

Chapter Two

**DISEASES OF
FORAGE LEGUMES AND GRASSES**

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Section A: Forage Legumes

ALFALFA (*Medicago sativa*)

BACTERIAL WILT

Clavibacter michiganensis subsp. *insidiosum*

Cultural: Use crop sequences that include no more than 4 consecutive years of a susceptible alfalfa cultivar. Thoroughly clean and disinfest mowers between infested and noninfested fields. Harvest young stands before old ones when using the same equipment. Avoid cutting when plants are wet.

Resistant Cultivars:

Resistant: Most cultivars are resistant.

Intermediate: Rambler.

Susceptible: Anik, Peace, Rangelander.

Chemical: None.

Notes: Stem nematodes may transmit wilt bacteria; therefore, use nematode and wilt-resistant cultivars where both diseases occur together.

References:

1. Goplen, B.P. *et al.* 1980. Growing and managing alfalfa in Canada. Can. Dep. Agric. Publ. 1705.
2. Nelson, G.A. 1977. Bacterial wilt of alfalfa. Alberta Dep. Agric., Agdex 121/632-1.
3. Peake, R.W. and Cormack, M.W. 1955. Effect of bacterial wilt on hay yield of irrigated alfalfa. Can. J. Agric. Sci. 35: 202-210.
4. Pearse, P.G., Howard, R.J., Hwang, S.F., and P.R. Northover. 2004. Survey of bacterial wilt pathogens in alfalfa seed produced in Alberta, Saskatchewan and Manitoba in 2003 and 2004. Can. Plant Dis. Surv. 84: 60-61.

BLACK STEM and LEAF SPOT

Phoma medicaginis var. *medicaginis* (syn. *Ascochyta imperfecta*)

Cultural: Rotate alfalfa with non-legume crops. Spring burning has been recommended, but may injure stand if growth has already begun. When disease is prevalent, early cutting will reduce leaf loss.

Resistant Cultivars: None.

Intermediate: Beaver, Rambler and Vernal.

Chemical: Boscalid WG or mancozeb WG.

Limitations: May be used for alfalfa grown for seed only.

Notes: Usually 2 years are required for inoculum build-up. Cool moist conditions favour this disease. Thiram used as a seed treatment for the control of seed decay and seedling blight may reduce black stem in the early years of a stand.

References:

1. Cormack, M.W. 1945. Studies on *Ascochyta imperfecta*, a seed and soil-borne parasite of alfalfa. *Phytopathology* 35: 838-855.
2. Harding, H. 1972. Foliage diseases of alfalfa in northern Saskatchewan: a note on the 1972 survey and the differential reactions of nine varieties. *Can. Plant Dis. Surv.* 52: 149-150.
3. Hwang, S.F., Wang, H., Gossen, B.D., Chang, K.F., Turnbull, G.D. and Howard, R.J. 2006. Impact of foliar diseases on photosynthesis, protein content and seed yield of alfalfa and efficacy of fungicide application. *Eur. J. Plant Path.* 115: 389-399.
4. Mead, H.W. 1964. Resumé of data on black stem of alfalfa caused by *Ascochyta imperfecta* Pk. *Can. Plant Dis. Surv.* 44: 134-141.
5. Wang, H., Hwang, S.F., Gossen, B.D., Turnbull, G.D. and Howard, R.J. 2004. Assessing resistance to spring black stem of alfalfa caused by *Phoma* spp. *Can. J. Plant Sci.* 84: 311.

BLOSSOM BLIGHT

Botrytis cinerea, *Sclerotinia sclerotiorum*

Cultural: High humidity is a prerequisite for blossom blight epidemics. An outbreak is less likely to occur in thin stands because of increased air movement and faster drying.

Resistant Cultivars: None.

Chemical: Boscalid WG.

Limitations: May be used for alfalfa grown for seed only.

Notes: This disease is not highly seed-borne (2).

References:

1. Gossen, B.D., Smith, S.R. and Platford, R.G. 1994. *Botrytis cinerea* blossom blight on alfalfa on the Canadian Prairies. *Plant Dis.* 78: 1218.
2. Gossen, B.D. and Anderson, K. 1995. Survey of *Botrytis cinerea* in alfalfa seed in Saskatchewan and Manitoba, 1993. *Can. Plant Dis. Surv.* 75: 166-167.
3. Lan, Z. 1999. Development and Control of *Botrytis cinerea* in Alfalfa Flowers. M.Sc. Thesis, University of Saskatchewan, Saskatoon, SK. 119 pp.
4. Olivier, C., Gossen, B.D., and Séguin-Swartz, G. 2008. White mold (*Sclerotinia sclerotiorum*) infection of flowers and leaves on bean and alfalfa. *Can. J. Plant Pathol.* 29: 58-65.

COMMON LEAF SPOT

Pseudopeziza medicaginis

Cultural: Harvest for hay before defoliation becomes severe.

Resistant Cultivars: Rambler.

Chemical: Boscalid WG, mancozeb WG or pyraclostrobin EC.

Limitations: May be used for alfalfa grown for seed only.

References:

1. Harding, H. 1972. Foliage diseases of alfalfa in northern Saskatchewan; a note on the 1972 survey and the differential reactions of nine varieties. *Can. Plant Dis. Surv.* 52: 149-150.

CROWN AND ROOT ROT

Rhizoctonia solani, *Fusarium roseum*, *Phoma medicaginis* var. *medicaginis*, *Pseudomonas viridiflava*

Cultural: Use cultivars with resistance to cold and bacterial wilt. Fertilize according to results of soil analysis. Cultivars with *M. falcata* backgrounds (winter-hardy cultivars) are generally more resistant than those with *M. sativa* backgrounds.

Resistant Cultivars: None.

Intermediate: AC Nordica, Heinrichs, Rambler and other cultivars with subsp. *falcata* parentage.

Susceptible: Algonquin, Apica, Beaver and other cultivars with subsp. *sativa* parentage.

Chemical: None.

References:

1. Gossen, B.C. 1994. Field response of alfalfa to harvest frequency, cultivar, crown pathogens, and soil fertility: II. Crown rot. *Agron. J.* 86: 88-93.
2. Gossen, B.D. 1998. Development of secondary crowns reduces crown rot severity in alfalfa cultivars. *Agron. J.* 90: 587-590.
3. Leath, K.J. and Kendall, W.A. 1978. *Fusarium* root rot of forage species: pathogenicity and host range. *Phytopathology* 68: 826-831.
4. Richard, C. *et al.* 1982. Low-temperature interactions in *Fusarium* wilt and root rot of alfalfa. *Phytopathology* 72: 293-297.

DAMPING-OFF AND SEEDLING BLIGHT

Pythium spp., *Aphanomyces* spp., and other soil-borne root rot pathogens

Cultural: Use seed with high percentage germination and vigour.

Resistant cultivars: None.

Chemical: Treat seed with thiram 75% WP; metalaxyl SU.

Limitations: Metalaxyl is only effective against *Pythium* spp. fungi.

References:

1. Gossen, B.D. 1994. Effect of fungicide seed treatments on establishment of alfalfa, 1994. Pp. 178-181 in 1994 Pest Management Res. Rep., AAFC, Ottawa, ON.
2. Hwang, S.F., *et al.* 2002. Seedbed preparation, timing of seeding, fertility and root pathogens affect establishment and yield of alfalfa. *Can. J. Plant Sci.* 82: 371-381.
3. Hwang, S.F., Wang, H., Gossen, B.D., Turnbull, G.D., Howard, R.J. and Strelkov, S. 2006. Effects of seed treatments and root pathogens on seedling establishment and yield of alfalfa, bird's-foot trefoil, and sweetclover. *Plant Pathol. J.* 5: 322-328.

DOWNY MILDEW*Peronospora trifoliorum***Cultural:** Rotation with non-legume crops. Harvest cleanly to prevent reinfection from crop residue.**Resistant Cultivars:** Algonquin and Anik.**Intermediate:** Beaver, Rambler, Roamer and Vernal.**Susceptible:** Rangelander.**Chemical:** None.**References:**

1. Berkenkamp, B. *et al.* 1978. Resistance of alfalfa cultivars to downy mildew. *Can. J. Plant. Sci.* 58: 893-894.
2. Ellis, P. and Berkenkamp, B. 1983. Alfalfa yield losses due to disease. *Can. Dep. Agric., Canadex* 632.121.

