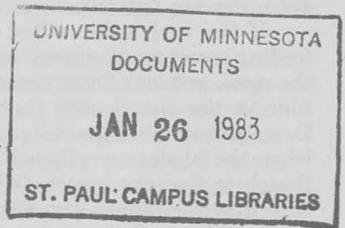


Chemical Guide to Insect, Disease, and Weed Control on Turf 1983

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Turfgrass culture becomes more complex as new varieties of turfgrass and new pesticides are introduced. A dense and healthy turfgrass developed through proper management is still the best and cheapest defense against pests such as insects, diseases, and weeds. Cultural practices such as proper fertilization, watering, and mowing are the basis of a sound management program. Chemical pesticides are supplements, not replacements, to cultural practices and should be carefully selected to control specific pests.

Pesticide Formulations and Precautions

Pesticides are available as solutions, liquid concentrates, wettable powders, or granules. Solutions are applied directly as sprays, whereas liquid concentrates and wettable powders are mixed with water and then applied as sprays. Granules are applied dry with a fertilizer spreader.

Pesticides must be applied accurately for optimum control. Application rates higher than those recommended may injure the turf. The amount of pesticide to apply depends on the concentration of the active ingredient in the pesticide.

Concentrations of liquid formulations are generally expressed as pounds of active ingredient per gallon (lb. a.i./gal.) on the pesticide label. If the concentration is 4 lb. a.i./gal., then 1 quart of the pesticide applied uniformly to 1 acre will supply 1 lb. of active ingredient per acre.

Concentrations of granules and powders are expressed as percentages of active ingredients. A wettable powder that is listed as 50 percent active ingredient contains $\frac{1}{2}$ its total weight in active ingredient and $\frac{1}{2}$ inert carrier. To apply a recommended rate of 1 lb. a.i./acre, 2 lbs. of the material should be used to cover 1 acre of turf.

Pesticides are dangerous chemicals and should be treated as such. They should be stored in their original containers with the label securely attached. Prolonged contact of pesticides with the skin or prolonged inhalation of mists and dusts should be avoided. Read the label before using and follow all directions carefully.

Chemical Weed Control

An understanding of weeds and their growing characteristics can aid greatly in their control through herbicide application. Annual weeds germinate from seed, grow, mature, and die in less than 12 months, whereas perennial weeds may live for many years even though they can produce new plants every year. Annual weeds such as crabgrass and knotweed that germinate in the spring and mature in the summer or fall each year are designated summer annuals. Annual weeds such as chickweed and henbit germinate in the fall and mature in late spring and are called winter annuals.

Preemergence herbicides are applied to the soil before the weed seeds germinate and are most effective if applied two to four weeks before germination. Thus applications in early May are best for summer annuals, and applications in mid-September are best for winter annuals. Preemergence herbicides usually are not effective in controlling perennial weeds.

Postemergence herbicides are applied after weeds appear. Liquid sprays are more effective than granular materials, and effectiveness is also increased if herbicide is used when weeds are young and growing rapidly. Postemergence control of annual weeds should take place prior to development of mature weed seeds or the area will have been seeded for the following year's growth of weeds. Amine forms are preferred to ester formulations in applying postemergence herbicides. The risk that vapors from herbicides may drift and damage other plants is much greater for ester formulations than for amines.

Eliminating weeds is of minimal value unless desirable grass is present to fill in the bare spots. A reseeding program should be considered whenever the existing turf is weak. If reseeding is used in conjunction with preemergence herbicides, siduron should be the herbicide used since the others will interfere with the germination of desirable grasses along with the weeds. Some postemergence herbicides will also affect new seedlings of desirable grasses. Most are safe to apply after new grass has been cut two or three times.

Table 1 lists some of the herbicides commonly used on turfgrass areas. The registration status of herbicides and other pesticides is continuously reviewed by manufacturers and the Environmental Protection Agency and is subject to change. Read the product label before purchasing to make certain it is registered for the intended use. Table 2 lists some of the weeds common to turfgrass areas in Minnesota and herbicides used to control them.

Controlling Insects

Detecting the presence of an insect is the first step in good insect control. Be sure to examine an area of grass that contains living as well as damaged grass plants. The most serious turf insects feed on living plants and are not found in dead areas. Insects found in completely dead patches generally are not responsible for the damage.

If the turf looks wilted and water-starved, a root-feeding insect may be involved. Peel the sod back, examine the roots, and look for any root-feeding pests. Some insects hide in the thatch and then feed on the grass blades. Damage from this type of feeding appears as brown patches when the blades are clipped off. You must search in the thatch to find the insect. Others live on the blades and withdraw the plant's sap. Close examination of the grass blade will reveal this type of pest.

