Chapter One

DISEASES OF CEREALS

BARLEY (*Hordeum distichum, H. vulgare*)

BACTERIAL BLIGHT

Xanthomonas translucens

Cultural: The disease is seed-borne and can also overwinter on crop debris. Sowing seed from uninfected fields and rotation with non-cereal crops should reduce disease incidence.

Resistant Cultivars: None.

Chemical: None.

References:

1. Martens, J.W., W.L. Seaman and T.G. Atkinson (eds.) 1984. Diseases of Field Crops in Canada. Can. Phytopath. Soc. 160 pp.

BARLEY STRIPE MOSAIC

Barley stripe mosaic virus

Cultural: Use pedigreed seed. Control wild oats (see Notes).

Resistant Cultivars: None.

Chemical: None.

Notes:

1. The virus is rare or absent in the various classes of pedigreed seed, i.e., select, foundation, registered, and certified seed.

2. Wild oats are a repository for BSMV which can be transmitted to barley via leaf contact (2).

3. Barley from Canada intended for seed use in Montana must be certified free of seed-borne barley stripe mosaic virus.

References:

1. Chiko, A.W. 1973. Barley stripe mosaic in the Canadian Prairies in 1972. Can. Plant Dis. Surv. 53: 107-111.

2. Chiko, A.W. 1983. Reciprocal contact transmission of barley stripe mosaic virus between wild oats and barley. Plant Dis. 67: 207-208.

BARLEY YELLOW DWARF

Barley yellow dwarf virus

Cultural: Seed early to avoid aphid infestation and damage.

Resistant Cultivars: None.

Intermediate: Conquest, Norbert.

Susceptible: All others.

Chemical: None.

References:

1. Gill, C.C. 1970. Epidemiology of barley yellow dwarf in Manitoba and effect of the virus on yield of cereals. Phytopathology 60: 1826-1830.

2. Haber, S. 2002. Personal communication. Agric. & Agri-Food Can. Cereal Res. Centre. Winnipeg, MB.

COMMON ROOT ROT

Cochliobolus sativus, Fusarium spp.

Cultural: Rotations that include several years of non-host crops (rapeseed, flax, legumes) or growing bromegrass will reduce inoculum in the soil and may reduce levels of disease. Deep seeding increases disease severity and should be avoided if possible. Use adequate levels of fertilizer (N + P) on stubble-planted barley to reduce disease severity. Under reduced tillage, especially direct seeding, disease severity may decrease in comparison to conventional tillage.

Cultivar Resistance:

Resistant	Intermediate	Susceptible
CDC Alamo, B1602, CDC Bold, Conlon, CDC Gainer, Legacy, CDC McGwire, Peregrine, AC Rosser, CDC Speedy, TR 359, TR 361, Trochu, CDC Unity, Virden, Xena, CDC Yorkton	Argyle, AC Bacon, Bedford, Bonanza, AC Bountiful, Bridge, Bronco, BT435, Calder (TR 262), CDC Battleford, CDC Buck, Condor, CDC Copeland, CDC Creme, CDC Dawn, Deuce, CDC Dolly, Duel, Duke, CDC Earl, Falcon, CDC Freedom, CDC Gainer, CDC Guardian, AC Harper, Harrington, HB 805, AC Hawkeye, CDC Helgason, HB803, Kasota, CDC Lager, Leduc, Manley, Merit, Merlin, AC Metcalfe, AC Newdale, Phoenix, CDC Silky, CDC Sisler, Stander, Stetson, CDC Stratus, Tankard, Tercel, CDC Thompson, CDC Tisdale, TR 145, TR 166, TR 256, , Tukwa, Tyto, Vivar (1)	AC Albright, B1215, Brier, CDC Fleet, Jackson, Jaeger, Johnston, AC Lacombe, Mahigan, Niobe, Niska, Noble, Otal, AC Oxbow, Prospect, Seebe, Stein, AC Stacey (1) (see Note 1)

Chemical: Treat seed with - carbathiin (COM) SN; triadimenol (COM) SN (see Notes).
Limitations: As per label.

Notes:

1. The resistance status of Excel, Foster, Winthrop, and Robust is undetermined.

2. Seed treatment reduces seedling blight caused by these fungi but does not control root rot in post-seedling plants.

References:

1. Bailey, K.L. and L.J. Duczek. 1996. Managing cereal diseases under reduced tillage. Can. J. Plant Pathol. 18: 159-167.

2. Conner, R.L. et al. 1996. Influence of crop rotation on common root rot of wheat and barley. Can. J. Plant Pathol. 18: 247-254.

3. Duczek, L.J. and Piening, L.J. 1982. Effect of seeding depth, seeding date, and seed size on common root rot of spring barley. Can. J. Plant Sci. 62: 885-891.

4. Piening, L.J. *et al.* 1976. Barley losses due to common root rot in the Prairie Provinces of Canada. Can. Plant Dis Surv. 56: 41-45.

5. Piening, L.J. *et al.* 1983. Effect of fertilizer on root rot of barley on stubble and fallow land. Can. J. Plant Pathol. 5: 136-139.

6. Piening, L.J. and Orr, D. 1988. Effects of crop rotation on common root rot of barley. Can. J. Plant Pathol. 10: 61-65.

7. Turkington, T.K. 2002. Personal communication. Agric. & Agri-Food Can. Res. Centre, Lacombe, AB.

8. Turkington, T.K. 1998. The influence of tillage and rate of nitrogen fertilizer on common root rot of barley. Can. J. Plant Pathol. 20: 130-131.

COVERED SMUT and FALSE LOOSE SMUT

Ustilago hordei and *U. nigra*

Cultural: None (see Note 1).

Cultivar Resistance:

Resistant	Intermediate	Susceptible
CDC Alamo, AC Bacon, Calder, CDC Battleford, CDC Bold, CDC Bountiful, Brier, Bronco, BT941, CDC Copeland, Deuce, Diamond, CDC Dolly, CDC Earl, Falcon, CDC Freedom, CDC Gainer, Galt, CDC Guardian, HB 805, Kasota, Klages, AC Lacombe, Leduc, Legacy, Mahigan, Merit, Merlin, AC Newdale, Niobe, Niska, AC Rosser, Seebe, AC Stacey, Stetson, Tercel, CDC Thompson, CDC Tisdale, TR 166, TR 256, TR 359, TR 361, Trochu, Tukwa, Tyto, Vivar Winchester, CDC Yorkton	Abee, CDC Alamo, AC Albright, Bedford, B1215, B1602, Bridge, AC Buffalo, Conlon, Conquest, CDC Copeland, CDC Creme, CDC Dawn, Duel, Duke, AC Harper, AC Hawkeye, HB803, Heartland, Iona, Jeager, Klondike, CDC Lager, CDC McGwire, Manley, Melvin, Noble, Otal, AC Oxbow, Peregrine, Phoenix, Prospect, CDC Richard, Samson, CDC Silky, CDC Speedy, Stein, CDC Stratus, Virden	Argyle, Bonanza, BT435, CDC Buck, Condor, Ellice, Empress, CDC Fleet, Harrington, Jackson, Johnston, CDC Kendall, CDC Sisler, Tankard, Tupper, CDC Unity (see Note 2)

Chemical: Treat seed with - carbathiin SU, SN; carbathiin + thiram DU, SU; maneb DU, SU; tebuconazole SN, WP; triadimenol SN (all COM) (see Notes 3, 4, 5).

Limitations: Treated grain must not be mixed with untreated grain for feed or sale. If treated seed has been stored longer than the time specified on the label, it should be buried at a depth and location where it will not be accessible to animals or birds, and will not contaminate water supplies.

Notes:

1. There are presently no standards in the Seeds Act for covered and false loose smuts in pedigreed barley seed.

2. The resistance status of Excel, Foster, Robust and Xena is undetermined.

3. Seed of resistant cvs. and seed of susceptible cvs. free of smut should not require chemical treatment. If smut was observed in a crop that is being used for seed, or detected by a laboratory seed test, the seed should be treated.

4. Triadimenol is available only for custom-treated seed lots.

5. Registered seed treatments may have minimal effects with hulless barley (2).

References:

1. Menzies, J.G. 2002. Personal communication. Agric. & Agri-Food Can. Cereal Res. Centre, Winnipeg MB.

2. Evans, I.R. 1999. Personal communication. Alberta Agr., Food & Rural Development, Edmonton AB.

ERGOT

Claviceps purpurea

Cultural: Avoid sowing barley, wheat, rye or triticale on land where an ergoty crop was harvested the preceding year or near headlands and roadsides unless they were mowed at anthesis (flowering) the previous year to prevent sclerotia formation.

Cultivar Resistance: None.

Chemical: None.

Notes: Resistance to ergot in barley is by exclusion of inoculum from the floret until it is fertilized. Factors such as low soil-available copper, occasionally low boron, or late application of herbicides, all of which reduce pollen fertility will greatly increase susceptibility to ergot of any cultivar. Sandy, high organic and black loamy soils are most often copper deficient and subject to ergot infestation.