STEM NEMATODE*Ditylenchus dipsaci***Cultural:** Avoid late cutting and excessive grazing. Limit stand life to 4 years. Use fertilizer as indicated by soil fertility analysis. Rotate alfalfa with non-host crops such as grains, pulses, and sugar beets.**Resistant Cultivars:** 53Q60, Affinity+Z, Alfagraze, AmeriGraze 401+Z, Forecast 1001, Geneva, Haygrazer, Intrigue, Magnum IV, Magnum V-Wet, Nemesis, Prevail, Starbuck, Ultrastrand, and WL327.**Intermediate:** 630, 5246, 5262, 5454, Arrow, DK 124, DK 140, GH777, Magnum III, Magnum III-Wet, MultiKing I, MultiPlier 3, Proleaf, Rocket, Spredor 3 and WL 232HQ.**Susceptible:** 134, 5312, 54V54 and Trident II.**Chemical:** None.**Notes:** This disease has been reported only rarely on the prairies, and then primarily under irrigation.

VERTICILLIUM WILT

Verticillium albo-atrum

Cultural: Plough down infested fields as soon as possible. Control susceptible weeds and volunteer alfalfa in ploughed fields with herbicides or cultivation and do not plant alfalfa or other forage legumes in infested land for at least 3 years. Rotate alfalfa with resistant crops such as corn, grasses, and cereals. If both diseased and healthy fields are to be harvested, cut healthy fields first. Clean plant debris from harvesting equipment when moving it from field to field. Forage from infested fields should not be fed on forage land and should preferably be used on the producing farm. Prevent irrigation run-off from diseased to healthy fields. Control insect vectors such as pea aphid, alfalfa weevil and grasshopper.

Resistant Cultivars: Most cultivars have useful levels of resistance, but none are immune.

Susceptible: AC Grazeland Br, Algonquin, Anik and Runner.

Chemical: Seed may be treated with thiram WP or thiram SU.

Notes:

1. Resistant cultivars are also resistant to bacterial wilt.
2. Thiram seed treatment does not interfere with *Rhizobium* inoculum provided seed is sown soon after the inoculum is applied.
3. Thiram seed treatment is not required prior to movement and sale if the field inspection did not show disease or seed-testing did not show *V. albo-atrum* in the seedlot.

References:

1. Busch, L.V. and Smith, E. 1981. Susceptibility of Ontario-grown alfalfa cultivars and certain *Medicago* species to *Verticillium albo-atrum*. Can. J. Plant Pathol. 3: 169-172.
2. Huang, H.C. 2003. Verticillium wilt of alfalfa: epidemiology and control strategies. Can. J. Plant Pathol. 25: 328-338.
3. Huang, H.C. and Atkinson, T.G. (eds.). 1983. Verticillium wilt of alfalfa. Agric. Can. Publ. 1982-8E (rev.).
4. Jefferson, P.G., and Gossen, B.D. 2002. Irrigation increases stand and yield losses due to Verticillium wilt in a susceptible alfalfa cultivar. Plant Dis. 86: 588-592.

WINTER CROWN ROT (COTTONY SNOW MOLD)

Coprinus psychromorbidus

Cultural: Plant winter-hardy cultivars.

Resistant Cultivars: None.

Intermediate: AC Nordica and other cultivars with *M. sativa* subsp. *falcata* parentage.

Chemical: None.

References:

1. Gossen, B.D. *et al.* 1992. Evaluation of alfalfa lines for reaction to winter crown rot in field trials in Saskatchewan. *Can. J. Plant Pathol.* 14: 159-168.
2. Hwang, S.F. and D.A. Gaudet. 1995. Effects of plant age and cold hardening on development of resistance to winter crown rot in first-year alfalfa. *Can. J. Plant Science* 75: 421-428.
3. Hwang, S.F. and D.A. Gaudet. 1998. Effects of low-temperature stress and freezing resistance on development of winter crown rot in the first year alfalfa. *Can. J. Plant Sci.* 78: 689-696.
4. Traquair, J.A. and Hawn, E.J. 1982. Pathogenicity of *Coprinus psychromorbidus* on alfalfa. *Can. J. Plant Pathol.* 4: 106-108.

YELLOW LEAF BLOTCH*Leptotrochila medicaginis*

Cultural: Rotate alfalfa with non-legume crops. Spring burning reduces over-wintering inoculum, but may injure stand if growth has already begun. Cutting for hay before leaf drop reduces the load of over-wintering inoculum and minimizes leaf loss.

Resistant Cultivars: Anik and Rambler.

Intermediate: Beaver, Rangelander and Vernal.

Susceptible: Peace.

Chemical: None.

References:

1. Berkenkamp, B. and Meeres, J. 1979. Resistance of alfalfa cultivars to yellow leaf blotch. *Can. J. Plant Sci.* 59: 873-874.
2. Harding, H. 1972. Foliage diseases of alfalfa in northern Saskatchewan: a note on the 1972 survey and the differential reactions of nine varieties. *Can. Plant Dis. Surv.* 52: 149-150.

OTHER DISEASES

The following diseases of alfalfa are currently of minor importance (MI) and/or are diseases for which no practical control measures (NC) are currently recommended:

Anthracnose (*Colletotrichum destructivum*) MI

Brown Root Rot (*Phoma sclerotoides*) NC - See SWEETCLOVER, Brown Root Rot on page 13.

Gray Leaf Spot (Stagonospora Leaf Spot) (*Leptosphaeria pratensis*) MI

Leaf Spot (*Stemphylium botryosum*) MI

Lepto Leaf Spot (*Leptosphaerulina trifolii*) MI

Mosaic (alfalfa mosaic virus) NC

Root Rot (*Cylindrocarpon* spp., *Fusarium* spp., *Phytophthora megasperma*, *Pseudomonas* spp.) MI

Rust (*Uromyces striatus*) MI

Stem Rot (*Sclerotinia trifoliorum*, *S. sclerotiorum*) MI

White Leaf Spot (moisture stress or potassium deficiency) NC

Witches' Broom (witches' -broom phytoplasma) MI

RED CLOVER (*Trifolium pratense*)

BLACK STEM

Ascochyta viciae (syn. *A. meliloti*)

Cultural: Rotate red clover with non-legume crops. Spring burning has been recommended but may injure stand if growth has already begun.

Resistant Cultivars: None.

Chemical: None.

References:

1. Edmunds, L.K. and Hanson, E.W. 1960. Host range, pathogenicity and taxonomy of *Ascochyta imperfecta*. *Phytopathology* 50: 105-108.

NORTHERN ANTHRACNOSE

Kabatiella caulivora

Cultural: Rotation with non-legume crops.

Resistant Cultivars: Norlac.

Intermediate: Altaswede.

Chemical: None.

Notes: The disease is favoured by wet cool weather.

References:

1. Folkins, L.P. *et al.* 1976. Norlac red clover. Can. J. Plant Sci. 56: 757-758.

OTHER DISEASES

The following diseases of red clover are currently of minor importance (MI) and/or are diseases for which no practical control measures (NC) are currently recommended:

Aster Yellows and Witches' Broom (aster yellows and witches'-broom phytoplasmas) MI

Black Patch (*Rhizoctonia leguminicola*) MI

Brown Root Rot (*Phoma sclerotoides*) NC - See SWEETCLOVER, Brown Root Rot on page 13.

Damping-off and Seedling Blight (*Pythium* spp.) See ALFALFA, Winter Crown Rot on page 9

Leaf Spot (*Stagonospora recondens*) NC

Lepto Leaf Spot (*Leptosphaerulina trifolii*) MI

Mosaic (bean yellow mosaic virus) MI

Phyllody (phyllody phytoplasma) MI

Powdery Mildew (*Erysiphe polygoni*) NC

Sooty Blotch (*Cymadothea trifolii*) NC

Stem Rot (*Sclerotinia trifoliorum*, *S. sclerotiorum*) MI

Target Spot (*Stemphylium sarcinaeforme*) MI

Winter Crown Rot (*Coprinus psychromorbidus*) NC - See ALFALFA, Winter Crown Rot on page 9.

SWEETCLOVER (*Melilotus alba* and *M. officinalis*)

BLACK STEM AND GREY STEM CANKER

Ascochyta viciae (syn. *A. meliloti*, *A. caulicola*)

Cultural: Rotate with non-legume crops. Early spring burning may be effective but may damage crops if growth has already begun.