Once detected, the insect should be identified. The following information can help in identifying the most common turf insects. The insects are listed according to where they are found.

Root Feeders

White grubs are the larvae of the common May beetles or June bugs that fly to lights in the spring. The adults lay eggs in spring and summer. The damaging grubs are whitish with brown heads. They feed on the roots of grass, and heavy infestations will loosen sod so that it can be rolled back with a minimum of resistance. The grubs are usually found curled in a "C" shape. Population levels of 3 to 10 grubs per square foot can be expected to produce noticeable damage. Therefore, control is justified when a random check of the turf shows this level.

The most common species in Minnesota feed on the roots for three years before they reach the adult stage. The first year, grubs are up to ½ inch long and produce little damage. The second year, the grubs range from ½ inch to ¾ inch in length, and damage becomes more apparent. This is the best time to control the grubs since damage usually is not extensive and chemicals will effectively control the grubs. The third year, the grubs grow to 1 inch or more, and damage becomes very apparent, particularly in the hot, dry month of August. Unfortunately, control is not effective at this time since damage is generally complete and the big grubs are difficult to kill.

The best method of control is to examine the turf at least once a year and treat with a suggested insecticide when 2 to 5 one-half-inch grubs are found per square foot. Getting the insecticide into the root zone is important in successful grub control. This is best done by wetting the turf the previous evening, applying a granular form of the insecticide the following morning, and immediately watering thoroughly. Do not treat in the fall, since the grubs move down into the soil for the winter.

Ataenius spretulus are white grubs with a one year life history. They can be damaging to annual bluegrass on golf courses. They are not a threat to home lawns.

Adult control with diazinon 48 percent E.C. when *Spirea van houtteii* and black locust are in bloom is best.

Adults are black or brownish-black and ⅛ inch long. Larval control also is possible in early July. Larval populations of 30 per square foot can be damaging. Larvae are "C" shaped, ⅛ inch long, and white.

Bluegrass billbugs, as adults, are long-snouted, ¼-inch, gray-to-black beetles with a strongly tapered abdomen. They can be found walking on hard surfaces in early spring prior to depositing eggs in grass stems. The plump, legless white larvae that hatch first feed on stems and then on available roots. Infested turf has off-colored, irregularly shaped areas that yellow and finally turn brown in late July. Areas of advanced infestation will peel back, but with more resistance than that found for white grubs. However, these areas can contain individual plants that offer little resistance when pulled.

Billbugs are best controlled in May as the females are laying eggs. Application of an insecticide is suggested approximately 10 days after adults are sighted. Billbugs, like white grubs, also can be controlled when the larvae are feeding on the roots. Approximately 10 larvae per square foot are considered sufficient to cause noticeable damage. Treatment is not suggested in late July or August because the larvae complete their feeding then and move 1-2 inches into the soil to pupate.

Blade Feeders

Sod webworm is the most common blade feeding turf pest in Minnesota. The adults frequently are called lawn moths. They are light-colored moths or "millers" that make short, erratic, darting flights. They fold their wings back closely against their bodies when resting. This gives them a very narrow appearance.

The moths lay their eggs in the turf. The worms hatch from these eggs and begin to feed at night on the grass leaves. Some species damage plant crowns or roots as well as leaves. During the day the worms hide in silk-lined tunnels or burrows at or slightly below the soil surface. When fully grown, the worms are a dirty white to light brown with darker spots and are approximately ¾ inch long.

Close visual examination of the thatch will detect this pest. Flooding the area with water will force the worms to the surface where they can be counted. A population of 15 worms per square yard may damage turf seriously. Examinations should be made in June and again in early August, since sod webworms have two generations a year. The lawn should be well watered a day or so before applying the insecticide; then delay further watering for at least three days after treatment.

Cutworm larvae are similar to sod webworm larvae but do not construct silk-lined tunnels. The larvae coil when disturbed and are generally gray and soft-bodied. They are often associated with holes produced during spring aeration. All stages of the insect may be present at the same time. They are more common on golf courses than in home lawns.

Aphids or *leafhoppers* are small insects that can be found feeding on the exposed blades. Established turf is seldom damaged; however, new lawns can suffer from feeding by these sap-sucking insects. Control is suggested for new lawns only.

Greenbugs are aphids that can damage established turf. The insects are small and yellow to green, and they can be found by sweeping your hand over suspected areas. Greenbugs are carried into Minnesota by southerly winds, so they can show up overnight. Damage is almost always to areas of the lawn shaded by trees or shrubs. Bluegrass is mainly attacked. Control is suggested when greenbug populations are first noted.