References:

1. Seaman, W.L. 1980. Ergot of grains and grasses. Can. Dep. Agric. Publ. 1438 (rev.) 16 pp.

2. Evans, I.R. 1998. Personal communication. Alberta Agric., Food and Rural Development, Edmonton, AB.

3. Evans, I.R. *et al*. 1990. Ergot control in wheat and barley with soil applied copper sulphate. Can. J. Plant Pathol. 12: 333.

4. Evans, I.R., *et al.* 1995. Copper, a key element for disease control in wheat and barley crops in Alberta. (Abstract) Phytopathology 85: 1125.

5. Agri-fax. 1995. Copper deficiency: diagnosis and correction. Agdex 532-2, 8 pp. Alberta Agr., Food and Rural Development, Edmonton AB.

EYESPOT

Pseudocercosporella herpotrichoides

Cultural: Rotation to crops other than cereals and turning under barley straw and stubble is an effective means of keeping the disease under control.

Resistant Cultivars: None.

Chemical: None.

References:

1. Slopek, S.W. 1989. First report of eyespot (*Pseudocercosporella herpotrichoides*) in spring barley in Alberta. Can. Plant Dis. Surv. 69: 125-127.

FLAME CHLOROSIS

Soil transmitted virus-like agent

Cultural: If flame chlorosis is identified infecting more than 5% of plants in the field, rotate that field out of cereals for one or more years (1,2). Flame chlorosis reaches most damaging levels in fields with many years of continuous cultivation in barley (or barley and wheat), and where seed type, seeding practices and seeding conditions result in slow germination and emergence. To reduce risk of flame chlorosis, use vigorous seed and avoid deep seeding.

Resistant Cultivars: None.

Chemical: None.

Notes: Flame chlorosis is a newly recognized disease which affects primarily barley and wheat, occasionally oat and some graminaceous weeds. The disease is most prevalent in western Manitoba and the eastern Red River Valley south of Winnipeg (4).

References:

1. Haber, S. 2002. Personal communication. Agric. & Agri-Food Can. Cereal Res. Centre, Winnipeg MB.

2. Haber, S., Barr, D.J.S., and Platford, R.G. 1991. Observations on the distribution of flame chlorosis in Manitoba and its association with certain zoosporic fungi and the intense cultivation of cereals. Can. J. Plant Pathol. 13: 241-246.

3. Haber, S. *et al.* 1990. Flame chlorosis: a new, soil-transmitted virus-like disease of barley in Manitoba, Canada. J. Phytopath. 129: 245-256.

4. Haber, S. *et al.* 1992. 1992 survey of flame chlorosis in Manitoba and eastern Saskatchewan. Can. Plant Dis. Surv. 73: 1, 73-74.

FUSARIUM HEAD BLIGHT (SCAB)

Fusarium graminearum, F. poae, other *Fusarium* spp.

Cultural: Incorporation of straw and stubble and rotations away from barley, wheat and corn (also hosts) should reduce disease levels. Barnyard grass and quackgrass should be controlled as they are non-crop hosts (see note 1).

Cultivar Resistance:

Resistant	Intermediate	Susceptible
None	Argyle, AC Bountiful, Condor, Conlon, CDC Copeland, CDC Dawn, Deuce, CDC Dolly, CDC Fleet, CDC Freedom, Harrington, AC Hawkeye, CDC Kendall, Manley, CDC McGwire, AC Metcalfe, AC Newdale, AC Oxbow, Phoenix, Seebe. CDC Speedy, Stein, CDC Stratus, Tankard, CDC Thompson, TR 256, TR 361, CDC Unity, Xena	All others

Chemical: None.

Notes:

1. The disease has been most prevalent and severe in south-central Manitoba, but since 1997 has also been severe in western Manitoba and south-eastern Saskatchewan.

2. Cultivars differ in reaction to fusarium head blight. Falcon, CDC Fleet, Kasota, AC Lacombe, Mahigan, AC Rosser and Stander are among the most susceptible; the least susceptible cultivars can be rated as 'intermediate'.

3. Compared to wheat, barley crops generally show a greater incidence but a lower severity to fusarium head blight, resulting in similar over-all levels of damage (in Manitoba).

References:

1. McCallum, B. 1999. Personal communication. Agric. and Agri-Food Can., Cereal Research Centre, Winnipeg, MB.

2. Tekauz, A. 2002. Personal communication. Agric. and Agri-Food Can., Cereal Research Centre, Winnipeg, MB.

LEAF STRIPE

Pyrenophora graminea

Cultural: Delaying seeding until soil is warm will often reduce, although not eliminate leaf stripe in plants grown from infected seed. Do not plant seed harvested from infested fields.

Cultivar Resistance:

Resistant	Intermediate	Susceptible
Abee, B1215, Bonanza, Brier, CDC Buck, Condor, Diamond, Seebe, Tankard	Argyle, B1602, Bedford, Bridge, Conquest, Duel, Duke, Ellice, Heartland, Herta, Klages, Manley, Noble, Norbert, CDC Richard, Samson, Stein, Tupper, Virden	CDC Creme, Duece, Elrose, Empress, Galt, Harrington, Heartland, Jackson, Johnston, Leduc, Klondike, Melvin, Olli, Otal, Parkland, AC Stacey, Winchester

Chemical: Treat seed with - carbathiin (COM) SN; carbathiin + thiram (COM) SU; tebuconazole (COM) SN, WP; triadimenol (COM) SN.
Limitations: As per label.

Notes: No testing for barley cultivar reaction to leaf stripe has been undertaken in recent years, therefore resistance of newer cultivars is unknown.

References:

1. Tekauz, A. 2002. Personal communication. Agric. & Agri-Food Can. Cereal Res. Centre, Winnipeg MB.

2. Tekauz, A. 1991. Determination of barley cultivar reaction to *Pyrenophora graminae* using disease nurseries. Can. J. Plant Pathol. 12: 57-62.

3. Tekauz, A., F.R. Harper and J.G.N. Davidson. 1985. Effect of date of seeding and seed treatment fungicides on infection of barley by *Pyrenophora graminea*. Can. J. Plant Pathol. 7: 408-416.

LOOSE SMUT

Ustilago nuda

Cultural: None.

Cultivar Resistance:

Resistant	Intermediate	Susceptible
AC Bountiful, Calder, AC Metcalfe, AC Oxbow, TR 166, TR 256, TR 361	CDC Alamo, HB 805, Jaeger, Leduc, Legacy, Merlin, CDC Silky, CDC Tisdale, Tupper, Vivar	All others (See Notes 1, 2)

Chemical: Treat seed with carbathiin (COM) DU, SN, SU; triadimenol (COM) SN; tebuconazole (COM) SN, WP; triticonazole (COM) LI. (See Note 3).

Limitations: Treated grain must not be mixed with untreated grain for feed or sale. Treated left-over seed may be saved for planting the following year unless it has been treated with a dual-purpose (fungicide/ insecticide) formulation; otherwise, it should be buried to a depth and location where it will not be accessible to animals or birds and will not contaminate water supplies, or double seeded if left-over quantities are limited.

Notes:

1. The resistance status of cvs. is assessed by artificial inoculation and is therefore genetic. Some cvs., particularly two-rowed types, have good field resistance, based on exclusion of spores to the flowers; but at this time, there is no practical means to measure this type of resistance.

2. The resistance status of Conlon, Excel and Robust is undetermined.

3. Seed of resistant cvs. and seed of susceptible cvs. that test free of smut should not usually require chemical treatment.

References:

1. Menzies, J.G. 2002. Personal Communication. Agric. & Agri-Food Can. Cereal Res. Centre, Winnipeg MB.

NET BLOTCH

Pyrenophora teres

Cultural: Turning under of straw and stubble, on which the fungus may over-winter, reduces the amount of available inoculum for the following year's crop. Barley should not follow barley in heavily infested fields.

Cultivar Resistance:

Resistant	Intermediate	Susceptible
Calder, CDC Freedom, Heartland, CDC Helgason, CDC McGwire, TR 256, TR 359	CDC Battleford, AC Bountiful, Brier, Bronco, Conlon, CDC Copeland, CDC Dawn, CDC Earl, Ellice, Falcon, CDC Fleet, CDC Gainer, CDC Guardian, AC Harper, AC Hawkeye, Kasota, CDC Kendall, AC Lacombe, Leduc, Mahigan, Manley, CDC McGuire, Merit, AC Newdale, Niobe, AC Oxbow, AC Ranger, AC Rosser, CDC Select, CDC Silky, AC Stacey, Stetson, CDC Stratus, CDC Tisdale, TR 166, TR 361, Conlon, HB903, CDC Thompson, CDC Unity, Virden, Vivar, Winchester, CDC Yorkton, (see Note 1).	All others (see Note 2).

Chemical: Treat seed with - carbathiin (COM) DU, SN, SU; maneb (COM); triadimenol (COM) SN; spray foliage - with propiconazole (COM) EC (see Notes 3, 4).

Limitations: Pre-harvest interval - 45 days (propiconazole).