Resistant Cultivars: Yukon.

Chemical: None.

Note: This is a seed-borne disease, but no seed treatment is currently recommended for its control.

References:

1. Berkenkamp, B. and Baenziger, H. 1962. Reaction of sweet clover varieties to black stem. Can. Plant Dis. Surv. 42: 265.
2. Berkenkamp, B. *et al.* 1969. Floral infection by *Ascochyta caulicola* (gray stem canker) and varietal reaction of sweet clover. Plant Dis. Rep. 53: 348-349.

BROWN ROOT ROT

Phoma sclerotoides (syn. *Plenodomus meliloti*)

Cultural: None (see Notes).

Resistant Cultivars: None.

Chemical: None.

Notes:

1. Alfalfa, red clover, alsike clover and bird's-foot trefoil are less severely affected than sweetclover.
2. Several programs to breed for resistance in alfalfa are underway in the USA in 2009.

References:

1. Berkenkamp, B. and Baenziger, H. 1969. The reaction of sweet clover varieties to brown root rot. Can. J. Plant Sci. 49: 181-183.

OTHER DISEASES

The following diseases of sweetclover are currently of minor importance and/or are diseases for which no practical control measures are currently recommended:

Downy Mildew (*Peronospora trifoliorum*) MI - See ALFALFA, Downy Mildew on page 8.

Leaf Spot, Stem Blight and Root Rot (*Leptosphaeria pratensis*) MI

Winter Crown Rot (*Coprinus psychromorbidus*, syn. low temperature basidiomycete) MI

ALSIKE CLOVER (*Trifolium hybridum*)

The following diseases of alsike clover are currently of minor importance (MI) and/or are diseases for which no practical control measures (NC) are currently recommended:

Black Stem (*Phoma medicaginis*) MI - See ALFALFA, Black Stem on page 5.

Brown Root Rot (*Phoma sclerotoides*) NC - See SWEETCLOVER, Brown Root Rot on page 13.

Leaf Spot (*Leptosphaeria pratensis*) MI

Lepto Leaf Spot (*Leptosphaerulina trifolii*) MI

Mosaic (bean yellow mosaic virus) MI

Phyllody (clover proliferation phytoplasma) MI

Powdery Mildew (*Erysiphe polygoni*) NC

Rust (*Uromyces trifolii*) MI

Sooty Blotch (*Cymadothea trifolii*) NC

Winter Crown Rot (*Coprinus psychromorbidus*) NC - See ALFALFA, Winter Crown Rot on page 9.

BIRD’S-FOOT TREFOIL (*Lotus corniculatus*)

The following diseases of bird’s-foot trefoil are currently of minor importance (MI) and/or are diseases for which no practical control measures (NC) are currently recommended:

Blossom Blight (*Botrytis cinerea*, *Sclerotinia sclerotiorum*) MI - see ALFALFA, Blossom Blight on page 6.

Target Spot (*Stemphylium loti*) MI

Wilt (*Sclerotinia trifoliorum*) MI

Winter Crown Rot (*Coprinus psychromorbidus*) MI - see ALFALFA, Winter Crown Rot on page 9.

CICER MILKVETCH (*Astragalus cicer*)

The following diseases of cicer milkvetch are currently of minor importance (MI) and/or are diseases for which no practical control measures (NC) are currently recommended:

Leaf Spot (*Stemphylium* sp.) MI

SAINFOIN (*Onobrychis viciifolia*)

CROWN AND ROOT ROT

Fusarium spp., *Pseudomonas* spp., *Erwinia* spp.

Cultural: Do not seed sainfoin in mixtures with other legumes or grasses unless planting is in alternate rows. Limit stand life to 4 to 5 years. Fertilize as indicated by results of soil analysis. See Notes.

Resistant Cultivars: None.

Chemical: None.

Notes:

1. Sainfoin persisted better under heavy grazing or frequent cutting when planted in mixed stands with grass (2).
2. Crown and root rot was less severe when crop was cut once for hay and allowed to set seed (3).

References:

1. Gaudet, D.A. *et al.* 1980. The role of bacteria in the root and crown rot complex of irrigated sainfoin in Montana. *Phytopathology* 70: 161-167.
2. Kilcher, M.R. 1982. Persistence of sainfoin under semiarid conditions. *Can. Dep. Agric., Canadex* 125.11.
3. Sears, R. G. *et al.* 1975. Root and crown rotting organisms affecting sainfoin (*Onobrychis viciifolia*) in Montana. *Plant Dis. Rep.* 59: 423-426.

OTHER DISEASES

The following diseases of sainfoin are currently of minor importance (MI) and/or are diseases for which no practical control measures (NC) are currently recommended:

Brown Root Rot (*Phoma sclerotoides*) NC - See SWEETCLOVER, Brown Root Rot on page 13.

Damping-off and Seedling Blight (*Pythium* spp., *Aphanomyces* spp.) NC - See ALFALFA, Damping-off on page 7.

Leaf and Stem Spot (*Ascochyta orobi*) MI

Leaf Spot (*Stemphylium* sp.) MI

Septoria Leaf Spot (*Septoria orobina*) MI

Wilt (*Sclerotinia trifoliorum*) MI

Winter Crown Rot (*Coprinus psychromorbidus*) NC - see ALFALFA, Winter Crown Rot on page 9.

WHITE CLOVER (*Trifolium repens*)

The following diseases of white clover are currently of minor importance (MI) and/or are diseases for which no practical control measures (NC) are currently recommended:

Leaf Spot (*Cercospora zebrina*, *Stagonospora meliloti*) MI

Pepper Spot (*Pseudoplea trifolii*) MI

Root Rot (*Cylindrocarpon* spp., *Fusarium* spp.) MI

Rust (*Uromyces trifolii*) MI

Sooty Blotch (*Cymadothea trifolii*) NC

Winter Crown Rot (*Coprinus psychromorbidus*) NC - See ALFALFA, Winter Crown Rot on page 9.

GENERAL REFERENCES – Forage Legumes

1. Bailey, K.L. *et al.* 2003. Diseases of field crops in Canada. Can. Phytopathol. Soc. 290 pp.
2. Dickson, J.G. 1956. Diseases of field crops. Second Ed. McGraw Hill Book Co., New York. 517 pp.
3. Stuteville, D.L. and Erwin, D.C. 1990. Compendium of alfalfa diseases. Second Ed. Am. Phytopathol. Soc., St. Paul, Minn. 84 pp.
4. Frank, G. (Ed.). 2003. Alfalfa seed and leafcutter bee production and marketing manual. Irrigated Alfalfa Producers' Association, Brooks, AB 160 p.

SECTION B: Grasses

BENTGRASS (*Agrostis* spp.)

ALGAE

Green and filamentous blue-green algae.

Cultural: Aerify turf to assist water penetration and drying of soil surface. Improve air circulation and light by judicious pruning of trees and shrubs. Avoid heavy applications of organic nitrogen fertilizers.

Chemical: None.

References:

1. Escritt, J.R. 1978. ABC of Turf Culture. Kaye and Ward, London. pg. 8.
2. Musser, H.B. 1962. Turf Management. McGraw-Hill Book Co. Inc. pg. 235.

BROWN PATCH

Rhizoctonia solani

Cultural: Avoid unbalanced or excessive nitrogen application, particularly where there is a history of the disease. Switch or pole off dew. Reduce frequency of mowing. Reduce irrigation, especially late in the day (2). In seed fields, postharvest burning gives partial control (1). *A. stolonifera* and *A. canina* do not tolerate burning; residue should be removed after harvest.

Resistant Cultivars: None.

Chemical: On turf areas, apply: iprodione GR, SU, WP, WG, EC; *Bacillus subtilis* SU, penthiopyrad WG, thiophanate-methyl GR, WP; trifloxystrobin WG. On golf course or turf farm, apply: azoxystrobin EC; WP; captan WG, WP; chlorothalonil SU, WG; *Bacillus subtilis* SU, triticonazole SU. On golf course apply: iprodione+triticonazole+trifloxystrobin SU, metconazole WG, mineral oil, myclobutanil WP; propiconazole EC; pyraclostrobin EC. Consult product label for timing of application and recommended spray intervals.