Chinch bugs on turf are rare in Minnesota. Obtain positive identification before control is attempted. Immature bugs are red but become dark as they mature. Adults are 1/8 inch long, have a head that is narrower than the thorax (shoulder) and have white forewings with a conspicuous black triangle midway along the outside margin.

Insects That Live in Grass

There are a few very common insects or insect relatives that live in grass but do not cause direct feeding damage.

False chinch bugs are approximately 1/4 inch long, brown, and generally found in dead areas of the turf. They can be distinguished from the true chinch bug by the absence of a *conspicuous* black triangle on the outer wing margin and by a head that is about the same width as the thorax (shoulder). Control is not recommended since they do not cause damage.

Big-eyed bugs are also confused with the true chinch bug. However, the head of the big-eyed bug is as wide as the thorax (shoulder) and the eyes are very noticeable. The big-eyed bug feeds on other insects; control is not recommended.

Ants are to be expected in lawns. Their preference for nesting in areas of sparse vegetation can lead to the assumption that the ants are causing the poor lawn development. This is not true. Ants do not feed on plants and so pose no threat to lawns. Ant control is not justified on the basis of protecting the lawn.

Ants on golf courses can pose problems. Some ants are associated with root feeding aphids. Control as colonies appear.

Night crawlers are beneficial and should be tolerated whenever possible. However, large populations can cause lumpiness and, in extreme cases, reduce the value of the turf for recreation. Vertical mowing can help reduce the lumpiness and also the amount of food available for night crawler development. Pesticide application also can be used to reduce the night crawler population.

Controlling Diseases

Lawn grasses may be seriously damaged by diseases; however, with proper fertilization, watering, and mowing, most lawns will recover and the manager may not even recognize the disease. Good turf care is the best preventive measure for lawn diseases.

Disease prevention practices include the following: a) grow grasses adapted to your area and level of management; b) apply fertilizer according to local recommendations and based on a soil test; c) water when it's needed but avoid keeping the grass wet for long periods; d) mow frequently at the recommended height for your grass type and use; e) maintain thatch layer at less than 1/2 inch; f) thin or prune trees and shrubs to allow air movement and light penetration; g) improve drainage and reduce compaction by aerifying.

Table 1. Herbicides commonly used for control of weeds in turf.

Common Name	Trade Name	Type of Control	Remarks
Benfenin	Balan	Preemergence	Controls annual grasses; do not use on bentgrass greens; do not reseed for 6-8 weeks after application.
Bensulide	Betasan, Pre-san	Preemergence	Controls annual grasses; do not reseed for 4 months after application.
Bentazon	Basagran	Postemergence	Most effective herbicide for yellow nutsedge control; apply when plants are growing vigorously.
Bromoxynil	Buctril, Brominal	Postemergence	Controls broadleaf weeds; especially effective when weed seedlings are 1/2 inch tall.
DCPA	Dacthal	Preemergence	Effective on germinating grasses and some broadleaf weeds; do not reseed for 10-12 weeks after application.
Dicamba	Banvel	Postemergence	Controls broadleaf weeds; often used in mixtures with 2,4-D and MCPP; can severely damage ornamental trees and shrubs through root uptake; use only in open areas; do not reseed for 6 weeks after application.
Glyphosate	Roundup	Postemergence	Nonselective herbicide that kills all vegetation; apply when plants are actively growing and no rain expected for 12-14 hours; can reseed 48 hours after application.
MCPP, MCPA, or Mecoprop	Numerous names	Postemergence	Controls broadleaf weeds; often used in mixtures with 2,4-D and dicamba; especially good against clover.
Methanearsonates	Numerous forms of AMA, CMA, DSMA, MAMA, MSMA,	Postemergence	Controls annual grassy weeds such as crabgrass; apply when soil moisture is good; repeated applications at 10-14 day intervals often necessary.
Oxadiazon	Ronstar	Preemergence	Controls annual grasses and some broadleaf weeds; do not use on bentgrass greens or fescue lawns.
Siduron	Tupersan, Trey	Preemergence	Controls annual weedy grasses; may reseed desirable grasses immediately.
2,4-D	Numerous names	Postemergence	Controls many broadleaf weeds; apply when weeds are actively growing; fall is most effective time.

Table 2. Weeds commonly found in turf and chemicals used for control.