Notes:

1. The resistance of cultivars to the net and spot forms of *P. teres* may differ; if one form predominates in a field or region, cultivars rated intermediate may in fact appear susceptible or resistant.

2. In farm fields, six-rowed barley cultivars generally show less damage from this disease than do the two-rowed types.

3. Seed treatment reduces the chances of introducing new races of the pathogen to barley fields and may reduce the incidence of seedling blight.

4. Seed treatment will not protect post-seedling plants from infection.

References:

1. Piening, L.J. 1968. Development of barley net blotch from infested straw and seed. Can. J. Plant Sci. 48: 623-625.

2. Tekauz, A. 2002. Personal communication. Agric. & Agri-Food Can. Cereal Res. Centre, Winnipeg MB.

3. Tekauz, A. 1990. Characterization and distribution of pathogenic variation in *Pyrenophora teres* f. *teres* and *P. teres* f. *maculata* from western Canada. Can J. Plant Pathol. 12: 141-148.

SCALD

Rhynchosporium secalis

Cultural: Turning under of crop remains or a 1-year rotation from barley reduce the available inoculum. Bromegrass should not be used in the rotation as it is susceptible to scald. Continuous production of the same resistant variety under intensive management should be avoided to reduce the risk of virulent pathotype selection that can lead to breakdown of resistance.

Cultivar Resistance:

Resistant	Intermediate	Susceptible
Kasota, Mahigan, Niska, Seebe	CDC Alamo, AC Bacon, CDC Bold, Brier, Bronco, CDC Dawn, CDC Dolly, Falcon, CDC Fleet, CDC Gainer, AC Harper, AC Hawkeye, HB 805, Jaeger, AC Lacombe, CDC McGwire, Niobe, Peregrine, AC Rosser, CDC Silky, Trochu, Tukwa, Vivar, Xena	All others

Chemical: Treat seed with - triadimenol (COM) SN; spray foliage with - propiconazole (COM) EC (see Note 3).

Limitations: Preharvest interval - 45 days (propiconazole).

Notes:

1. Pathotypes of *R. secalis*, capable of attacking several of the resistant cultivars, exist in western Canada. Presently, these are not predominant nor widespread, but they can occur in individual fields.

2. Some herbicides inhibit the sporulation of the pathogen and may reduce infections within a field (4).

3. Seed treatment with triadimenol may provide some early season disease suppression.

References:

1. Orr, D.D. and Turkington, T.K. 1997. Foliar disease development on Harrington barley - Lacombe 1997. PMRR, 1997.

2. Orr, D.D. and Turkington, T.K. 1996. The effect of seed dressing on early scald infection - Lacombe 1996. PMRR, 1996.

3. Skoropad, W.P. 1960. Barley scald in the Prairie Provinces of Canada. Phytopathol. News 6: 25-27.

4. Skoropad, W.P. and Kao, W.W. 1965. The effect of some herbicides on sporulation of *Rhynchosporium secalis*. Phytopathology 55: 43-45.

5. Tekauz, A. 2002. Personal communication. Agric. & Agri-Food Can. Cereal Res. Centre, Winnipeg MB.

6. Turkington, T.K. 2002. Personal communication. Agric. & Agri-Food Canada, Res. Centre, Lacombe AB.

7. Xi, K. 2002. Personal communication. Alberta Agric., Food and Rural Dev., Lacombe AB.

SPECKLED LEAF BLOTCH

Septoria passerinii, Septoria avenae

Cultural: Rotation to crops other than barley and turning under of barley straw and stubble help to reduce infection.

Cultivar Resistance:

Resistant	Intermediate	Susceptible
Brier, CDC Buck, Falcon	AC Bacon, Kasota, AC Lacombe, Mahigan, CDC Silky	All others

Chemical: Spray foliage with - propiconazole (COM) EC.

Limitations: Preharvest interval - 45 days (propiconazole).

References:

1. Tekauz, A. 2002. Personal communication. Agric. & Agri-Food Can. Cereal Res. Centre, Winnipeg MB.

SPOT BLOTCH

Cochliobolus sativus

Cultural: Turning under of crop residue and several years rotation with non-cereal crops helps to reduce infection.

Cultivar Resistance:

Resistant	Intermediate	Susceptible
None	TR 256, TR 359, Tyto	All others.

Chemical: Spray foliage with - propiconazole (COM) EC.

Limitations: Preharvest interval - 45 days (propiconazole).

References:

1. Martens, J.W., W.L. Seaman and T.G. Atkinson (eds.). 1984. Diseases of Field Crops in Canada. Can. Phytopath. Soc. 160 pp.

2. Tekauz, A. 2001. Personnal communication. Agric. & Agri-Food Can. Cereal Res. Centre, Winnipeg MB.

STEM RUST

Puccinia graminis f. sp. *tritici*, *P. graminis* f. sp. *secalis*,

Cultural: Early seeding usually will reduce the levels of rust damage in susceptible cultivars.

Cultivar Resistance:

Resistant (see Notes)	Intermediate	Susceptible
Argyle, Bedford, Bonanza, AC Bountiful, Brier, Bronco, BT 421, BT435, BT 926, CDC Bold, CDC Buck, AC Buffalo, B1215, CDC Candle, Condor, Conlon, Conquest, CDC Copeland, Deuce, Diamond, Duel, Duke, CDC Earl, Empress, Excel, Foster, CDC Gainer, Galt, CDC Guardian, Heartland, Johnston, Kasota, CDC Kendall, Klondike, AC Lacombe, Leduc, Legacy, Mahigan, Manley, Melvin, AC Metcalfe, AC Newdale, Niska, Noble, AC Oxbow, CDC Richard, Robust, AC Rosser, Samson, CDC Silky, CDC Sisler, Stander, CDC Stratus, Stein, Stetson, Tankard, Tercel, TR 229, TR 256, TR 975, Trochu, CDC Unity, Vivar, Virden, Xena, CDC Yorkton	AC Bacon, CDC Battleford, Bridge, B1602, Calder, CDC Dawn, CDC Dolly, Ellice, Falcon, CDC Freedom, AC Harper, AC Hawkeye, HB 805, Jaeger, CDC McGwire, Merit, Niobe, Peregrine, Prospect, CDC Speedy, CDC Thompson, CDC Tisdale, TR 166, TR 359, TR 361, Tukwa, Tyto	Abee, BT 941, CDC Alamo, AC Albright, CDC Creme, CDC Fleet, Harrington, HB 803, Jackson, Klages, Merlin, Olli, Otal, Phoenix, SD 904, Seebe, AC Stacey, Tupper, Winchester, and most hulless cultivars (See Appendix I on page 45)

Chemical: Spray foliage with - propiconazole (COM) EC.

Limitations: Preharvest interval - 45 days (propiconazole).

Notes:

1. The resistance conferred by the Rpg1 gene is host-genotype-environment sensitive and may under certain situations result in abnormally high infection, particularly at higher temperatures.

2. A race of stem rust (QCC) virulent to gene Rpg1 is now common in western Canada. All barley cultivars are susceptible to this race, and may be damaged in epidemic years.

References:

1. Fetch, T. 2002. Personal communication. Agric. & Agri-Food Can. Cereal Res. Centre, Winnipeg MB.

OTHER DISEASES

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

Aster Yellows (aster yellows phytoplasma)

Brome Mosaic (brome mosaic virus)

Halo Spot (*Pseudoseptoria stomaticola*)

Leaf Rust (*Puccinia hordei*)

Leaf Spot (physiological)

Powdery Mildew (*Erysiphe graminis*)

Seedling Blight, Damping-off (*Cochliobolus sativus, Fusarium* spp., *Pythium* spp., other fungi)

Stripe Rust (*Puccinia striiformis*)

Take-all (*Gaeumannomyces graminis* var. *tritici*)

Wheat Streak Mosaic (Wheat streak mosaic virus; WSMV)

OAT (*Avena sativa*)

Oat is subject to a number of diseases, the severity of which varies with region, prevailing weather, and choice of cultivars. For a more comprehensive treatment of oat diseases, see Harder, D.E. and S. Haber. 1992. Oat diseases and pathologic techniques. pp. 307-425. *In* H.G. Marshall and M. Sorrells (eds.), Oat Science and Technology. Agronomy Monogram No. 33, ASA/CSSA, Madison, WI.

ANTHRACNOSE

Colletotrichum graminicola

Cultural: Turning under of straw and stubble to incorporate organic matter into the soil, fertilizer application at recommended levels, and rotations that include several years of non-cereal crops should reduce disease incidence.

Resistant Cultivars: None.

Chemical: None.

Notes:

1. Anthracnose may be found in any field where oats have been grown successively for several years. It is found primarily in the north-central and western regions of Alberta where soils may be of degraded type and/or poor fertility.

2. Barley, rye, and wheat are also susceptible.

References:

1. Boewe, G.H. 1960. Diseases of wheat, oats, barley and rye. Ill. Nat. Hist. Surv., Circ. 48.

2. Harder, D.E. and Skoropad, W.P. 1968. The occurrence of cereal anthracnose in Alberta. Can. Plant Dis. Surv. 48: 39-42.