Notes: All grasses are susceptible. Hot, very humid day-time conditions with nights above 18°C favour the disease. The pathogen enters via wounds caused by mowing.

References:

1. Bloom, J.R. and Couch, H.B. 1960. Influence of environment on diseases of turfgrass. I. Effect of nutrition, pH and soil moisture on rhizoctonia brown patch. *Phytopathology* 50: 532-535.
2. Hardison, J.R. 1980. Role of fire for disease control in grass seed production. *Plant Dis.* 64: 641-645.
3. Kelly, A.F. 1988. Seed production of agricultural crops. Longman Scientific, page 115.

COTTONY SNOW MOLD

See BLUEGRASS, Cottony Snow Mold on page 22.

DOLLAR SPOT

Sclerotinia homoeocarpa

Cultural: Disperse early morning dew by switching or poling. Avoid mowing or watering in the evening. Ensure adequate nitrogen and good ventilation.

Resistant Cultivars: None.

Chemical: Before or at first sign of disease, apply myclobutanil WP or *Bacillus subtilis* SU, or at first sign of disease and at intervals of 1 to 4 weeks, apply - chlorothalonil WG, SU; iprodione GR, SU, WG, WP; iprodione+triconazole+trifloxystrobin SU, penthiopyrad WG, propiconazole EC; thiophanate-methyl GR, WP, SU. On golf courses, apply boscalid WG, mineral oil, triconazole SU at first sign of disease and at 14-21 day intervals. On golf courses and turf farms, azoxystrobin EC may be used in tank mix as given on the product label, metconazole WG may be applied once.

Notes: *S. homoeocarpa* can develop resistance to thiophanate-methyl. Use this fungicide in an alternating schedule with different classes of fungicides. Dollar spot was recently confirmed on the prairies for the first time (3).

References:

1. Fenstermacher, J.M. 1980. Certain features of dollar spot disease and its causal organism *Sclerotinia homoeocarpa*. Pages 49-53 in *Advances in Turfgrass Pathology*. Larsen and Joyner, eds. Harcourt Brace Jovanovich Inc., Duluth.
2. Smith, J.D. *et al.* 1989. *Fungal Diseases of Amenity Turf Grasses* (3rd ed.), E & F.N. Spon, N.Y., N.Y. 401 pp.
3. Smith, J.D., Gossen, B.D., and Hsiang, T. 2001. First report of dollar spot, caused by *Sclerotinia homoeocarpa*, on turfgrass in Saskatchewan, Canada. *Plant Dis.* 85: 803.

GRAY SNOW MOLD

Typhula spp.

Cultural: Maintain grass vigour with adequate, balanced fertility in early fall. Avoid applying nitrogen within 6 weeks of turf dormancy to allow turf to harden off. Keep thatch to a minimum. Disperse heavy snow accumulations when snow begins to melt.

Resistant Cultivars: None.

Chemical: To turf, in late fall apply: iprodione GR, SU, WG, WP. On golf courses or turf farms in fall, apply: azoxystrobin EC, WP; chlorothalonil SU, WG, iprodione+triconazole+trifloxystrobin SU, metconazole WG. On golf courses, apply: mineral oil, myclobutanil WP, propiconazole EC; pyraclostrobin EG; triconazole SU; chlorothalonil + propiconazole + fludioxonil SU, in late fall or early winter before snow.

Notes: Timing of fungicide application is important. Apply as late in fall as possible before permanent snowfall.

References:

1. Fushtey, S.G. 1975. The nature and control of snow mold of fine turfgrass in southern Ontario. *Can. Plant Dis. Surv.* 55: 87-90.
2. Gossen, B.D., Hsiang, T. and Murray, T.D. 2001. Managing snow mold diseases of winter cereals and turf. *in* Iriki, N. *et al.* (eds.) *Low Temperature Plant-Microbe Interactions Under Snow*. Hokkaido National Agriculture Research Station, Sapporo, Japan. pp. 181-192.
3. Hsiang, T., Matsumoto, N., and Millett, S.M. 1999. Biology and management of *Typhula* snow molds of turfgrass. *Plant Dis.* 83: 788-798.

LEAF BLOTCH, RED LEAF SPOT, APICAL BLIGHT

See BLUEGRASS, Leaf Spot on page 24.

PINK SNOW MOLD AND FUSARIUM PATCH

Microdochium nivale (syn. *Fusarium nivale*)

Cultural: Let turf harden off for winter. Mow into late fall and remove all leaves and debris. Use adequate and balanced, but not excessive or acid-tending fertilizer. Ensure adequate air and soil drainage.

Resistant Cultivars: None.

Intermediate: Pennncross, Astoria, Bardot, Emerald, Prominent

Susceptible: Seaside, Highland and many others.

Chemical: In fall, before turf growth slows down, apply - iprodione SU, WP, WG, GR; thiophanate-methyl WP. On golf courses apply: triticonazole SU; chlorothalonil + propiconazole + fludioxonil SU; mineral oil, propiconazole EC; pyraclostrobin EC, in late fall or early winter before snow. On golf courses or sod farms apply: azoxystrobin EC, WP; chlorothalonil SU, WG, iprodione+triticonazole+trifloxystrobin SU, metconazole WG. For fusarium patch control, in early spring or fall apply trifloxystrobin WG.

Limitations: Triticonazole requires tank mix with iprodione for control. Metconazole requires tank mix with chlorothalonil SU, WG.

Notes: For fusarium patch control, two or more applications, at 3- to 6-week intervals may be needed (4). Individual snow mold pathogens almost always occur in complexes with other pathogens and fungicide application is aimed at controlling the whole complex. Also see gray snow mold, cottony snow mold, and snow scald.

References:

1. Fushtey, S.G. 1985. Chemical control of fusarium patch disease in fine turfgrass. *Proc. 22nd Ann. Conf. W.C.T.A.* Feb. 1985.
2. Gossen, B.D., Hsiang, T. and Murray, T.D. 2001. Managing snow mold diseases of winter cereals and turf. *in* Iriki, N. *et al.* (eds.) *Low Temperature Plant-Microbe Interactions Under Snow*. Hokkaido National Agriculture Research Station, Sapporo, Japan. pp. 181-192.
3. Gaudet, D., and Gossen, B.D. 2003. Overwintering diseases. Pg. 214-222 *in* *Diseases of Field Crops in Canada*. K.L. Bailey, *et al.* (eds.), Canadian Phytopathological Society, Saskatoon, SK. 290 pp.
4. Smith, J.D. 1981. Some turfgrass disease problems in Saskatchewan. *Greenmaster* 17: 5-7.

PYTHIUM BLIGHT

Pythium spp.

Cultural: Avoid overwatering new plantings. On established turf, water as infrequently and thoroughly as possible and early in the day. Do not mow when grass is moist. Avoid unbalanced fertilizer applications. Keep thatch to a minimum.

Resistant Cultivars: None.

Chemical: Apply before disease develops or at first sign of disease - azoxystrobin EC, WP; etridiazole WP; fosetyl AL WG, WP; metalaxyl-m EC; phosphites AS, propamocarb hydrochloride AS, pyraclostrobin EG.

Notes: All grasses are susceptible. Can occur during cool wet weather, but most severe damage is caused during hot humid weather.

RED THREAD

See FESCUE, Red Thread on page [30](#).

SNOW SCALD

Sclerotinia borealis

Cultural: Remove deep snow cover in early spring. Remove trees and shrubs that favour snow accumulation and retention.

Resistant Cultivars: None.

Intermediate: Seaside.

Susceptible: Penncross and most other varieties.

Chemical: None.

Notes: Most grass species are susceptible. Bentgrasses may be severely damaged on the prairies, especially in higher snowfall areas or years.

References:

1. Smith, J.D. 1981. Some turfgrass disease problems in Saskatchewan. Greenmaster 17: 5-7.

TAKE-ALL PATCH

Gaeumannomyces graminis var. *avenae*

Cultural: Use acidic fertilizers such as ammonium sulphate and/or acidic top dressing to correct high pH soils. Renovate disease patches with more resistant grasses such as fescue or bluegrass. Avoid sowing bentgrass on recently cleared land (1, 2).

Resistant Cultivars: None.

Chemical: None.

Notes: Most common in higher rainfall areas following applications of alkaline materials. Chemical soil sterilization or use of wide-spectrum fungicides may inhibit antagonistic soil organisms.

