

# Commercial Crop Production Turfgrass

## Integrated Turfgrass Disease Management

Effective turfgrass disease management can be achieved by maintaining healthy and vigorously growing grass. Diseases can be avoided by selecting resistant cultivars and turfgrass species that are well-adapted to site conditions and the local climate. Establishing a fertility program that promotes turfgrass vigor (Table 1), adopting optimal mowing heights (Table 1) and using good irrigation practices can minimize fungicide use significantly.

**Table 1. Fertility and mowing practices for turfgrass.**

<b>Grass Type</b>	<b>Nitrogen Fertility Timing</b>	<b>Mowing<sup>1</sup></b>
Warm season grasses	Summer (April-August)	1-2 inches
Cool season grasses	Fall	2.5 to 4.0 inches

<sup>1</sup>Do not remove more than one-third of the leaf growth during a single mowing. Maintain a sharp blade to minimize mechanical injuries on leaf blades.

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**Table 2. Disease identification key for southern turfgrass.**

*Developed by G. Holcomb, Professor Emeritus*

<b>I. Grass affected in distinct patches, yellow to brown.</b>	
A. Patches about 3 inches in diameter; leaf lesions present. .....	<b>Dollar spot</b>
B. Patches greater than 3 inches in diameter; no leaf lesions present. <b>Go to 1 or 2.</b>	
1. Ring or arc of lush growth or dead grass; mushrooms present or absent. .....	<b>Fairy ring</b>
2. No ring or arc of lush growth present; no mushrooms present. a. Grass often affected in streaks, with leaves matted; primarily on rye grass over-seeded on golf courses and Bermudagrass greens. .....	<b>Pythium blight</b>
b. Patches more or less circular, may enlarge to several feet; leaves rotted at the base, can be pulled easily from the leaf sheath. .....	<b>Large patch<sup>1</sup></b>
c. Affected areas irregular in shape, 8-24 inches in diameter (or larger) with a mixture of yellow and dead grass; roots are sparse, short and black; stolons may be rotted. .....	<b>Take-all root rot<sup>2</sup></b>
<b>II. Grass not affected in patches.</b>	
A. Chlorotic spots and orange powder (spores that can be rubbed off) on leaves. .....	<b>Rust</b>
B. Leaf spots present, but no orange powder present. <b>Go to 1, 2, or 3.</b>	
C. No leaf spots present. <b>Go to 4 or 5.</b>	
1. Leaf spots varying in size; occurring primarily on Bermudagrass and ryegrass. .....	<b>Melting out or Leaf spot</b>
2. Leaf spots oval to irregular in shape with brown borders and tan to gray centers; primarily on St. Augustinegrass. .....	<b>Gray leaf spot</b>
3. Leaf spots reddish brown to brown surrounded by a yellow halo; primarily on centipedegrass. .....	<b>Anthracnose</b>
4. Grass covered with an easily removed slimy or crusty growth. .....	<b>Slime molds<sup>3</sup></b>
5. Mottle, chlorosis or mosaic on leaves; on St. Augustinegrass or centipedegrass. .....	<b>St. Augustine decline or Centipede Decline<sup>4</sup></b>

<sup>1</sup> Formerly known as Brown patch.

<sup>2</sup> Take-all root rot may also resemble chinch bug damage.

<sup>3</sup> Nonpathogenic. Not a disease.

<sup>4</sup> Viral diseases caused by *Panicum mosaic virus*.