BARLEY YELLOW DWARF (RED LEAF)

Barley yellow dwarf virus

Cultural: Seed early to avoid aphid infestation and virus damage.

Cultivar Resistance:

Resistant	Intermediate	Susceptible
AC Assiniboia, AC Gwen, AC Ronald, OT 2009, OT 7008	AC Belmont, AC Boudrias SW Exactor, AC Pinnacle, AC Preakness, AC Rebel, Robert	All others

Chemical: None.

References:

1. Gill, C.C. 1970. Epidemiology of barley yellow dwarf in Manitoba and effect of the virus on yield of cereals. Phytopathology 60: 1826-1830.

2. Haber, S. 2002. Personal communication. Agric. & Agri-Food Can. Cereal Res. Centre, Winnipeg MB.

COVERED SMUT and LOOSE SMUT

Ustilago kolleri and *U. avenae*

Cultural: None (see Note 1).

Cultivar Resistance:

Resistant	Intermediate	Susceptible
AC Assiniboia, AC Belmont, AC Boudrias, CDC Dancer, Dumont, Elvy, Kaufmann, AC Marie, AC Medallion, OT 382, OT 7001, OT 2009, OT 7008, CDC Orrin, CDC Pacer, AC Pinnacle, AC Preakness, AC Rebel, Riel, Robert, Triple Crown	AC Antoine, CDC Boyer, Derby, Elvy, SW Exactor, Fraser, Harmon, AC Juniper, Kelsey, AC Morgan, Rodney, Sioux, Waldren	Athabasca, Boullion, Calibre, Cascade, Foothill, Grizzly, Jasper

Chemical: Treat seed with - carbathiin SN; carbathiin + thiram DU, SU; maneb DU, SU; tebuconazole SN; triticonazole LI (all COM) (see Note 2).

Limitations: Treated grain must not be mixed with untreated grain for feed or sale. Left over treated grain may be double seeded. If treated seed has been stored longer than the time specified on the label, it should be buried at a depth and location where it will not be accessible to animals, and will not contaminate water supplies.

Notes:

1. There are presently no standards in the Seeds Act for covered and loose smut in pedigreed oat seed.

2. Seed of resistant cvs. and seed of susceptible cvs. free of smut should not normally require chemical treatment.

References:

1. Menzies, J.G. 2002. Personal communication. Agric. & Agri-Food Can. Cereal Res. Centre, Winnipeg MB.

CROWN RUST

Puccinia coronata f. sp. *avenae*

Cultural: European buckthorn naturalized in Manitoba is an alternate host for the crown rust fungus; therefore, the shrub should be eradicated near farm fields (1). Seeding early will usually decrease the level of rust damage.

Cultivar Resistance:

Resistant	Intermediate	Susceptible
AC Assiniboia, AC Gwen, Kaufmann, AC Medallion, OT 2009, OT 7008, AC Pinnacle, AC Ronald	None	All Others

Chemical: Spray foliage with - propiconazole (COM) EC.
Limitations: Preharvest interval - 45 days (propiconazole).

Notes:

1. Races of crown rust virulent to *Pc68* (effective gene in AC Assiniboia, AC Gwen, AC Medallion, AC Pinnacle and AC Ronald) presently are occurring at less than 2% in the rust population, levels too low to cause any rust damage. Planting these cultivars early will decrease the level of rust damage.

References:

1. Harder, D.E. 1979. Crown rust of oats, Agric. Can., Canadex 113-630. 4 pp.

2. Chong, J. 2000. Incidence and virulence of *Puccinia coronata* f. sp. *avenae* in Canada from 1996 to 1998. Can. J. Plant Pathol. 22: 99-109.

3. Chong, J. 2002. Personal communication. Agric. & Agri-Food Can. Cereal Res. Centre, Winnipeg, MB.

4. Simons, M.D. 1985. Crown rust. *in* The Cereal Rusts, Vol. II, Roelfs, A.P. and Bushnell, W.R. (eds.), Academic Press, N.Y. pp. 131-172.

ERGOT

(See under Rye, page 1-20)

SEEDLING BLIGHT, DAMPING-OFF

Cochliobolus sativus, Pyrenophora chaetomioides, Fusarium spp., *Pythium* spp., other fungi

Cultural: None.

Resistant Cultivars: None.

Chemical: Treat seed with - maneb (COM) DU, SU. Limitations: As per label.

Notes: Chemical seed treatment reduces infection at early stages of plant growth but will not protect post-seedling plants from infection by these fungi.

References:

1. Martens, J.W., W.L. Seaman and T.G. Atkinson (eds.) 1984. Diseases of Field Crops in Canada. Can. Phytopath. Soc. 160 pp.

STEM RUST

Puccinia graminis f. sp. *avenae*

Cultural: Seeding early will usually decrease the level of rust damage.

Cultivar Resistance:

Resistant	Intermediate	Susceptible
AC Assiniboia, AC Belmont, CDC Boyer, CDC Dancer, Dumont, AC Gwen, Kaufmann, AC Marie, AC Medallion, OT 2009, OT 7008, AC Pinnacle, AC Preakness, AC Rebel, Riel, Robert, AC Ronald	Fidler	All others

Chemical: None.

Notes: All cultivars are susceptible to race NA67, which first appeared in 1998 and is now present in western Canada.

References:

1. Fetch, T. 2002. Personal communication. Agric. & Agri-Food Can. Cereal Res. Centre, Winnipeg MB.

2. Martens, J.W. 1985. Oat stem rust. *in* The Cereal Rusts, Vol. II. Roelfs, A.P. and Bushnell, W.R. (eds.), Academic Press, N.Y. pp. 103-129.

3. McCallum, B. 1999. Personal communication. Agric. & Agri-Food Can. Cereal Res. Centre, Winnipeg MB.

OTHER DISEASES

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

Blast (physiological)

Brome Mosaic (brome mosaic virus)

Common Root Rot (*Cochliobolus sativus, Fusarium* spp.)

Flame Chlorosis (soil transmitted virus-like agent)

Fusarium Head Blight (*Fusarium* spp.)

Gray Speck (manganese deficiency)

Halo Blight (*Pseudomonas syringae* pv. *coronafaciens*)

Leaf Blotch (*Pyrenophora avenae, Septoria avenae* f. sp. *avenae*)

Oat Blue Dwarf (oat blue dwarf virus)

Oat Necrotic Mottle (oat necrotic mottle virus)

Wheat Streak Mosaic (wheat streak mosaic virus; WSMV)

RYE (*Secale cereale*) FALL AND SPRING-SOWN CULTIVARS

ERGOT

Claviceps purpurea

Cultural: Avoid sowing wheat, rye, triticale, or barley on land where an ergoty crop was harvested the preceding year or near headlands and roadsides unless they were mowed at anthesis (flowering) the previous year to prevent sclerotia formation. Ergots do not usually remain viable for more than a year or so. Delayed swathing allows most if not almost all of the ergots to "shell out" (fall to the ground).

Resistant Cultivars: None.

Chemical: None.

Notes:

1. Copper availability or deficiency is not known to have any effect on the incidence of ergot in rye or other open pollinated cereal or grass.

2. Although rye generally does not suffer losses from infection with barley yellow dwarf virus (BYDV), autumn infection with BYDV has been observed to increase dramatically the susceptibility of fall rye to natural infection by ergot (4).

References:

1. Seaman, W.L. 1980. Ergot of grains and grasses. Can. Dep. Agric., Publ. 1438 (rev.) 16 pp.

2. Agri-fax. 1995. Copper deficiency: diagnosis and correction. Agdex 532-2, 8 pp. Alberta Agr., Food and Rural Development, Edmonton AB.

3. Evans, I.R. 2000. Personal communication. Alberta Agriculture Food & Rural Dev., Edmonton AB.

4. Haber, S. 1995. Interactions of barley yellow dwarf viruses. Pp 145-161, *in* Barley Yellow Dwarf - 40 Years of Progress, D'Arcy and Burnett, eds., APS Press, St. Paul MN.

SEEDLING BLIGHT, DAMPING-OFF

Cochliobolus sativus, Fusarium spp., *Pythium* spp., other fungi

Cultural: None.

Resistant Cultivars: None.

Chemical: Treat seed with - maneb (COM) DU, SU, WP; carbathiin + thiram (COM) DU, SU. Limitations: As per label.

Notes:

1. Chemical seed treatment reduces infection at early stages of plant growth but will not protect post-seedling plants from infection by these fungi.

2. Rye seed should be treated annually with a fungicide as it is more susceptible to damping-off than wheat, barley, and oats.

References:

1. Martens, J.W., W.L. Seaman and T.G. Atkinson (eds.). 1984. Diseases of Field Crops in Canada. Can. Phytopath. Soc. 160 pp.