References:

1. Davidson, R.M. and Goss, R.L. 1972. Effects of P, S, N, lime, chlordane, and fungicides on ophiobolus patch disease of turf. Plant Dis. Rep. 56: 565-567.
2. Gould, C.J. 1973. Ophiobolus patch: Bane to bentgrass. Golf Supt. 41(3).

OTHER DISEASES

The following diseases of bentgrass are currently of minor importance (MI) and/or are diseases for which no practical control measures (NC) are currently available:

Stripe Smut (*Ustilago striiformis*) MI

BLUEGRASS, KENTUCKY (*Poa pratensis*)**ALGAE**

See BENTGRASS, Algae on page 17.

ANTHRACNOSE

See FESCUE, Anthracnose on page 30.

BLISTER SMUT

Entyloma dactylidis

Cultural: Use resistant cultivars, or resistant species. Encourage rapid spring growth by providing adequate nutrients and water.

Resistant Cultivars: Majestic, Merion, Nugget, Sydsport.

Susceptible: Baron, Victa and many others.

Chemical: None.

Notes: Favoured by mild winters.

References:

1. Fushtey, S.G. and Taylor, D.K. 1977. Blister smut in Kentucky bluegrass at Agassiz, B.C. Can. Plant Dis. Surv. 57: 29-30.

COTTONY SNOW MOLD

Low-temperature basidiomycete - LTB (syn. *Coprinus psychromorbidus*)

Cultural: Remove thatch. Reduce snow cover with fences, by spreading drifts, and/or by removing trees and bushes. Spread soot or fine ash on snow to accelerate melting. Maintain adequate soil fertility.

Resistant Cultivars: None (see Notes).

Intermediate: Dormie, Park.

Susceptible: Fylking, Nugget, Sydsport, Merion, Newport and most other varieties.

Chemical: None.

Notes: Individual snow mold pathogens almost always occur in complexes with other pathogens and fungicide application is aimed at controlling the whole complex. See pink snow mold, gray snow mold and snow scald.

References:

1. Gossen, B.D. 1997. Development of snow mold resistance in alfalfa, Kentucky bluegrass and fall rye for western Canada. Pg. 53-62 in Proc. Int. Workshop on Plant-Microbe Interactions at Low-Temperature under Snow, Sapporo, Japan, November 25-28, 1997. 280 pp.
2. Gossen, B.D., Hsiang, T. and Murray, T.D. 2001. Managing snow mold diseases of winter cereals and turf. in Iriki, N. *et al.* (eds.) Low Temperature Plant-Microbe Interactions Under Snow. Hokkaido National Agriculture Research Station, Sapporo, Japan. pg. 181-192.
3. Smith, J.D. 1975. Resistance of turf grasses to low-temperature basidiomycete snow mold and recovery from damage. Can. Plant Dis. Surv. 55: 147-174.

FAIRY RING

Marasmius oreades, *Lycoperdon* spp., *Psalliota* spp., *Clitocybe* spp.

Cultural: To mask symptoms on turf, apply nitrogen, aerate soil to 25-cm depth and irrigate well. Use spike and soak method (3). Divide lawn into sections with paths or borders (see Notes). Application of certain surfactants reduces symptom severity (1).

Resistant Cultivars: None.

Chemical: Treat soil with formaldehyde SN after the infested soil is disturbed and broken up. Apply azoxystrobin EC, WP on turf farms or golf course as soon as possible after symptom development.

Notes: Marasmius fairy rings will disappear when they contact artificial barriers or other fairy rings. Other types of fairy rings may generally be masked by adequate fertilizer and ample irrigation.

References:

1. Nadeau, L.B., Blenis, P.V. and Knowles, N.R. 1993. Potential of an organosilicone surfactant to improve soil wettability and ameliorate fairy ring symptoms caused by *Marasmius oreades*. Can. J. Plant Sci. 73: 1189-1197.
2. Smith, J.D. 1980. Is biologic control of *Marasmius oreades* fairy rings possible? Plant Dis. 64: 348-354.
3. Smith, J.D. 1978. Fairy ring biology and control. Canadex 273.630, 3 pp.

GRAY SNOW MOLD

Typhula incarnata, *T. ishkariensis*

Cultural: Allow turf to harden off in the fall (2). Renovate and re-seed severely diseased areas.

Resistant Cultivars: None.

Intermediate: Park.

Susceptible: Merion, Nugget (1) and many other varieties.

Chemical: To turf, in late fall apply: iprodione GR, SU, WG, WP. On golf courses or turf farms in fall, apply: azoxystrobin EC, WP; chlorothalonil SU, WG, iprodione+triticonazole+trifloxystrobin SU, metconazole WG. On golf courses, apply: mineral oil, myclobutanil WP, propiconazole EC; pyraclostrobin EG; triticonazole SU; chlorothalonil + propiconazole + fludioxonil SU, in late fall or early winter before snow.

Notes:

1. Resistance has been evaluated to *T. incarnata* only.
2. With *T. ishkariensis*, which occurs in areas with colder winters, two or more fungicide applications may be required.
3. Individual snow mold pathogens almost always occur in complexes with other pathogens, and fungicide application is aimed at controlling the whole complex. See pink snow mold, cottony snow mold, and snow scald

References:

1. Gossen, B.D., Hsiang, T. and Murray, T.D. 2001. Managing snow mold diseases of winter cereals and turf. in Iriki, N. et al. (eds.) Low Temperature Plant-Microbe Interactions Under Snow. Hokkaido National Agriculture Research Station, Sapporo, Japan. pp. 181-192.
2. Hsiang, T., Matsumoto, N. and Millett, S.M. 1999. Biology and management of *Typhula* snow molds of turfgrass. Plant Dis. 83: 788-798.
3. Smith, J.D. 1981. Some turfgrass disease problems in Saskatchewan. Greenmaster 17(2): 5-7.

LEAF SPOT (Net Blotch), MELTING-OUT*Drechslera poae*

Cultural: Avoid close mowing, excessive nitrogen application and excessive irrigation. Postharvest burning of crop residue in seed fields reduces leaf spot (2).

Resistant Cultivars: Bristol, Classic, Eclipse, Majestic.

Intermediate: Adelphi, America, A34, Banff, Barron, Enmundi, Fylking, Georgetown, Haga, Merion, Midnight, Nassau, Nuggett, Plush, Primo, Ram 1, Sydsport, Touchdown, Trampas, Victa.

Susceptible: Argyle, Cheri, Dormie, Geronimo, Glade, Gnome, Harmony, Mystic, Newport, Park, Prato, Welcome (1).

Chemical: Azoxystrobin EC, WP; captan WG, WP; iprodione GR, SU, WG, WP; chlorothalonil SU, WG; mineral oil, propiconazole EC; pyraclostrobin EG; trifloxystrobin WG.

Notes: Infection of leaves is favoured by high humidity. Foot rot and melting out develop after leaf spotting. Important on west coast, rarely severe in the prairies.

References:

1. Fushtey, S.G. 1987. Update on disease reaction of Kentucky bluegrass licensed for sale in Canada. Canadex 636, 2 pp.
2. Gray, P.M. and Guthrie, J.W. 1977. Burning and other cultural practices relative to populations of seed-borne pathogens of *Poa pratensis* L. Seed Technol. 5: 545-553.

NECROTIC RING SPOT*Leptosphaeria korrae*

Cultural: Use ammonium sulfate as the nitrogen fertilizer source. Apply 0.45 kg actual N per 1,000 sq. ft. in March, April, June, September and November. Irrigate only when necessary. Remove excess thatch and aerate turf to reduce compaction. Overseed with resistant cultivars or species.

Resistant Cultivars: Midnight, Wabash, Park, Eclipse, Adelphi and Majestic have shown resistance in Wisconsin. Perennial ryegrass and tall fescue have shown resistance in Washington.

Chemical: None.

References:

1. Worf, G.L. *et al.* 1986. Necrotic ring spot disease of turfgrass in Wisconsin. Plant Dis. 70: 453-458.
2. Clarke, B.B. and Gould A.B. 1993. Turfgrass patch diseases caused by ectotrophic root infecting fungi. APS Press, St. Paul, Minn. 161 pp.

PINK SNOW MOLD

See BENTGRASS, Pink Snow Mold on page 19.