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**Table 3. Fungicides labeled for use on commercial turfgrasses.**

Fungicide <sup>1</sup>	Large patch	Dollar spot	Gray leaf spot	Leaf spots & Melting out	Take-all root rot <sup>2</sup>	Fairy ring	Pythium blight	Algae
azoxystrobin	X		X	X	X	X	X	
boscalid		X						
captan				X				
chlorothalonil		X	X	X				X
cyazofamid							X	
ethazole (etridiazole)							X	
fenarimol		X			X			
fludioxonil			X	X				
fluoxastrobin			X	X	X		X	
flutolanil	X					X		
fosetyl-al							X	
iprodione	X	X		X				
mancozeb		X	X	X			X	X
mefenoxam							X	
metconazole	X	X				X		
myclobutanil	X	X		X	X			
polyoxin D	X		X	X		X <sup>3</sup>		
phosphites (various salts)							X	
propamocarb							X	
propiconazole	X	X	X	X	X			
pyraclostrobin		X <sup>e</sup>	X	X	X	X	X	
quintozene (PCNB)		X		X				
tebuconazole	X	X	X		X			
thiophanate-methyl	X	X	X	X	X			
thiram		X						
triadimefon	X	X	X		X			
trifloxystrobin		X	X	X				
triticonazole	X	X			X			X
vinclozolin		X		X				

<sup>1</sup>Active ingredient.

<sup>2</sup>Also, *Gaeumannomyces graminis* var. *graminis* (Ggg) root decline, Bermuda decline and spring dead spot.

<sup>3</sup>For disease suppression only.

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**Table 4. Efficacy<sup>1</sup> of fungicides in managing turfgrass diseases.**

Fungicide <sup>2</sup>	Large patch	Dollar spot	Gray leaf spot	Leaf spots & Melting out	Take-all root rot <sup>c</sup>	Fairy ring	Pythium blight	Algae
azoxystrobin	4		4	3	(3)	3	2	
boscalid		4						
chlorothalonil		3	2	2				3
copper hydroxide + mancozeb								4
cyazofamid							3	
fenarimol		3			(2)			
fludioxonil				3				
fluopicolide + pfropamocarb							3	
fluoxastrobin							2	
flutolanil	4					3		
fosetyl-al							2	
iprodione	2	3		4				
mancozeb		1	2	3			2	3
mefenoxam							2	
metconazole		4	2			3		
myclobutanil	2+	4		1				
polyoxin D	1		1			2+		
phosphite salts							2	
propamocarb							2	
propiconazole	2	4	2	2	(2)			
pyraclostrobin	3	2+	4	3	(3)	3	2+	
quintozene (PCNB)	4			2				
tebuconazole		4						
thiophanate-methyl		4	4	2				
triadimefon	4	4	2		(2)	3		
trifloxystrobin			3	2				
triticonazole	3	4						2
vinclozolin		4		3.5				

<sup>1</sup>Efficacy ratings are on a scale from 1 to 4 where 1=inconsistent but performs well in some instances, and 4=consistently good to excellent results. Efficacy data are based on trials using commercial formulations of the fungicides, not the formulations

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readily available to homeowners. Ratings were compiled by Dr. Clarke at Rutgers University, Drs. Munshaw and Vincelli at University of Kentucky and Dr. Koch at University of Wisconsin-Madison (PPA-I Chemical Control of Turfgrass Diseases 2020; <http://www2.ca.uky.edu/agcomm/pubs/PPA/PPAI/PPAI.pdf>).

<sup>2</sup>Active ingredient.

<sup>3</sup>Also, *Gaeumannomyces graminis* var. *avenae* (Ggg) root decline, Bermuda decline and spring dead spot.

<sup>4</sup>Ratings within parentheses are for take-all patch caused by Ggg.

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**Table 5. Fungicides registered for use on commercial turfgrasses only.**

