control. Consult label for maximum use rates and labeled turfgrass species.
fluopyram	Indemnify (0.195 to 0.39 fl oz per 1,000 sq ft)	Soil-inhabiting plant parasitic nematodes including Sting, Stem- gall, Ring, Root-knot, Awl, Cyst, and others.	Golf courses, sports fields, residential, institutional, municipal, commercial turf, and sod production.	Irrigate within 24 hours after application to depth of root-zone to be protected. Minimum of 14 days between applications, consult label for maximum annual use rates.
furfural	Mulitguard Protect (5.5 to 8 gallons)	Root-infesting, plant- parasitic nematodes	Root-infesting, plant- parasitic nematodes Golf courses; tees and greens, spot-treatment only for fairways and roughs as well as sod farms	Apply up to 6 applications per year at 14-28 day intervals. Consult label for specific restrictions on acreage treated, buffer zones, re-entry intervals, and more.

Curfew (1,3-dichloropropene) is a nematicide registered for use in Alabama, Florida, Georgia, North Carolina, and South Carolina by EPA 24(c) supplemental labels. Users in those states should consult their respective EPA 24 (c) label for specific instructions.

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The information given herein is for educational purposes only. Reference to commercial products or trade names is made with the understanding that no discrimination is intended and no endorsement by the Texas A&M AgriLife Extension Service is implied.

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