POWDERY MILDEW

Erysiphe graminis

Cultural: Avoid close mowing and excessive nitrogen application. Use creeping red fescue in shaded locations (3). Postharvest burning in seed fields gives partial control (2).

Resistant Cultivars: Bristol, Dormie, Harmony, Mystic, Ram 1, Welcome (1) and most of the new elite varieties.

Intermediate: America, A 34, Eclipse, Enmundi, Georgetown, Glade, Newport, Nuggett, Sydsport, Touchdown, Trampas.

Susceptible: Adelphi, Argyle, Banff, Cheri, Classic, Flyking, Geronimo, Gnome, Haga, Majestic, Merion, Midnight, Nassau, Plush, Prato, Primo, Victa, all *P. annua*.

Chemical: To turf, at 14-day intervals, apply – thiophanate-methyl WP. Propiconazole EC or pyraclostrobin EC may be used on Kentucky bluegrass grown for seed production.

References:

1. Fushtey, S.G. 1987. Update on disease reaction of Kentucky bluegrass licensed for sale in Canada. Canadex 636, 2pp.
2. Hardison, J.R. 1980. Role of fire for disease control in grass seed production. Plant Dis. 64: 641-645.
3. Smith, J.D. 1978. Powdery mildew on *Poa pratensis* cultivars and selections. J. Sports Turf Res. 54: 45-52.

RUST

Puccinia poae-nemoralis, *P. recondita*, *P. graminis*

Cultural: Maintain vigorous grass growth in summer. Postharvest burning gives partial control in seed crops (2).

Resistant Cultivars: None.

Intermediate: Most cultivars.

Susceptible: Dormie, Merion (1).

Chemical: Pyraclostrobin EG PCP# 28859 may be used on golf course turf. Pyraclostrobin EC PCP# 27322 may be used on bluegrass grown for seed production.

References:

1. Fushtey, S.G. 1982. Relative susceptibility of Kentucky bluegrass cultivars to damage by rust. Proc. West. Can. Turf Assoc. 19: 33.
2. Hardison, J.R. 1980. Role of fire for disease control in grass seed production. Plant Dis. 64: 641-645.

SILVERTOP

Insects (*Leptoterna dolabrata*, *Capsus simulans*, mites, thrips), *Fusarium poae*

Cultural: Postharvest burning in seed fields can be effective (2, 5).

Resistant Cultivars: None

Chemical: Insecticide application of Decis EC at the boot stage may reduce silvertop incidence (4).

References:

1. Berkenkamp, B. and Meares, J. 1975. Observations on silvertop of grasses in Alberta. Can. Plant Dis. Surv. 55: 83-84.
2. Gagne S., Richard, C. and Gagnon, C. 1984. La coulure des gramine: Etat des connaissances. Phytoprotection 65: 45-52.
3. Hardison, J.R. 1980. Role of fire for disease control in grass seed production. Plant Dis. 64: 641-642.
4. Okuda, M.S. 1988. Evaluation of Decis EC for control of silvertop and *Capsus simulans* in creeping red fescue. Pest. Res. Rep. 1988, p. 134.
5. Soroka, J.J., and Gossen, B.D. 2005. Phytophagous arthropods and silvertop levels associated with post-harvest residue treatments in three turfgrass species grown for seed. Can. J. Plant Sci. 85: 213-224.

SLIME MOLDS

Physarum spp. and others.

Cultural: Break up unsightly spore masses by vigorous raking, brushing, or hosing down with a strong stream of water.

Chemical: None.

STRIPE SMUT

Ustilago striiformis

Cultural: Use minimum nitrogen during warmest summer months. Postharvest burning of seed fields gives partial control (1).

Resistant Cultivars: Adelphi, Majestic, Park, Touchdown.

Susceptible: Merion, Windsor.

Chemical: None.

Notes: Seed may be infested.

References

1. Hardison, J.R. 1980. Role of fire for disease control in grass seed production. *Plant Dis.* 64: 641-645.

BROMEGRASS, MEADOW (*Bromus riparius*)

HEAD SMUT OF GRASSES

Ustilago bullata

Cultural: Use seed that is free of the pathogen. Rogue seed fields.

Resistant Cultivars: None.

Chemical: None.

Notes: Races of this pathogen attack many native and introduced grass species. However, meadow brome grass and slender wheatgrass are the only economically important species for which substantial damage has been reported in Western Canada.

References:

1. Falloon, R.E. 1979. Seedling and shoot infection of *Bromus catharticus* by *Ustilago bullata*. *Trans. Br. Mycol. Soc.* 73: 49-56.
2. Gossen, B.D. and Turnbull, G.D. 1995. Head smut of grasses on the Canadian Prairies: distribution, impact and control. *Can. J. Plant Pathol.* 19: 56-59.
3. Turnbull, G.D. and Gossen, B.D. 1996. Head smut of grasses on the Canadian prairies: II. Host range and variability. *Can. J. Plant Pathol.* 18: 255-260.

BROMEGRASS, SMOOTH (*Bromus inermis*)

BROWN LEAF SPOT (LEAF BLOTCH)

Pyrenophora bromi (imperfect state *Drechslera bromi*)

Cultural: Graze pastures clean, cut stubble short, and remove hay and straw to reduce carry-over in crop debris. Stubble burning in seed crops will reduce incidence but occasionally lowers yields. Since the disease is most severe when soil fertility is low, apply recommended N fertilizer and P after soil test (3).

Resistant Cultivars: None (see Notes).

Intermediate: Baylor, Magna.

Susceptible: Carlton, Manchar, and many others.

Chemical: None.

Notes: Cultivars of southern and southern × northern breeding are less susceptible than northern ones (4). Meadow brome grass is resistant to brown leaf spot (1).

References:

1. Gossen, B.D. 2013. Personal communication. Agriculture & Agri-Food Canada Research Centre, Saskatoon, SK.
2. Hsiang, T., and Gossen, B.D. 2003. Diseases of grasses. Pg. 246-258 in Diseases of Field Crops in Canada. K.L. Bailey *et al.* (eds.), Canadian Phytopathological Society, Saskatoon, SK. 290 pp.
3. Smith, J.D. 1968. Control of *Pyrenophora bromi* in *Bromus inermis* by burning crop residues. Can. J. Plant Sci. 48: 329-331.
4. Smith, J.D. and Knowles, R.P. 1973. Resistance to *Pyrenophora bromi* in brome grass. Can. J. Plant Sci. 53: 93-99.

SELENOPHOMA LEAF SPOT

Selenophoma bromigena

Cultural: Graze pastures clean, cut stubble short and pick up all hay and straw to reduce carry-over in crop debris. Stubble burning in seed crops will reduce disease incidence but occasionally lowers seed yield (4).

Resistant Cultivars: None (see Notes).

Intermediate: Magna.

Susceptible: Carlton and many other cultivars.

Chemical: None.

Notes: Those cultivars of southern and southern × northern breeding are less susceptible than northern ones (3). Meadow brome is resistant to selenophoma leaf spot (1).

References:

1. Gossen, B.D. 2013. Personal communication. Agriculture & Agri-Food Canada Research Centre, Saskatoon, SK.
2. Hsiang, T., and Gossen, B.D. 2003. Diseases of grasses. Pg. 246-258 in *Diseases of Field Crops in Canada*. K.L. Bailey *et al.* (eds.), Canadian Phytopathological Society, Saskatoon, SK. 290 pp.
3. Smith, J.D. and Knowles, R.P. 1967. Mass selection for resistance to *Selenophoma bromigena* in northern and southern types of *Bromus inermis*. *Can. J. Plant Sci.* 47: 679-681.
4. Smith, J.D. 1969. Control of *Selenophoma* leaf spot in clones of *Bromus inermis* by burning crop debris. *Can. J. Plant Sci.* 49: 381-383.

SILVERTOP

See BLUEGRASS, Silvertop on page 26.

OTHER DISEASES

The following diseases of bromegrass are currently of minor importance (MI) and/or are diseases for which no practical control measures (NC) are currently recommended:

Bacterial Blight (*Xanthomonas translucens*) MI

Black Node (*Alternaria* sp.) MI

Ergot (*Claviceps purpurea*) NC

Halo Blight (Chocolate Spot) (*Pseudomonas coronafaciens*) MI

Powdery Mildew (*Erysiphe graminis*) MI

Root Rot (*Fusarium* spp.) NC

Scald (*Rhynchosporium secalis*) NC

Septoria Leaf Spot (*Septoria bromi*) NC

Snow Scald (*Sclerotinia borealis*) MI

FESCUE, RED (*Festuca rubra*)

ANTHRACNOSE

Colletotrichum graminicola

Cultural: Aerate or spike turf to relieve compaction. Ensure good fertility and adequate moisture.