Weed	Type of Weed	Herbicides for Control	Time of Application
Barnyardgrass	Annual grass	Benefin, Bensulide, DCPA, Siduron, Oxidiazon	May
Bluegrass, Annual	Annual grass	Benefin, Bensulide, DCPA, Siduron	May or August
Bromegrass, Smooth	Perennial grass	Glyphosate	Anytime air temp. is above 50 degrees F.
Chickweed	Perennial broadleaf	MCPP, Dicamba	Mid-Aug. - Oct. or Apr. - May
Clover	Perennial broadleaf	MCPP, Dicamba	Mid-Aug. - Oct. or Apr. - May
Crabgrass	Annual grass	Benefin, Bensulide, DCPA, Siduron, Oxidiazon	Early May
Dandelion	Perennial broadleaf	2,4-D, MCPP	Mid-Aug. - Oct. or Apr. - May
Dock	Perennial broadleaf	2,4-D	Mid-Aug. - Oct. or Apr. - May
Fescue, Tall	Perennial grass	Glyphosate	Any time air temp. is above 50 degrees F.
Foxtail	Annual grass	Benefin, Bensulide, DCPA, Siduron	May
Henbit	Annual broadleaf	2,4-D + Dicamba	April - May or Oct. - Nov.
Ivy, Ground	Perennial broadleaf	2,4-D + MCPP + Dicamba	Mid-Aug. - Oct. or Apr. - May
Knotweed, Prostrate	Annual broadleaf	2,4-D + MCPP + Dicamba	April - May
Mallow	Annual broadleaf	2,4-D + MCPP + Dicamba	April - May
Medic, Black	Annual or perennial broadleaf	Dicamba	Mid-Aug. - Oct. or April - May
Nutsedge, Yellow	Perennial grass	Bentazon, Methanearsonates	May - June
Plaintain	Perennial broadleaf	2,4-D	Mid-Aug. - Oct. or Apr. - May
Purslane, Common	Annual broadleaf	2,4-D + Dicamba	May - Sept.
Quackgrass	Perennial grass	Glyphosate	Anytime air temp. is above 50 degrees F.
Sandbur	Perennial grass	Methanearsonates	May - June
Shepherd's-purse	Annual broadleaf	MCPP, Dicamba	Oct. - Nov. or April
Spurge, Prostrate	Annual broadleaf	2,4-D + MCPP + Dicamba	May - August
Thistle, Canada	Perennial broadleaf	2,4-D + MCPP	Mid-Aug. - Oct. or Apr. - May
Woodsorrel, Yellow	Annual or perennial broadleaf	2,4-D + MCPP + Dicamba	May - June
Yarrow	Perennial broadleaf	2,4-D + Dicamba	May - August

Table 3. Insecticide suggestions to control turf insects in 1981.

Pest	Pesticide	Dosage	Remarks
Ants	Diazinon 48% E.C.*	4 fl. oz. per 3 gals.	Spot treat nests for best results.
	25% E.C.	8 fl. oz. per 3 gals. to cover 125 sq. ft.	
	50% W.P.	4 oz. per 3 gals.	
	Chlorpyrifos 22.4% E.C.* (Dursban)	1½ fl. oz. per 30 gals. to cover 1,000 sq. ft.	
	5.3% E.C. bendiocarb 76% W.P.* (Turcam)	4 fl. oz. per 15 gals. to cover 500 sq. ft. ½-1 oz. to cover 1,000 sq. ft.	
Billbugs	Diazinon 48% E.C. (AG 500)	4 fl. oz. in 3 gals. to cover 1,000 sq. ft.	Irrigate turf after treatment. Apply mid-May through mid-June.
	(or Spectracide E.C. or G) Propoxur 70% W.P.* (Baygon)	As labeled 4 oz. in 15-40 gals. to cover 1,000 sq. ft.	
Cutworm	Carbaryl 80% W.P. (Sevin) 50% W.P.	1¼ lbs. in 200 gals. to cover 5,000 sq. ft. 2 lbs. in 200 gals. to cover 5,000 sq. ft.	Withhold water for 2-3 days following application.
	Chlorpyrifos 22.4% E.C.* (Dursban)	1½ fl. oz. in 30 gals. to cover 1,000 sq. ft.	
	5.3% E.C. Diazinon 48% E.C. (or Spectracide)	4 fl. oz. in 15 gals. to cover 1,000 sq. ft. 4 fl. oz. per 3 gals. to cover 1,000 sq. ft. of soil (As labeled)	
	Trichlorfon 80% S.P. (Dylox, Proxol) 40.5% E.C.	2½-3¼ oz. in 15-30 gals. to cover 1,000 sq. ft. ¼-¾ pint in 15-20 gals. to cover 1,000 sq. ft.	