SNOW SCALD AND COTTONY SNOW MOLD

Myriosclerotinia borealis, Coprinus psychromorbidus

Cultural: Sow early and apply ample fertilizers, especially phosphorus, since vigorous, well stooled out plants are more resistant. Avoid using fields where snow builds up during the winter or where it lies longer in the spring (see Notes).

Resistant Cultivars: None (see Notes).

Chemical: None.

Notes: Recommended varieties are generally very cold hardy in the Peace River region and the Northern Parklands where snow molds are most likely to be a problem. They are, however, susceptible to snow molds, and damage depends on the vigour of the plants and the depth and duration of the snow cover: the deeper and longer, generally the greater the damage.

References:

1. Smith, J.D. 1975. Snow molds on winter cereals in northern Saskatchewan in 1974. Can. Plant Dis. Surv. 55: 91-96.

2. Davidson, J.G.N. 1978. Plant diseases. Pp 3-5 in Tests on Cereal and Oilseed Crops in the Peace River Region. Agric. & Agri-Food Can. Res. Centre, Beaverlodge AB.

3. Gaudet, D. 2000. Personal communication. Agric. & Agri-Food Can. Res. Centre, Lethbridge, AB.

STEM SMUT

Urocystis occulta

Cultural: Rotate rye with any other crop to prevent build-up of soil-borne spores (see Notes). Use clean seed. Spring rye cultivars are resistant.

Resistant Cultivars: AC Rifle.

Intermediate: Kodiak, Musketeer, Prima, Puma, RT 178.

Susceptible: Cougar.

Chemical: Treat seed with carbathiin (COM) SN; carbathiin + thiram (COM) DU, SU.

Limitations: Treated grain must not be mixed with untreated grain for feed or sale. Treated left-over seed may be saved for planting the following year, unless it has been treated with a dual purpose (fungicide/insecticide) formulation; otherwise, it should be buried to a depth and location where it will not be accessible to animals and will not contaminate water supplies.

Notes: Farmer experience in a dry soil area of southern Alberta, where a crop:fallow:crop sequence is used, indicates that soil-borne inoculum will survive one fallow year. If wheat or barley alternates with rye in the above cropping sequence, the soil-borne inoculum is not a problem. Seed fall rye early to reduce risk of infection.

References:

1. Degenhardt, K.J. *et al.* 1983. Evaluation of seed treatment fungicides for control of seed- and soil-borne stem smut of fall rye. Pp. 288 *in* Pesticide Research Report. ECPUA, Ottawa.

2. Evans, I.R. 2000. Personal communication. Alberta Agriculture, Food & Rural Dev., Edmonton AB.

OTHER DISEASES

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

Bacterial Blight (*Xanthomonas translucens*)

BarleyYellow Dwarf (barley yellow dwarf virus)

Brome Mosaic (brome mosaic virus)

Common Root Rot (*Cochliobolus sativus* + *Fusarium* spp.)

Leaf Rust (*Puccinia recondita*)

Powdery Mildew (*Erysiphe graminis*)

Stem Rust (*Puccinia graminis* f. sp. *secalis*)

TRITICALE (*Triticale hexaploide*)

COMMON BUNT

Tilletia tritici, T. laevis

Cultural: None.

Resistant Cultivars: AC Alta, AC Altima, Carman, Carta, Copia, Frank, Pronghorn, T150, Wapiti, Welsh, 88DL01076 (winter).

Chemical: None.

Notes: There is presently no standard in the Seeds Act for common bunt in pedigreed seed.

References:

1. Gaudet, D.A. 2000. Personal communication. Agric. & Agri-Food Can. Res. Centre, Lethbridge AB.

COMMON ROOT ROT

Cochliobolus sativus, Fusarium spp.

Cultural: Rotations that include several years of non-host crops (rapeseed, flax, legumes) reduce levels of *C. sativus*, and possibly disease. Deep seeding enhances disease severity and should be avoided where possible. Reduced tillage reduces disease severity.

Resistant Cultivars: None.

Intermediate: AC Alta, AC Altima, Carman, AC Certa, Frank, Pronghorn, Wapiti.

Susceptible: Welsh.

Note: There is currently no testing of new varieties for common root rot reaction conducted in western Canada.

Chemical: None.

References:

1. Conner, R.L. 2000. Personal communication. Agric. & Agri-Food Can. Res. Centre, Lethbridge, AB.

ERGOT

Claviceps purpurea

Cultural: Avoid sowing rye or triticale on land where an ergoty crop was harvested the preceding year or near headlands and roadsides unless they were mowed at anthesis (flowering) the previous year to prevent sclerotia formation.

Resistant Cultivars: None (see Notes).

Chemical: None.

Notes: Resistance to ergot in triticale as in wheat, barley and oat, is by exclusion of inoculum from the floret until fertilized, i.e. the florets remain closed. Factors such as late application of herbicides or low soil-available copper, both of which reduce pollen fertility causing florets to open, may increase susceptibility to ergot in any cultivar.

References:

1. Evans, I.R. 2000. Personal communication. Alberta Agric., Food and Rural Dev., Edmonton, AB.

2. Seaman, W.L. 1980. Ergot of grains and grasses. Can. Dep. Agric. Publ. 1438 (rev.) 16 pp.

LEAF RUST

Puccinia recondita

Cultural: None.

Cultivar Resistance:

Resistant	Intermediate	Susceptible
AC Alta, AC Altima, Banjo, AC Certa, AC Copia, Frank, Pronghorn, T150	Wapiti	Welsh

Chemical: None.

References:

1. Kolmer, J.A. 1996. Personal communication. Agric. & Agri-Food Can. Cereal Res. Centre, Winnipeg MB.

STEM RUST

Puccinia graminis f. sp. *tritici*

Cultural: No susceptible barberry species should be imported into Canada and all bushes, whether native species or susceptible imported cultivars found should be eradicated (see Notes).

Cultivar Resistance:

Resistant	Intermediate	Susceptible
AC Alta, AC Altima, Banjo, AC Certa, AC Copia, Frank, Wapiti, Welsh, T150	Pronghorn	

Chemical: None.

Notes: The sexual stages of the life cycle of the stem rust fungus develop on barberry. Infection of this host results in the production of early spring inoculum and new physiological races. Barberry consequently threatens the production of both cereal grains and various grass species in Canada.

References:

1. Harder, D.E. 1998. Personal communication. Agric. & Agri-Food Can. Cereal Res. Centre, Winnipeg MB.

2. McCallum, B. 1999. Personal communication. Agric. & Agri-Food Can. Cereal Res. Centre, Winnipeg MB.

OTHER DISEASES

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

BarleyYellow Dwarf (barley yellow dwarf virus)

Brome Mosaic (brome mosaic virus)

Flame Chlorosis (soil-transmitted virus-like agent)

Fusarium Head Blight (*Fusarium* spp.)

WHEAT, COMMON AND DURUM (*Triticum aestivum* and *T. durum*)

BARLEY YELLOW DWARF

Barley yellow dwarf virus

Cultural: Seed early to avoid aphid infestation and damage.

Cultivar Resistance:

Resistant	Intermediate	Susceptible
None	AC Superb, AC Vista, HY644	All others

Chemical: None.

References:

1. Gill, C.C. 1970. Epidemiology of barley yellow dwarf in Manitoba and effect of the virus on yield of cereals. Phytopathology 60: 1826-1830.

2. Haber, S. 2002. Personal communication. Agric. & Agri-Food Can. Cereal Res. Centre, Winnipeg MB.

BLACK POINT, KERNEL SMUDGE

Alternaria alternata, Cochliobolus sativus

Cultural: Avoid irrigation during the milk stage and the dough stage. High application rates of nitrogen should be avoided.

Cultivar Resistance:

Resistant	Intermediate	Susceptible
Glenlea, Thatcher, Park	Canuck, Leader, AC Nanda, AC Phil, AC Reed	Neepawa, Columbus, Fielder, Owens, and all durum wheats

Note: There is currently no testing of new varieties for black point/kernel smudge reaction conducted in western Canada.
Chemical: None.

References:

1. Conner, R.L. 2002. Personal communication. Agric. & Agri-Food Can. Res. Centre, Lethbridge AB.

2. Wiese, M.V. 1977. Compendium of wheat diseases. Am. Phytopathol. Soc., St. Paul, Minn. pp. 12-13.

3. Fernandez, M.R., J.M. Clarke, and R.M. DePauw. 2000. Black point reaction of durum and common wheat cultivars grown under irrigation in southern Saskatchewan. Plant Dis. 84: 892-894.

BROWNING ROOT ROT

Pythium arrhenomanes, P. volutum, other *Pythium* spp.

Cultural: Return cereal residues to soil and maintain adequate phosphorus levels to assure vigorous seedling growth (1).

Resistant Cultivars: None.

Chemical: None.

Notes: This disease is much less important since the application of phosphate fertilizers came into general use (2).

References:

1. Vanterpool, T.C. 1940. Studies on browning root rot of cereals VI. Further contributions on the effects of various soil amendments on the incidence of the disease in wheat. Can. J. Res. C. 18: 240-257.