Resistant Cultivars: None.

Intermediate: Belmonte, Bolero, Diamond, Ensylva, Highlight, Jade, Pennlawn.

Susceptible: Bergond, Dawson, Engina, Paramir.

Chemical: Apply to turf before the disease appears fosetyl AL WG, penthiopyrad WG, *Bacillus subtilis* SU. As a preventative on golf course or turf farm, apply: azoxystrobin EC, WP; chlorothalonil SU, WG, metconazole WG. On golf courses apply: propiconazole EC; *Bacillus subtilis* SU, triticonazole SU; trifloxystrobin WG. Consult product label for timing and recommended spray intervals.

Notes: Primarily a disease of turf, favoured by high temperatures with high humidity.

COTTONY SNOW MOLD

See BLUEGRASS, Cottony Snow Mold on page [22](#).

GRAY SNOW MOLD

See BLUEGRASS, Gray Snow Mold on page [23](#).

PINK SNOW MOLD

See BENTGRASS, Pink Snow Mold on page [19](#).

RED THREAD

Laetisaria fuciformis

Cultural: Improve soil nitrogen and ensure overall good nutrition. Sow mixtures containing less susceptible species such as Kentucky bluegrass. Postharvest burning of seed fields gives partial control (1).

Resistant Cultivars: None.

Chemical: Apply propiconazole EC at 14-day intervals, when cool moist conditions occur.

Notes: Favoured by moist, cool conditions, with a higher temperature optimum than for pink snow mold. Common on the West Coast, especially under low nitrogen levels. Only occasionally serious in the prairies.

References:

1. Hardison, J.R. 1980. Role of fire for disease control in grass seed production. *Plant Dis.* 64: 641-645.

SILVER TOP

See BLUEGRASS, Silver Top on page 26.

STEM EYESPOT

Didymella festucae (imperfect state, *Phleospora idahoensis*)

Cultural: To avoid major losses, apply nitrogen to bring total N up to 50-70 kg ha in late fall to maximize seed production in the first crop year (1, 3) (see Note 1). Use a hot burn to remove all debris and stubble immediately after harvest (2) (See Note 2).

Resistant Cultivars: None.

Chemical: None.

Notes:

1. Stem eyespot affects seed production only, not turf or forage (2).
2. Burning after harvest may prevent seed production the following season in fields in the Peace River region. It is therefore only practical as part of rejuvenation in this region. In more southern areas, burning increased yield the following year (1).

References:

1. Gossen, B.D., Soroka, J.J. and Najda, H. 2002. Residue management increases seed yield of three turfgrass species in western Canada. *Can. J. Plant Sci.* 82: 687-692.
2. Smith, J.D. 1974. *Didymella festucae* and its imperfect state, *Phleospora idahoensis*, on *Festuca* species in western North America. *Can. J. Bot.* 52: 2061-2074.

SNOW SCALD

Sclerotinia borealis

Cultural: **Hay and seed crops** - apply nitrogen fertilizer in the late fall to raise total N to 50-70 kg/ha for first crops and 70-100 kg/ha for subsequent and rejuvenated crops. Remove debris of previous crops.

Turf - Remove deep snow cover in early spring. Remove trees and shrubs that favour snow accumulation and retention.

Resistant Cultivars: None.

Chemical: None.

References:

1. Smith, J.D. 1981. Some turf grass disease problems in Saskatchewan. *Greenmaster* 17: 5-7.

OTHER DISEASES

The following diseases of fescue are currently of minor importance (MI) and/or are diseases for which no practical control measures (NC) are currently recommended:

Blister Smut (*Entyloma dactylidis*) MI

Brown Stripe (*Passalora graminis*) NC

Net Blotch (*Drechslera dictyoides*) NC

Powdery Mildew (*Erysiphe graminis*) MI

Rust (*Puccinia graminis*, *P. recondita*) MI

Stripe Smut (*Ustilago striiformis*) MI

MEADOW FOXTAIL (*Alopecurus pratensis*)

LEAF SCALD

Rhynchosporium spp.

Cultural: In seed fields, cut stubble short following harvest or graze fields clean and remove all crop debris.

Resistant Cultivars: None (see Notes).

Chemical: None.

Notes:

1. Most cultivars are intermediate in susceptibility. No resistant cultivars have been released in Canada as of 2006.
2. The disease tends to increase with age of the stand.

OTHER DISEASES

The following diseases of meadow foxtail are currently of minor importance (MI) and/or are diseases for which no practical control measures (NC) are currently recommended:

Leaf Streak (*Drechslera* sp.) NC

Snow Scald (*Sclerotinia borealis*) NC

Stem Rust (*Puccinia graminis*) NC

TIMOTHY (*Phleum pratense* and *P. bertolonii*)

PURPLE EYESPOT

Heterosporium phlei (syn. - *Cladosporium phlei*)

Cultural: Apply recommended rates of N and P fertilizer. Although burning of stubble will partially control disease in seed crops, severe damage to stand may result (1).

Resistant Cultivars: None (see Notes).

Intermediate: Climax, Bounty.

Susceptible: Champ.

Chemical: Apply before the disease appears propiconazole EC (limited to hay in Prairie Provinces).

Notes: North American cultivars are generally more resistant than those from elsewhere.

References:

1. Smith, J.D. 1970. Resistance of timothy cultivars to *Heterosporium phlei*, *Drechslera phlei* and frost injury. Can. Plant Dis. Surv. 50: 95-98.

OTHER DISEASES

The following diseases of timothy are currently of minor importance (MI) and/or are diseases for which no practical control measures (NC) are currently recommended:

Apical Blight (*Drechslera phlei*) NC

Browning Root Rot (*Pythium* spp.) MI

Cottony Snow Mold (Low-temperature basidiomycete) MI

Ergot (*Claviceps purpurea*) NC

Snow Scald (*Sclerotinia borealis*) MI

GENERAL REFERENCES - Grasses

1. Bailey, K.L., B.D. Gossen, Gugel, R. and Morall, R.A.A. (*Editors*). 2003. Diseases of Field Crops in Canada. Canadian Phytopathological Society, Saskatoon, SK. 290 pp.
2. Clarke, B.B. and Gould, A.B. (eds.). 1993. Turfgrass Patch Diseases Caused by Ectotrophic Root Infecting Fungi. APS Press. 161 pp.
3. Fushtey, S.G. and Sears, M.K. 1981. Turfgrass diseases and insect pests. Ont. Minist. Agric. Food, Publ. 162.
4. Gossen, B.D. *et al.* 2001. Managing snow mold diseases of winter cereals and turf. Pg 181-192 in Iriki, N. *et al.* Low Temperature Plant-Microbe Interactions Under Snow. Hokkaido National Agriculture Research Station, Sapporo, Japan.
5. Ormrod, D.J. and S.G Fushtey. 1983. Diseases of lawns. B.C. Minist. Agric. Food, Publ. 81-2, 12 pp.
6. Smith, J.D. 1980. Major diseases of turfgrasses in western Canada. Univ. Saskatchewan Publ. 162.
7. Smith, J.D. 1987. Winter-hardiness and overwintering diseases of amenity turfgrasses with special reference to the Canadian Prairies. Agriculture Canada Research Branch. Tech. Bull. 1987-12E. 193 pp.
8. Smith, J.D. *et al.* 1989. Fungal Diseases of Amenity Turf Grasses (3rd Ed.), E & F.N. Spon, N.Y., N.Y. 401 pp.
9. Smiley, R.W. *et al.* 2005. Compendium of Turfgrass Diseases (3rd Ed.). APS Press, St Paul, MN. 167 pp.

APPENDIX I. Fungicides registered for use on forage legumes.