Table 3. (continued) Insecticide suggestions to control turf insects in 1981.

Pest	Pesticide	Dosage	Remarks	
Chinch bug	Carbaryl, Diazinon Chlorpyrifos (see cutworm) Aspon 13% E.C. 5% G 67.6% E.C.* bendiocarb 76% W.P.* (Turcam)	10 $\frac{2}{3}$ fl. oz. in 15 gals. to cover 500 sq. ft. 3 $\frac{1}{2}$ lbs. per 1,000 sq. ft. 18-24 fl. oz. in 150-200 gals. to cover 5,000 sq. ft. $\frac{1}{2}$ -1 oz. to cover 1,000 sq. ft.	Chinch bugs are rare in Minnesota. Be sure of identification before treatment is attempted.	
Nightcrawlers	Carbaryl 80% W.P. (Sevin) 50% W.P.	1 $\frac{1}{4}$ lbs. in 200 gals. to cover 5,000 sq. ft. 2 lbs. in 200 gals. to cover 5,000 sq. ft.	Water thoroughly following application.	
Slugs	Chlorpyrifos 22% E.C.* (Dursban) Mesuroil 2% Bait Metaaldehyde 2% Bait	1 lb. to cover 1,000 sq. ft. 1 lb. to cover 1,000 sq. ft.		
Sod webworm	Carbaryl, Chlorpyrifos (see cutworm) Diazinon 50% W.P. 48% E.C. (or Spectracide) Trichlorfon 40.5% E.C. (Dylox, Proxol) 80% S.P. Chlorpyrifos 22.4% E.C.* (Dursban) 5.3% E.C. Aspon 13% E.C. Propoxur 13.5% E.C.* (Baygon) 70% W.P.* Ethoprop 5% G*	4 oz. per 3 gals. to cover 1,000 sq. ft. 4 fl. oz. per 3 gals. to cover 1,000 sq. ft. (As labeled) $\frac{1}{4}$ - $\frac{3}{8}$ pints in 15-30 gals. to cover 1,000 sq. ft. 2 $\frac{1}{4}$ -3 $\frac{3}{4}$ oz. in 15-30 gals. to cover 1,000 sq. ft. 1 $\frac{1}{2}$ fl. oz. to cover 1,000 sq. ft. 4 fl. oz. in 15 gals. to cover 1,000 sq. ft. 10 $\frac{2}{3}$ fl. oz. in 15 gals. to cover 1,000 sq. ft. 11 fl. oz. in 10-15 gals. to cover 1,000 sq. ft. 2 $\frac{3}{4}$ oz. in 10-15 gals. to cover 1,000 sq. ft. 2.3 lbs./1,000 sq. ft.	Withhold water for 2-3 days following application.	
White Grub	Diazinon 48% E.C. Diazinon 2% G Diazinon 5%G Diazinon 14% G Trichlorfon 40.5% E.C. (Dylox, Proxol) 80% S.P. Chlorpyrifos 5.3% E.C. (Dursban) 41.2% E.C.* Ethoprop 5% G* bendiocarb 76% W.P.* (Turcam)	4 fl. oz. to cover 1,000 sq. ft. 6 lbs. per 1,000 sq. ft. 2 $\frac{1}{2}$ lbs. per 1,000 sq. ft. 1 lb. per 1,000 sq. ft. $\frac{3}{8}$ pints in 30 gals. to cover 1,000 sq. ft. 3 $\frac{3}{4}$ oz. in 30 gals. to cover 1,000 sq. ft. 16 fl. oz. in 15 gals. to cover 500 sq. ft. 1 $\frac{1}{2}$ -3 fl. oz. in 30 gals. to cover 1,000 sq. ft. 2.3 lbs/1,000 sq. ft. For <i>Ataenius spretulus</i> larval control. Apply $\frac{1}{2}$ "-1" water after application. Bluegrass only. Not for home lawn use. Use on dry foliage only. 1-2 oz. to cover 1,000 sq. ft.	also for <i>Ataenius spretulus</i> larval control.	Water thoroughly following application. Best control is achieved when grubs are less than $\frac{1}{2}$ " long. Granulars are more effective than E.C. formulations.

*Commercial applicators only.

Table 4. Periods when diseases are most likely in Minnesota and number of fungicide treatments required for best management.

	Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
Leaf Spot					3-4				1			
Fusarium Blight					1			*	1			
Smut						2-3			1-2			
Dollar Spot							*					
Fairy Ring					1				1			
Powdery Mildew										1		
Rust											1	
Fusarium Patch		1										
Typhula Blight		*									1-3	
Pythium Blight							1-3					
Brown Patch							1-3					
Septoria					1-2					*		

*indicates no chemicals are recommended

Table 5. Turfgrass diseases and fungicides.

Disease	Common Name	Trade^{ab} Name	Manufacturer^c
Helminthosporium Leaf Spot and Blight (melting out)	Chlorothalonil	Daconil 2787, 75% W 6F, 4F Proturf 101V Broad Spec- trum Fungicide, 95% G*	Diamond Shamrock OM Scott
Helminthosporium sp.	Cycloheximide Cycloheximide + PCNB Cycloheximide + Thiram Dyrene	Acti-dione TGF, 2.1% W Acti-dione RZ, 76.3% W* Acti-dione Thiram, 75.7% W Dyrene, 50% W* Dymec 50, 50% W* Proturf Fungicide III, 8.7% G* Ortho Dyrene Lawn Disease Control 50% W	Upjohn Upjohn Upjohn Mobay PBI-Gordon OM Scott Chevron
	Folpet Iprodione Kromad Mancozeb	Folpet (Phaltan) 50% W Chipco 26019, 50% W Kromad, 27.5% W* Fore, 80% W Formec 80, 80% W* Tersan LSR, 80% W	Stauffer Rhône-Poulenc Mallinckrodt Rhom & Haas PBI-Gordon duPont
	Maneb Pentachloronitro- benzene (PCNB)	Lawn Disease Preventer 9.95% G Proturf FFII, 15.4% G* Turficide, 10% G*	OM Scott Olin OM Scott
	Phenylmercuric Acetate (PMA) + Thiram Thiophanate Thiophanate + Thiram Thiophanate + Dyrene	Proturf Broad Spectrum Fungicide, 5.34% G* Cleary 3336, 50% W* Bromosan, 66.67% W* Spectro Turf Fungicide, 50% W*	W.A. Cleary W.A. Cleary W.A. Cleary
	Zineb	Dithane Z-78, 75% W* Acme Zineb 75 W	Rhom & Haas PBI-Gordon
Fusarium Blight Fusarium roseum Fusarium tricinctum	Bayleton Benomyl Rubigan Thiophanate Thiophanate-methyl	Bayleton 25%W Tersan 1991, 50% W Rubigan 50 W* Cleary 3336, 50% W* Fungo 50, 50% W* Topmec 70, 70% W* Proturf Systemic Fungi- cide, 1.15% G*	Mobay duPont Elanco W.A. Cleary Mallinckrodt PBI-Gordon OM Scott
Sclerotinia Dollar Spot Sclerotinia homeocarpa	Bayleton Benomyl	Bayleton, 25% W* Tersan 1991, 50%	Mobay duPont
	Cadmium chloride Cadmium succinate Chlorothalonil	Caddy, 20% L* Cad-Tret, 83% W* Cadminate, 60% W* Daconil 2787, 75% W 6F, 4F Proturf 101 V Broad Spec- trum Fungicide 9.5% G*	W.A. Cleary W.A. Cleary Mallinckrodt Diamond Shamrock OM Scott
	Cycloheximide Cycloheximide + PCNB Cycloheximide + Thiram Duosan Dyrene	Acti-dione TGF, 2.1% W Acti-dione RZ, 76.3% W* Acti-dione Thiram, 75.7% W Duosan 75%W Dyrene, 50% W* Dymec 50, 50% W* Proturf Fungicide III, 8.7% G* Ortho Dyrene Lawn Disease Control, 50% W	Upjohn Upjohn Upjohn Mallinckrodt Mobay PBI-Gordon OM Scott Chevron
	Iprodione Kromad Mancozeb	Chipco 26019, 50% W Kromad, 27.5% W* Fore, 80% WP Formec 80, 80% W* Lawn Disease Preventer 9.95% G	Rhône-Poulenc Mallinckrodt Rhom & Haas PBI-Gordon OM Scott
	Pentachloronitro- benzene (PCNB)	Lawn Disease Preventer 9.95% G Proturf FFII, 15.4% G* Turficide, 10% G*	OM Scott Olin OM Scott
	Phenylmercuric Rubigan Acetate (PMA) + Thiram Thiophanate Thiophanate-methyl	Proturf Broad Spectrum Rubigan 50 W* Fungicide 5.34% G* Cleary 3336, 50% W* Fungo 50, 50% W* Topmec 70, 70% W* Proturf Systemic Fungi- cide, 1.15% G*	W.A. Cleary Mallinckrodt PBI-Gordon OM Scott W.A. Cleary W.A. Cleary
	Thiophanate + Thiram Thiophanate + Dyrene	Bromosan, 66.67% W* Spectro Turf Fungicide 50% W*	W.A. Cleary W.A. Cleary
	Thiram	Spotrete, 75% W* Tersan 75, 75% W Thiramad, 75% W*	W.A. Cleary duPont Mallinckrodt
	Vorlan	Vorlan 50 W*	Mallinckrodt

Table 5. (continued) Turfgrass diseases and fungicides.