Fungicide <sup>1</sup>	Mode of Action Group <sup>2</sup>	Trade Name <sup>3</sup>	Formulation	Rate <sup>4</sup>	Maximum Use <sup>5</sup>
azoxystrobin	11	Heritage Heritage G Heritage TL	50WG 0.31G 8.8L	0.2-0.4 oz 2-4 lb 1-2 fl oz	3.7 oz 37 lb 18.5 fl oz
boscalid	7	Emerald <sup>6</sup>	70WG	0.13-0.18 oz	1.1 oz
captan	M	Captan	50WP 80WDG	0.13-0.2 lb 0.125 lb	
chlorothalonil	M	Chlorostar, Chlorothalonil, Countdown, Daconil, Echo, Ensign, Equus, Initiate, Mainsail, Manicure	38.5F 54F 82.5WDG	1.5-8.3 fl oz 1-5.5 fl oz 1-5 oz	
cyazofamid	21	Segway	34.5F	0.45-0.9 fl oz	2.7 fl oz
ethazole (etridiazole)	14	Terrazole <sup>8</sup>	35WP	2-4 oz	10 oz
fenarimol	3	Rubigan	11.6L	0.75-8 fl oz	32 fl oz
fludioxonil	12	Medallion	50WP	0.25-0.5 oz	1.5 oz
fluopicolide	43	Stellar <sup>9</sup>	5.7SC	1.2 fl oz	2.4 fl oz
fluoxastrobin	11	Disarm	480SC 0.25G	0.09-0.36 fl oz 1.2-4.6 lb	0.4 fl oz
flutolanil	7	Prostar	70WP	1.5-4.5 oz	4.5 oz
fosetyl-al	33	Chipco Signature Prodigy Signature	80WDG 80WDG	4-8 oz 4-8 oz	
iprodione	2	26GT Chipco 26019 Iprodione Pro	23.3F 50WP	3-8 fl oz 1.5-4 oz	35 fl oz 17.6 oz
mancozeb	M	Dithane, Fore, Manzate, Penncozeb, Pentathlon, Protect	37F 75DF 80WP	6.4-12.8 fl oz 4-8 oz 4-8 oz	See label
mefenoxam	4	Fenox Mefenoxam Subdue Ultra Flourish	1G 21.3L 22.5F 25.1 45WP	12.5-25 oz 0.5-1 fl oz 0.2-1 fl oz 0.5-1 fl oz 0.28-0.56 oz	3 apps/ season
metconazole	3	Tourney	50 WDG	0.18-0.44 oz	4 lb/A
myclobutanil	3	Eagle Hoist	20EW 40WP	1-2.4 fl oz 0.6-1.2 oz	13.8 fl oz 7.2 oz
phosphite (salts of phosphorous acid)	33	Alude, Exel, Fosphite, Fungi-phite, Helena Prophyt <sup>11</sup> , Primera Magellan, Vital	3.35 <sup>12</sup> 3.9 4.2 4.32	5-10 fl oz 2-3 fl oz 4-6 fl oz 4.1-8.2 fl oz	
polyoxin D zinc salt	19	Endorse	2.5WP	Refer to label	
propamocarb hydrochloride	28	Banol	66.5L	1.3-4 fl oz	12.5 fl oz
propiconazole	3	Banner, Dorado, Fathom, Headway, Honor Guard,	14.3L 41.8L	0.5-4 fl oz 0.18-1.44 fl oz	16 fl oz 5.8 fl oz