2. Vanterpool, T.C. 1952. The phenomenal decline of browning root rot on the Canadian prairies. Sci. Agric. 32: 443-458.

COMMON BUNT

Tilletia tritici, T. laevis

Cultural: None (see Note 1).

Cultivar Resistance:

	Resistant	**Intermediate**	**Susceptible**
Common	AC Abbey, AC Barrie, BW 755, AC Cadillac, Columbus, AC Crystal, AC Eatonia, ES 21, AC Foremost, AC Intrepid, AC Karma, Katepwa, Lancer, Leader, McKenzie, AC Minto, Pasqua, Prodigy, Selkirk, AC Taber, AC Vista, 5600HR	Amazon, Bluesky, CDC Bounty, BW 243, Conway, AC Corinne, AC Elsa, AC Glenavon, Glenlea, Invader, Neepawa, Oslo, Park, AC Splendor, CDC Teal, 5601 HR	Alikat, Biggar, BW 259, Genesis, Laser, Laura, PT 754, Roblin, Wildcat, 5701PR
Durum	Arcola, AC Avonlea, Coulter, Hercules, Kyle, Medora, AC Melita, AC Morse, AC Napoleon, AC Navigator, AC Pathfinder, Plenty, Sceptre, Wakooma, Wascana		
Soft White	none	AC Nanda	Fielder, AC Phil, AC Reed
Winter	AC Bellatrix	Readymade	CDC Clair, CDC Falcon, CDC Harrier, CDC Kestrel, Norstar, Norwin. CDC Osprey, CDC Ptarmigan, CDC Raptor, W337

Chemical: Treat seed with - carbathiin DU, SN, SU; carbathiin + thiram DU, SU; difenoconazole SN, maneb DU, SU; triadimenol SN; tebuconazole SN, WP; triticonazole LI (all COM).

Limitations: Treated grain must not be mixed with untreated grain for feed or sale. If treated seed has been stored longer than the time specified on the label, it should be buried at a depth and location where it will not be accessible to animals and birds, and will not contaminate water supplies.

Notes:

1. There is presently no standard in the Seeds Act for common bunt in pedigreed wheat seed.

2. As are most other smut diseases, common bunt is usually seed-borne. However, unlike other cereal smuts, bunt is hard to recognize in the field, and a low level of infection may go undetected. Therefore, to control infections, it is wise to treat seed of susceptible cvs. every year and of intermediate cvs. every 2 years. Seed of resistant cvs. does not require treatment specifically for this disease.

3. Soil-borne infections may be important. If bunt is present, rotate to non-susceptible crop(s) for at least one year.

4. A 1% bunt infection in wheat can downgrade a potential #1 grain lot to feed or sample.

References:

1. Gaudet, D.A. 2002. Personal communication. Agric. & Agri-Food Can. Res. Centre, Lethbridge AB.

2. Gaudet, D.A., and Puchalski, B.L. 1989. Status of bunt resistance in western Canadian spring wheat and triticale. Can. J. Plant Sci. 69: 797-804.

3. Gaudet, D.A. *et al.* 1989. Effect of environment on efficacy of seed treatment fungicides for control of common bunt in spring and winter wheat. Pesticide Sci. 26: 241-252.

4. Gaudet, D.A. and Puchalski, B.L. 1989. Races of common bunt (*Tilletia caries and T. foetida*) of wheat in western Canada. Can J. Plant Path. 11: 415-418.

5. Gaudet, D.A. *et al.* 1993. Susceptibility and resistance in Canadian spring wheat cultivars to common bunt (*Tilletia tritici* and *T. laevis*). Can. J. Plant Sci. 73: 1217-1224.

COMMON ROOT ROT

Cochliobolus sativus, Fusarium spp.

Cultural: Minimum and zero tillage practices and maintaining adequate and balanced soil fertility may reduce the severity of the disease. Rotations that include several years of non-host crops (rapeseed, flax, legumes) reduce levels of disease. Deep seeding enhances disease severity and should be avoided where possible.

Cultivar Resistance:

	Resistant	**Intermediate**	**Susceptible**
Common	Amazon, Bluesky, Glenlea, AC Intrepid, Laura, Roblin	Alikat, AC Barrie, Biggar, AC Cadillac, Columbus, Conway, AC Cora, AC Corinne, AC Crystal, Cutler, AC Eatonia, AC Elsa, AC Foremost, Genesis, AC Glenavon, Invader, AC Karma, Katepwa, Lancer, Laser, AC Majestic, CDC Makwa, Manitou, CDC Merlin, AC Michael, AC Minto, Napayo, Neepawa, Oslo, Park, Pasqua, Pitic 62, Prodigy, Selkirk, AC Splendor, AC Taber, CDC Teal, Thatcher, AC Vista	Leader
Durum		AC Morse, Coulter, Hercules, Kyle, Medora, AC Melita, AC Napoleon, AC Navigator, AC Pathfinder, Pelissier, Plenty, Sceptre, Wakooma, Wascana	None
Soft White	None	Fielder, AC Nanda, AC Phil, AC Reed	
Winter	None	CDC Clair, CDC Osprey	Norstar

Note: There is currently no testing of new varieties for common root rot reaction conducted in western Canada.

Chemical: Treat seed with - carbathiin SN; difenoconazole + metalaxyl SN; tebuconazole SN (all COM) (see Notes). Limitations: As per labels.

Notes: Seed treatment reduces seedling blight caused by these fungi but does not control root rot in post-seedling plants.

References:

1. Bailey, K.L. and L.J. Duczek. 1995. Managing cereal diseases under reduced tillage. Can. J. Plant Pathol. 18: 159-167.

2. Bailey, K.L. *et al.* 1992. Effects of tillage systems and crop rotations on root rot and foliar diseases of wheat, flax and peas in Saskatchewan. Can. J. Plant Sci. 72: 583-591.

3. Conner, R.L. 2000. Personal communication. Agric. & Agri-Food Can., Res. Centre, Lethbridge AB.

4. Conner, R.L. *et al.* 1996. Influence of crop rotation on common root rot of wheat and barley. Can. J. Plant Pathol. 18: 247-254.

5. Ledingham, R.J. 1961. Crop rotations and common root rot in wheat. Can. J. Plant Sci. 41: 479-486.

6. Ledingham, R.J. 1969. Effects of straw and nitrogen on common root rot of wheat. Can. J. Plant Sci. 50: 175-179.

DWARF BUNT

Tilletia controversa

Cultural: Avoid sowing winter wheat on land that has raised a dwarf bunt-infected crop in the last five to ten years. Late planted wheat may escape high levels of infection.

Resistant Cultivars: None.

Chemical: To prevent soil-borne or seed-borne dwarf bunt, treat seed with difenoconazole (COM) SN. Limitations: As per label.

Notes: Dwarf bunt is known to occur only in the north Okanagan and Creston valleys of British Columbia and in Ontario. None has ever been found on prairie grown wheat in Canada.

References:

1. Gaudet, D. 1998. Personal communication. Agric. & Agri-Food Can. Res. Centre, Lethbridge AB.

2. Jesperson, G.D. 2002. Personal communication. BC Ministry of Agric., Fish. and Food, Kelowna BC.

ERGOT

Claviceps purpurea

Cultural: Avoid sowing wheat, rye, triticale or barley on land where an ergoty crop was harvested the preceding year or near headlands and roadsides unless they were mowed the previous year to prevent sclerotia formation. Mowing grass in headlands during the current year should prevent honey dew development and subsequent spread into cereal crops.

Resistant Cultivars: None.

Chemical: None.

Notes:

1. Resistance to ergot in wheat is by exclusion of inoculum from the floret until fertilized. Factors such as low soil-available copper and late application of herbicides, both of which reduce pollen fertility causing normally self-pollinated flowers to open, will greatly increase susceptibility to ergot in any cultivar.

2. In certain cultivars, e.g. Glenlea, dry growing conditions despite adequate copper may result in elevated levels of ergot infection.

References:

1. Seaman, W.L. 1980. Ergot of grains and grasses. Can. Dep. Agric. Publ. 1438 (rv.) 16 pp.

2. Evans, I.R. 2000. Personal communication. Alberta Agric., Food & Rural Dev., Edmonton, AB.

3. Evans, I.R., *et al.* 1990. Ergot control in wheat and barley with soil applied copper sulphate. Can. J. Plant Pathol. 12: 333.

EYESPOT

Pseudocercosporella herpotrichoides

Cultural: Rotation to crops other than cereals and turning under barley straw and stubble is an effective means of keeping the disease under control.

Resistant cultivars: None.

Chemical: None.

References:

1. Slopek, S.W. *et al.* 1990. First report of eyespot (*Pseudocercosporella herpotrichoides*) in wheat in the prairie provinces. Can. Plant Dis. Surv. 70(2): 119-121.

FLAME CHLOROSIS

Soil transmitted virus-like agent

Cultural: If flame chlorosis is identified infecting more than 5% of plants in a field, rotate that field out of cereals for one year or more (1, 2). Flame chlorosis reaches its most damaging levels in fields with many years of continuous cultivation in barley (or barley and wheat), and where seed type, seeding practices and early season conditions result in slow germination and emergence. To reduce the risk of flame chlorosis, use vigorous seed and avoid deep seeding.