Active Ingredient	Trade Name	Formulation	PCP Number	Diseases Controlled
ALFALFA:				
boscalid	Lance	70% WG	27495	blossom blight, black stem and leaf spot. Seed crops only
penthioopyrad	Fontelis	200 g/L SU	30331	Sclerotinia stem rot
iprodione	Rovral Flo	240 g/L SU	29315	Sclerotinia, seed crops only
	Rovral RX	240 g/L SU	24378	
	Overall 240SC	240 g/L SU	30275	
mancozeb	Dithane	75% WG	20553	leaf & stem spot disease, seed crops only
	Rainshield			
	Manzate 75DF	75% WG	21057	
	Manzate Pro-stick	75% DF	28217	
	Pencozeb 75DF	75% WG	25397	
metalaxyl	Allegiance FL	317 g/L SU	26674	seed treatment, Pythium seed rots & seedling blight
	Belmont 2.7 FS	317g/L SU	30246	
metalaxyl -M	Apron XL LS	33% SU	25585	seed treatment, Pythium damping-off and early season Phytophthora root rot.
pyraclostrobin	Headline	250 g/L EC	27322	common leaf spot, seed crops only
thiram	Thiram 75	75% WP	27556	seed treatment: Verticillium wilt, seedling blight and damping off
BIRD'S - FOOT TREFOIL:				
metalaxyl	Allegiance FL	317 g/L SU	26674	seed treatment, Pythium seed rots & seedling blight
	Belmont 2.7 FS	317g/L SU	30246	
metalaxyl-M	Apron XL LS	33% SU	25585	seed treatment, Pythium damping-off and early season Phytophthora root rot.
CLOVER:				
metalaxyl	Allegiance FL	317 g/L SU	26674	seed treatment, Pythium seed rots & seedling blight
	Belmont 2.7 FS	317g/L SU	30246	
metalaxyl-M	Apron XL LS	33% SU	25585	seed treatment: Pythium damping-off and early season Phytophthora root rot.
SAINFOIN:				
metalaxyl	Allegiance FL	317 g/L SU	26674	seed treatment, Pythium seed rots & seedling blight
	Belmont 2.7 FS	317g/L SU	30246	
metalaxyl -M	Apron XL LS	33% SU	25585	Seed treatment. Pythium damping-off.
VETCH:				
metalaxyl	Allegiance FL	317 g/L SU	26674	seed treatment, Pythium seed rots & seedling blight
	Belmont 2.7 FS	317g/L SU	30246	
metalaxyl-M	Apron XL LS	33% SU	25585	seed treatment. Pythium damping-off and early season Phytophthora root rot.

APPENDIX II. Fungicides registered for use on turf grasses in Canada

Note: There are currently no products for control of lawn and turf diseases with domestic registration.

Fungicides					Diseases														
Active Ingredient	Trade Name	Formulation	PCP#	Use Area	GSM	PSM	BP	DS	P	MO/LS	RR	DO	FP	CSM	RT	R	AN	PM	FR
azoxystrobin	Heritage	50% WP	26155	G,S	X	X	X		X	X			X				X ^a		X
	Heritage Maxx	95 g/L EC	28393	G,S	X	X	X	X*	X	X			X				X ^a		X
<i>Bacillus subtilis</i>	Rhapsody ASO	1 x 10 ⁹ CFU/g SU	28627	G, S, L, O			X	X									X		
boscalid	Cadence WDG	70% WG	27496	G				X											
captan	Captan 50 WP	50% WP	4559, 14823,	G,S			X			X	X	X							
	Captan 80 WP	80% WP	9582,	G,S			X			X	X	X							
	Supra Captan 80 WDG	80% WG	24613	G,S			X			X	X	X							
	Captan 80 WDG	80% WG	23691																
Maestro 80DF	80% WG	26408																	
chlorothalonil	Daconil 2787	40.4% SU	15724	G,S,O	X ^a	X ^a	X	X		X							X ^a		
	Daconil Ultrex	82.5% WG	28354	G,S,O	X ^a	X ^a	X	X		X							X ^a		
chlorothalonil + propiconazole + fludioxonil	Instrata	362 g/L 57 g/L 14.5 g/L SU	28861	G	X	X													
etridiazole	Truban	30% WP	11460	G					X										
fosetyl AL	Aliette WP	80% WP	24564	G,S,T					X										
	Chipco Aliette Signature	80% WG	28299	G,S,T					X								X ^a		
iprodione	Green GT	240 g/L SU	24379	G, S	X	X	X	X		X									
	Rovral	50% WP	15213	T	X	X	X	X		X									
	Rovral WDG	500 g/kg WG	24709	T	X	X	X	X		X									
	Proturf Granular Fungicide X	1.3% GR	23494	G,T	X	X	X	X ^a		X									
	Quali-Pro Iprodione	240g/L FF	29410	T	X	X	X	X		X									

^a Preventive treatment

Use Area: G = golf course S = sod/turf farm L = lawn C = seed crop O = ornamental turf T = turf, area not specified on label

* must be tank mixed with another fungicide as given on the label.

GSM = grey snow mold
PSM = pink snow mold
BP = brown patch
DS = dollar spot

P = Pythium spp.
MO/LS = melting out, leaf spot
RR = root rot
DO = damping off

FP = fusarium patch
CSM = cottony snow mold
RT = red thread
R = rust

AN = anthracnose
PM = powdery mildew
FR = fairy ring

APPENDIX II. Fungicides Registered for Use on Turf Grasses (continued)

Active Ingredient	Trade Name	Formulation	PCP#	Use Area	GSM	PSM	BP	DS	P	MO/LS	RR	DO	FP	CSM	RT	R	AN	PM	FR
Iprodione+ triticonazole+ trifloxystrobin	Trilogy	29.41% 3.14% 1.47% SU	29870	G, S	X	X	X	X					X				X		
metalaxyl-M	Subdue MAXX	240 g/L EC	27055	G,S					X										
metconazole	Tourney	50% WG	30928	G ^d , S	X	X	X	X									X		
mineral oil	Civitas	98%	29825	G	X	X	X	X		X									
myclobutanil	Eagle WSP	40% WP	26585	G	X		X	X											
penthiopyrad	Velista	50% WG	30334	G, S, L, O			X	X									X		
phosphites of mono- and dibasic sodium, potassium, and ammonium	Phostrol	53.6% AS	30449	G, S, T					X										
propamocarb hydrochloride	Banol	722 g/L AS	29156	G, S					X										
propiconazole	Banner	130 g/L EC	23693	G	X	X	X ^a	X		X			X		X		X		
	Banner MAXX	14.3% EC	27003	G	X	X	X ^a	X		X			X		X		X		
	Qualipro Propiconazole	14.3% EC	28797	G	X	X	X	X		X			X		X		X		
	Topas 250E	250 g/L EC	24030	C														X ¹	
pyraclostrobin	Headline	250 g/L EC	27322	C												X ²		X ²	
	Insignia	20% EC	28859	G	X	X	X		X	X ^c						X			

^a preventive treatment **Use Area:** G = golf course S = sod/turf farm L = lawn C = seed crop O = ornamental turf T = turf, area not specified on label

^b control requires tank mix with Rovral Green

^c leaf spot only

^d not recommended for all turfgrass species, check label

¹ for use on bluegrass grown for seed only.

² for use on bluegrasses, fescues and ryegrasses grown for seed only.

GSM = grey snow mold
PSM = pink snow mold
BP = brown patch
DS = dollar spot

P = Pythium spp.
MO/LS = melting out, leaf spot
RR = root rot
DO = damping off

FP = fusarium patch
CSM = cottony snow mold
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AN = anthracnose
PM = powdery mildew
FR = fairy ring

APPENDIX II. Fungicides Registered for Use on Turf Grasses (continued)

Active Ingredient	Trade Name	Formulation	PCP#	Use Area	GSM	PSM	BP	DS	P	MO/LS	RR	DO	FP	CSM	RT	R	AN	PM	FR
thiophanate-methyl	Scotts Proturf Granular Systemic	2.3% GR	16660	T			X	X											
	Senator	70% WP	12279, 25343	G,T		X	X	X										X	
trifloxystrobin	Compass 50WG	50% WG	27527	G,S,L			X			X ^c			X				X ^a		
triticonazole	Premis 200F	200 g/L SU	28387	G	X	X ^b	X	X					X ^b				X		
	Chipco Triton	19.2% SU	29109	G	X	X ^b	X	X					X ^b				X		

^a preventive treatment **Use Area:** G = golf course S = sod/turf farm L = lawn C = seed crop O = ornamental turf T = turf, area not specified on label

^b control requires tank mix with Rovral Green

^c leaf spot only

GSM = grey snow mold
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