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Fungicide <sup>1</sup>	Mode of Action Group <sup>2</sup>	Trade Name <sup>3</sup>	Formulation	Rate <sup>4</sup>	Maximum Use <sup>5</sup>
		Propensity, Propiconazole, Savvi, Spectator			
pyraclostrobin	I I	Insignia	20WG	0.5-0.9 oz	5.5 oz
quintozene (PCNB)	I 4	Glacier, Parflo, PCNB, Revere, Terraclor, Turfcide	10G 38.3F 75WP	5-7.5 lb 11-24 fl oz 7-16 oz	Refer to label
tebuconazole	3	Torque <sup>13,6</sup>	38.7L	0.6 fl oz	3.6 fl oz
thiophanate-methyl	I	3336, Allban, Cavalier, Quali-Pro TM, T-Methyl, Transom, T-Storm	2G 41.25L 46.2F 50WP	1.5-9 lb 2-6 fl oz 1-5 fl oz 2-6 oz	Refer to label
thiram	M	Defiant, Spotrete, Thiram	42.1L 75WDG	3.8-7.5 fl oz 2.5-5 oz	Refer to label
triadimefon	3	Bayleton	50WP	0.25-2 oz	Refer to label
trifloxystrobin	I I	Compass	50WDG	0.1-0.25 oz	3 apps
triticonazole	3	Trinity, Triton	19.2L	0.5-2 fl oz	6 fl oz
vinclozolin	2	Curalan Touché	50EG	1 oz	3 oz
<b>Fungicide Combinations</b>					
azoxystrobin + propiconazole	I I, 3	Headway Headway G	5.7 + 9.5L 0.31 + 0.75G	0.75-3.0 fl oz 2-4 lb	Refer to labels
azoxystrobin + chlorothalonil	I I, M	Renown <sup>7</sup>	3 + 45L	2.5-4.5 fl oz	
chlorothalonil + propiconazole + fludioxonil	M, 3, I 2	Instrata <sup>7</sup>	29.9 + 4.7 + 1.2L	2.75-11 fl oz	
chlorothalonil + thiophanate-methyl	M, I	Consyst <sup>7</sup> Spectro 90 <sup>7</sup> Peregrine <sup>7</sup> Quali-Pro TM/C <sup>7</sup>	50 + 16.7WDG 72 + 18WDG	2-5 oz 3-5.8 oz	
fluopicolide + propamocarb hydrochloride	43, 28	Stellar <sup>14</sup>	5.54 + 55.4SC	1.2 fl oz	
fluoxastrobin + chlorothalonil	I I, M	Disarm C <sup>7</sup>	2.44 + 38.4L	1.5-5.9 fl oz	
fluoxastrobin + myclobutanil	I I, 3	Disarm M	15.8 + 25.6L	0.25-1.0 fl oz	Refer to label
iprodione + thiophanate-methyl	2, I	26/36 <sup>15</sup> TM + IP <sup>15</sup>	19.65 + 19.65L	1-4 fl oz	14.5 fl oz 6 apps/season
mancozeb + copper hydroxide	M, M	Junction	15 + 46.1DF	2-4 oz	
propiconazole + chlorothalonil	3, M	Concert <sup>7</sup>	2.9 + 38.5L	1.5-8.5 fl oz	

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Fungicide <sup>1</sup>	Mode of Action Group <sup>2</sup>	Trade Name <sup>3</sup>	Formulation	Rate <sup>4</sup>	Maximum Use <sup>5</sup>
pyraclostrobin + boscalid	11, 7	Honor <sup>6</sup>	16.8 + 11.2WG	0.55-1.1 oz	
thiophanate-methyl + flutolanil	1, 7	SysStar	28.6 + 51.4WDG	2-3 oz	Refer to label
trifloxystrobin + triadimefon	11, 3	Armada Tartan	25L 50WP	1-2 fl oz 0.6-1.2 oz	3 apps
triticonazole + chlorothalonil	3, M	Reserve <sup>7</sup>	5 + 40L	3.2-5.4 fl oz	

<sup>1</sup>Active ingredient

<sup>2</sup>Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

<sup>3</sup>Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

<sup>4</sup>Rates are the amount of formulation (product) per 1,000 square feet unless otherwise indicated.

<sup>5</sup>Maximum use per 1,000 square feet per year unless otherwise noted.

<sup>6</sup>For golf course use only.

<sup>7</sup>Not for use on home lawns or turf associated with apartments, day care centers, playgrounds or athletic fields next to schools (elementary through high school).

<sup>8</sup>For use on golf course tees and greens only.

<sup>9</sup>Premixed with propamocarb for control of *Pythium* spp.

<sup>10</sup>Do not use on bermudagrass.

<sup>11</sup>Helena Prophyt for use on sod farms only. Refer to label for modes of application and restrictions.

<sup>12</sup>Formulation based on phosphorous acid equivalent in lb/gal.

<sup>13</sup>Bermuda grass may be sensitive.

<sup>14</sup>For use on golf courses and sod farms only.

<sup>15</sup>Not for use on commercial sod.

Information in this section was last updated in October 2022 by R. Singh.