Resistant Cultivars: None.

Chemical: None.

References:

1. Haber, S. 2002. Personal communication. Agric. & Agri-Food Can. Cereal Res. Centre, Winnipeg MB.

2. Haber, S., Barr, D.J.S., and Platford, R.G. 1991. Observations on the distribution of flame chlorosis in Manitoba and its association with certain zoosporic fungi and the intense cultivation of cereals. Can. J. Plant Pathol. 13: 241-246.

3. Haber, S. *et al.* 1990. Flame chlorosis: a new, soil-transmitted virus-like disease of barley in Manitoba, Canada. J. Phytopath. 129: 245-256.

FUSARIUM FOOT ROT, CROWN ROT, PREMATURITY BLIGHT

Fusarium spp., *Cochliobolus sativus*

Cultural: Incorporation of crop residue into the soil and the addition of fertilizer to maintain adequate and balanced soil fertility may decrease disease severity. Other small grains, particularly oats, should not precede wheat in rotations (see Notes 1, 2).

Resistant Cultivars: None (see Note 2).

Chemical: None.

Notes:

1. *Fusarium* spp. and *Cochliobolus sativus* are also part of the "complex" that causes common root rot in cereals.

2. Durum wheats and winter wheats, in general, appear to be more susceptible than hard red spring types (1, 3).

References:

1. Cook, R.J. 1968. Fusarium root and foot rot of cereals in the Pacific Northwest. Phytopathology 58: 127-131.

2. Tinline, R.D. 1994. Etiology of prematurity blight of hard red spring wheat and durum wheat in Saskatchewan. Can. J. Plant Pathol. 16: 87-92.

3. Warren, H.L. and Kommedahl, T. 1973. Fertilization and wheat refuse effects on *Fusarium* species associated with wheat roots in Minnesota. Phytopathology 63: 103-108.

FUSARIUM HEAD BLIGHT (SCAB)

Fusarium graminearum, other *Fusarium* spp.

Cultural: Incorporation of straw and stubble and rotations away from wheat and corn (also a host) should reduce inoculum levels. Barnyard grass and quackgrass should be controlled as they are non-crop hosts (see Note 1).

Cultivar Resistance:

	Resistant	**Intermediate**	**Susceptible**
Common	None	Alikat, AC Barrie, CDC Bounty, AC Cadillac, AC Cora, ES21, Genesis, Katepwa, AC Majestic, PT 755, AC Superb, McKenzie, 5601HR	AC Harvest, BW 755, Columbus, AC Domain, AC Elsa, AC Glenavon, Glenlea, Invader, AC Karma, Laser, AC Minto, Pasqua, Roblin, AC Splendor, CDC Teal, AC Vista, 5600HR, 5701PR, Prodigy, AC Abbey
Durum	None	None	All
Winter	None	None	All (see Note 3)

Chemical: Spray heads/foliage with: chlorothalonil (COM) SU (see Notes 2, 3, 5) or tebuconazole (COM) SU (see note 4).

Limitations: Pre-harvest interval - 30 days (chlorothalonil, tebuconazole). Tebuconazole is a temporary registration in Saskatchewan and Manitoba only. Check registration status before using/recommending tebuconazole.

Notes:

1. The disease is most severe in Manitoba and adjacent areas of SE Saskatchewan.

2. Wheat classes and cultivars differ in susceptibility. Most CPS, durum and winter wheats are susceptible. Common wheats with 'Neepawa' in their background are more tolerant. Not all cultivars have been tested.

3. Because their earlier flowering may not coincide with a rain event, winter wheats can escape damage in some years.

4. Tebuconazole (Folicur) has had emergency registration in Manitoba and Saskatchewan from 2000-2002.

References:

1. Gilbert, J. 2000. Personal communication. Agric. & Agri-Food Can. Cereal Res. Centre, Winnipeg MB.

2. Gilbert, J. and A. Tekauz. 1995. Effects of fusarium head blight and seed treatment on germination, emergence and seedling vigour of spring wheat. Can J. Plant Pathol. 17: 252-259.

3. Gilbert, J. and A. Tekauz. 2000. Review: Recent developments in research on fusarium head blight of wheat in Canada. Can. J. Plant Pathol. 22: 1-8.

4. Gilbert, J. *et al.* 1994. Occurrence of fusarium head blight in Manitoba in 1993. Can. Plant Dis. Surv. 74: 77-78.

5. Martin, R.A., and H.W. Johnston. 1982. Effects and control of fusarium diseases of cereal grains in the Atlantic Provinces. Can. J. Plant Pathol. 4: 210-216.

6. Sutton, J.C. 1982. Epidemiology of wheat blight and maize ear rot caused by *Fusarium graminearum*. Can. J. Plant Pathol. 4: 195-209.

7. Tekauz, A. and J. Gilbert. 1998. Efficacy of foliar fungicides for control of fusarium head blight in wheat in Manitoba in 1996. Pesticide Management Research Report - 1998.

8. Tekauz, A., J. Gilbert and B. McCallum. 1998. Efficacy of foliar fungicides for control of fusarium head blight and leaf spots in wheat in Manitoba in 1997. Pesticide Management Research Report - 1998.

9. Wong, L.S.L. *et al.* 1992. Prevalence, distribution and importance of fusarium head blight in wheat in Manitoba. Can. J. Plant Pathol. 14: 233-238.

10. Wong, L.S.L., *et al.* 1995. Pathogenicity and mycotoxin production of *Fusarium* species causing fusarium head blight in wheats of varying resistance. Can. J. Plant Sci. 75: 261-267.

LEAF RUST

Puccinia triticina

Cultural: None.

Cultivar Resistance:

	Resistant	**Intermediate**	**Susceptible**
Common	Amazon, BW 243, BW 259,, AC Cora, AC Corinne, ES21, AC Intrepid, Invader, McKenzie, Minto, Pasqua, Prodigy, AC Splendor, 5500 HR, 5700PR	CDC Bounty, AC Cadillac, AC Domain, AC Elsa, AC Glenavon, Glenlea, AC Karma, Laura, BW755, CDC Merlin, Oslo, Roblin, AC Superb, AC Taber, CDC Teal, 5601HR, 5701PR	AC Abbey, Alikat, AC Barrie, Biggar, Bluesky, Columbus, Cutler, AC Crystal, AC Eatonia, AC Foremost, Genesis, Katepwa, Lancer, Laser, Leader, AC Majestic, CDC Makwa, AC Michael, Napayo, Neepawa, AC Vista, Wildcat
Durum	AC Avonlea, DT 494, Hercules, Kyle, Macoun, Medora, AC Melita, AC Morse, AC Napoleon, AC Navigator, AC Pathfinder, Plenty, Sceptre, Wascana, Wakooma	none	all others
Soft White	none	none	all
Winter	UM5089	CDC Falcon, CDC Raptor, S 95-4, S 96-33	all others

Chemical: Spray foliage with - mancozeb (COM) WG; propiconazole (COM) EC.

Limitations: Pre-harvest interval - 40 days (mancozeb); 45 days (propiconazole).

References:

1. McCallum, B. 2002. Personal communication. Agric. & Agri-Food Can. Cereal Res. Centre, Winnipeg MB.

LOOSE SMUT

Ustilago tritici

Cultural: None.

Cultivar Resistance:

	Resistant	**Intermediate**	**Susceptible**
Common	Alikat, Amazon, AC Barrie, Bluesky, CDC Bounty, BW 259, AC Cadillac, AC Corinne, AC Domain, AC Elsa, ES21 AC Foremost, AC Glenavon, Glenlea, AC Karma, Katepwa, Lancer, Laser, AC Michael, AC Minto, Napayo, Neepawa, Park, Roblin, Selkirk, Wildcat, 5600HR	AC Abbey, BW 243, BW 755, Canuck, Columbus, Genesis, AC Intrepid, Invader, Laura, Leader, AC Majestic, CDC Merlin, Pasqua, AC Splendor, CDC Teal, 5601HR, 5701PR	Biggar, AC Crystal, Cutler, AC Eatonia, McKenzie, Oslo, Prodigy, AC Taber, AC Vista
Durum	None	Hercules, Kyle, Medora, Pelissier, Wakooma, Wascana	AC Avonlea, AC Melita, AC Morse, AC Napoleon, AC Navigator, AC Pathfinder, Plenty, Sceptre
Soft White	none	none	all
Winter	none	none	all

Chemical: Treat seed with - carbathiin (COM), DU, SN, SU; triadimenol (COM) SN; tebuconazole (COM) SN, WP; triticonazole (COM) LI (see Notes 2, 3).

Limitations: Treated grain must not be mixed with untreated grain for feed or sale. Treated left-over seed may be saved for planting the following year, unless it has been treated with a dual-purpose (fungicide/insecticide) formulation; otherwise, it should be buried to a depth and location where it will not be accessible to animals and will not contaminate water supplies, or double seeded if quantities permit.