Disease	Common Name	Trade ^{ab} Name	Manufacturer ^c
Stripe Smut Ustilago striiformis	Bayleton	Bayleton, 25% W*	Mobay
	Benomyl	Tersan 1991, 50% W	duPont
	Pentachloronitro- benzene (PCNB)	Lawn Disease Preventer 9.95% G	OM Scott
	Thiophanate	Proturf FFII, 15.4% G*	OM Scott
	Thiophanate-methyl	Turficide, 10% G* Cleary 3336, 50% W* Fungo 50, 50% W* Topmec 70, 70% W* Proturf Systemic Fungi- cide, 1.15% G*	Olin W.A. Cleary Mallinckrodt PBI-Gordon OM Scott
Rust Puccinia spp.	Bayleton ^d	50% W	Mobay
	Chlorothalonil	Daconil 2787, 75% W 6F, 4F Proturf 101V Broad Spec- trum Fungicide, 9.5% G	Diamond Shamrock OM Scott
	Cycloheximide	Acti-dione TGF, 2.1% W	Upjohn
	Cycloheximide + PCNB	Acti-dione RZ, 76.3% W*	Upjohn
	Cycloheximide + Thiram	Acti-dione Thiram, 75.7% W	Upjohn
	Dyrene	Dyrene, 50% W*	Mobay
	Mancozeb	Fore, 80% W Formec 80, 80% W*	Rhom & Haas PBI-Gordon
	Pentachloronitro- benzene (PCNB)	Lawn Disease Preventer 9.95% G Proturf FFII, 15.4% G* Turficide, 10% G*	OM Scott Olin
	Zineb	Dithane Z-78, 75% W* Acme Zineb 75 W	Rohm & Haas PBI-Gordon
Powdery Mildew Erysiphe graminis	Bayleton	Bayleton, 25% W*	Mobay
	Cycloheximide	Acti-dione TGF, 2.1% W	Upjohn
	Cycloheximide + PCNB Cycloheximide + Thiram Mancozeb	Acti-dione RZ, 76.3% W* Acti-dione Thiram, 75.6% W Fore, 80% W Formec 80, 80% W*	Upjohn Upjohn Rhom & Haas PBI-Gordon
Gray Snow Mold (Typhula Blight)	Cadmium chloride	Caddy, 20% L*	W.A. Cleary
	Cadmium succinate	Cad-Trete, 83.5% W*	W.A. Cleary
	Calo-Clor	Cadminate, 60% W*	Mallinckrodt
	Calo-Gran	Calo-Clor, 90% W*	Mallinckrodt
	Chloroneb	Calo-Gran, 2.2% G*	Mallinckrodt
	Dyrene	Tersan SP, 65% W* Dyrene, 50% W* Dymec 50, 50% W* Proturf Fungicide III, 8.7% G*	duPont Mobay PBI Gordon OM Scott
		Ortho Dyrene Lawn Disease Control, 50% W	Chevron
		Lawn Disease Preventer, 9.95% G	OM Scott
		Proturf FFII, 15.4% G* Turficide, 10% G*	OM Scott Olin
		Proturf Broad Spectrum Fungicide, 5.34% G*	OM Scott
	Thiram	Spotrete, 75% W* Tersan 75, 75% W* Thiramad, 75% W*	W.A. Cleary duPont Mallinckrodt
Pink Snow Mold (Fusarium Patch) Fusarium nivale	Bayleton	Bayleton, 25% W*	Mobay
	Benomyl	Tersan 1991, 50% W	duPont
	Cadmium chloride	Caddy, 20% L*	W.A. Cleary
	Cadmium chloride	Cad-Trete, 83.5% W*	W.A. Cleary
	Calo-Clor	Calo-Clor, 90% W*	Mallinckrodt
	Calo-Gran	Calo-Gran, 2.2 G*	Mallinckrodt
	Cycloheximide + Thiram	Acti-dione Thiram 75.7% W	Upjohn
	Mancozeb	Fore, 80% W Formec 80, 80% W*	Rohm & Haas PBI-Gordon
		Lawn Disease Preventer 9.95% G	OM Scott
		Proturf FFII, 16.4% G* Turficide, 10% G* Proturf Broad Spectrum Fungicide, 5.34% G*	OM Scott Olin OM Scott
	Phenylmercuric Acetate (PMA) + Thiram		
	Rubigan	Rubigan 50 W*	Elanco
	Thiophanate-methyl	Fungo 50, 50% W* Topmec 70, 70% W* Proturf Systemic Fungi- cide, 1.15% G*	Mallinckrodt PBI-Gordon OM Scott
	Thiram	Spotrete, 75% W* Tersan 75, 75% W* Thiramad, 75% W*	W.A. Cleary duPont Mallinckrodt



Table 5. (continued) Turfgrass diseases and fungicides.

Disease	Common Name	Trade ^{ab} Name	Manufacturer ^c	
Pythium Blight (Greasy Spot, Cottony Blight) Pythium spp.	Chloroneb Cycloheximide + PCNB	Tersan SP, 65% W* Acti-dione TGF, 76.3% W	duPont Upjohn	
	Ethazole Terrazole	Koban, 35% W* Terrazole, 35% W*	Mallinckrodt Olin	
Rhizoctonia Brown Patch Rhizoctonia solani	Benomyl Cadmiun chloride	Tersan 1991, 50%W Cad-Trete, 83% W*	duPont W.A. Cleary	
	Cadmiun succinate Calo-Clor Chlorothalonil	Cadminate, 60% W* Calo-Clor, 90% W* Daconil 2787, 75% W, 6F, 4F	Mallinckrodt Mallinckrodt Diamond Shamrock	
	Cycloheximide + PCNB Cycloheximide + Thiram Dyrene	Proturf 101V Broad Spec- trum Fungicide, 9.5% G* Acti-dione RZ, 76.3% W* Acti-dione Thiram, 75.7% W Dyrene, 50% W* Dymec 50, 50%W* Proturf Fungicide II, 8.7% G*	OM Scott Upjohn Mobay PBI-Gordon OM Scott	
	Iprodione Kromad Mancozeb	Ortho Dyrene Lawn Disease Control, 50% W Chipco 26019, 50% W Kromad, 27.5% W* Fore, 80% W Formec 80, 80% W* Lawn Disease Preventer 9.95 % G	Chevron Rhone-Poulenc Mallinckrodt Rohm & Haas PBI-Gordon OM Scott	
	Pentachloronitro- benzene (PCNB)	Proturf FFII, 15.4% G* Turficide, 10% G* Proturf Broad Spectrum Fungicide, 5.4% G*	OM Scott Olin OM Scott	
	Phenylmercuric Acetate (PMA) + Thiram	Rubigan 50 W* Cleary 3336, 50% W* Fungo 50, 50% W* Topmec 70, 70% W* Proturf Systemic Fungi- cide, 1.15% G*	Elanco W.A. Cleary Mallinckrodt PBI-Gordon OM Scott	
	Rubigan Thiophanate Thiophanate-methyl	Bromosan, 66.65% W* Spectro Turf Fungicide 50% W*	W.A. Cleary W.A. Cleary	
	Thiophanate + Thiram Thiophanate + Dyrene	Spotrete, 75% W* Tersan 75, 75% W Thiramad, 75% W*	W.A. Cleary duPont Mallinckrodt	
	Thiram	Captan 50-W, 50% W Orthocide 50 Wettable, 50% W Orthocide 80 Wettable 80% W Captan 50-W, 50% W Captan 80-W, 80% W Koban, 35% W* Spotrete 75% W* Tersan 75, 75% W Thiramid, 75% W* Dyrene, 50% W* Dymec 50, 50% W* Ortho Dyrene Lawn Disease Control, 50% W Terrazole, 35% W*	Rohm & Haas Chevron Chevron Stauffer Stauffer Mallinckrodt W.A. Cleary duPont Mallinckrodt Mobay PBI-Gordon Chevron Olin	
	Damping-Off Pythium spp. Fusarium spp. Rhizoctonia solani	Ethazole (Pythium) Thiram		
		Dyrene		
		Terrazole (Pythium)		

^aTrade name followed by the percent active ingredients, W = wettable powder, F = flowable liquid, G = granular, L = liquid.

^bTrade names marked with an asterisk (*) are generally for use only by professional turfgrass managers.

^cThe labels for the same fungicide may differ between manufacturers. Follow the label directions for the particular product being applied.

^dGrass seed production only.

The information given in this publication 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 Minnesota Agricultural Extension Service is implied.

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