Notes:

1. There is presently no standard in the Seeds Act for loose smut in pedigreed wheat seed.

2. Seed of resistant cvs. and seed of susceptible cvs. free of smut should not require chemical treatment. If smut was observed in a crop which is being used for seed, it should be treated. When using seed of a cv. that is susceptible to smut and the presence of smut is uncertain, it would be wise to treat the seed. Cultivars rated as susceptible should be treated every year, those rated intermediate every second year. If in doubt treat seed annually.

3. Treatment with carbathiin at currently recommended rates does not provide effective disease control in all situations.

References:

1. Menzies, J.G. 2002. Personal communication. Agric. & Agri-Food Can. Cereal Res. Centre, Winnipeg MB.

POWDERY MILDEW

Erysiphe graminis

Cultural: Avoid heavy unbalanced applications of nitrogen fertilizer. Destroy nearby volunteer wheat.

Cultivar Resistance:

Resistant	Intermediate	Susceptible
(Soft White Spring) - AC Nanda (see Note 1)	(Soft White Spring) - Fielder, AC Phil, AC Reed	N/A

Chemical: Treat seed with - triadimenol (COM) SN; spray foliage with - propiconazole (COM) EC (see Note 2).

Limitations: Preharvest interval - 45 days (propiconazole).

Notes:

1. This disease is rarely a problem on hard red spring, or durum wheats.
2. Seed treatment will not provide control throughout the entire growing season.

References:

1. Atkinson, T.G. 1979. Seed treatment and foliar fungicides for the control of powdery mildew on soft white spring wheat. Pp. 518-519 *in* Pesticide Research Report, CCPUA, Ottawa.
2. Conner, R.L. 2002. Personal communication. Agric. & Agri-Food Can. Res. Centre, Lethbridge AB.
3. Wiese, M.V. 1987. Compendium of wheat diseases. 2nd ed. Am. Phytopathol. Soc., St. Paul, Minn. pp. 30-36.

RED SMUDGE

Pyrenophora tritici-repentis

Cultural: Avoid irrigation during kernel development. Severe levels of tan spot on the foliage contribute to the development of red smudge on the seed (see Tan Spot, page 42).

Resistant Cultivars: See Notes.

Chemical: None.

Notes: Durum and white CPS wheats are the most susceptible to red smudge. Most hard red spring wheats have good to moderate resistance.

References:

1. Fernandez, M.R., DePauw, R.M., Clarke, J.M. and L.P. Lefkovitch. 1998. Discoloration of wheat kernels by *Pyrenophora tritici-repentis*. Can. J. Plant Pathol. 20: 380-383.

2. Fernandez, M.R., Clarke, J.M., DePauw, R.M., and L.P. Lefkovitch. 1997. Emergence and growth of durum wheat derived from red smudge-infected seed. Crop Science 37: 510-514.

3. Fernandez, M.R. 2000. Personal communication. AAFC, Semi-Arid Prairie Research Centre, Swift Current, SK.

4. Fernandez, M.R. *et al*. 1994. Black point and red smudge in irrigated durum wheat in southern Saskatchewan. Can. J. Plant Pathol. 16: 221-227.

SEEDLING BLIGHT, DAMPING-OFF

Cochliobolus sativus, Fusarium spp., *Pythium* spp., other fungi

Cultural: None.

Resistant Cultivars: None.

Chemical: Treat seed with - maneb (COM) DU, SU, WP; carbathiin (COM) SN, DU; tebuconazole (COM) SN, WP. Limitations: As per label.

Notes: Chemical seed treatment reduces infection at early stages of plant growth, but will not protect post-seedling plants from infection by these same fungi.

References:

1. Martens, J.W., W.L. Seaman and T.G. Atkinson (eds.) 1984. Diseases of Field Crops in Canada. Can. Phytopath. Soc. 160 pp.

STAGONOSPORA NODORUM LEAF AND GLUME BLOTCH, STAGONOSPORA AVENAE BLOTCH

Phaeosphaeria nodorum, P. avenaria f.sp. *triticea* (3)

Cultural: Rotation with crops other than wheat, such as flax and oats helps to reduce disease incidence.

Cultivar Resistance: (see Notes 1 and 2)

	Resistant	**Intermediate**	**Susceptible**
Common	none	AC Barrie, Bluesky, CDC Bounty, AC Cadillac, Columbus, AC Corinne, AC Elsa, ES 13, Genesis, AC Glenavon, AC Karma, Katepwa, Laura, AC Majestic, Oslo, AC Splendor, AC Taber, CDC Teal, AC Vista, 5600HR	all others
Durum	none	AC Avonlea, Kyle, AC Melita, Medora, AC Morse, AC Napoleon, Plenty, Sceptre, Wakooma	all others
Winter	AC Bellatrix		

Chemical: Spray foliage with - chlorothalonil (COM) SU; mancozeb (COM) WG; propiconazole (COM) EC.

Limitations: Preharvest interval - 30 days (chlorothalonil); 40 days (mancozeb); 45 days (propiconazole).

Notes:

1. Some wheat cvs. may be tolerant to stagonospora nodorum blotch; yield losses of Columbus, Katepwa, Medora and Wakooma may be minimal despite foliar symptoms.

2. Under severe disease pressure cultivars suffer significant thousand kernel weight reduction (Field reactions of Bluesky and Oslo not known).

3. *Phaeosphaeria nodorum* is the principal causal agent; *P. avenaria* f. sp. *triticea*, while part of the leaf spot complex in wheat, is usually found at low levels.

References:

1. Fernandez, M.R., and R.M. DePauw. 1998. Reaction of common wheat cultivars to leaf spots in southern Saskatchewan. Proc. of 'Soils and Crops '98', Saskatoon, SK. pp. 436-439.

2. Gilbert, J. 2002. Personal communication. Agric. & Agri-Food Can. Cereal Res. Centre, Winnipeg MB.

3. Gilbert, J. and A. Tekauz 1993. Reaction of Canadian spring wheats to *Septoria nodorum* and the relationship between disease severity and yield components. Plant Dis. 77: 398-402.

4. Gilbert, J., S.M. Woods, and A. Tekauz. 1998. Relationship between environmental variables and the prevalance and isolation frequency o fleaf-spotting pathogens in spring wheat. Can. J. Plant Pathol. 20: 158-164.

5. Hosford, R.M. Jr. 1976. Fungal leaf spot diseases of wheat in North Dakota (Nature, importance and control). N.D. Agric. Exp. Sta., Bull. 500. 12 pp.

6. Hughes, G. 1992. Personal communication. Crop Dev. Centre, U. of Sask., Saskatoon, SK.

7. Pederson, E.A. and G.R. Hughes. 1992. The effect of crop rotation on development of the septoria complex on spring wheat in Saskatchewan. Can. J. Plant Pathol. 14: 152-158.

SEPTORIA TRITICI BLOTCH

Mycosphaerella graminicola.

Cultural: Rotation with crops other than wheat, such as flax and oats helps to reduce disease incidence.

Cultivar Resistance: (see Notes 1 and 2)

	Resistant	**Intermediate**	**Susceptible**
Common	none	AC Vista, AC Karma, AC Taber, AC Crystal, CDC Teal, AC Majestic, AC Elsa, AC Cadillac, Laura, AC Cora	all others

Durum	AC Avonlea, Kyle	AC Morse, Sceptre, and others	AC Melita, AC Pathfinder, AC Navigator
Soft White	none	Fielder	all others

Chemical: Spray foliage with - chlorothalonil (COM) SU; mancozeb (COM) WG; propiconazole (EC) COM.

Limitations: Preharvest interval - 30 days (chlorothalonil); 40 days (mancozeb); 45 days (propiconazole).

Notes:

1. Under controlled conditions, Kyle, Medora, Wakooma and Sceptre are resistant to bread wheat isolates of *S. tritici* found in the Canadian prairies; they may however be susceptible to *S. tritici* isolates from durum.

2. Information based on tests under controlled conditions.

References:

1. Gilbert, J. 2002. Personal communication. Agric. & Agri-Food Can. Cereal Res. Centre, Winnipeg MB.

2. Hosford, R.M. Jr. 1976. Fungal leaf spot diseases of wheat in North Dakota (Nature, importance and control). N.D. Agric. Exp. Sta., Bull. 500. 12 pp.

3. Pederson, E.A. and G.R. Hughes. 1992. The effect of crop rotation on development of the septoria complex on spring wheat in Saskatchewan. Can. J. Plant Pathol. 14: 152-158.

4. Gilbert, J., and S.M. Woods. 2001. Leaf spot diseases of spring wheat in southern Manitoba farm fields under conventional and conservation tillage. Can. J. Plant Pathol. 81: 551-559.

SPOT BLOTCH

Cochliobolus sativus

Cultural: Spring plowing to bury crop residue and several years rotation with non-cereal crops helps to reduce infection.

Cultivar Resistance:

	Resistant	**Intermediate**	**Susceptible**
Common	ACCorinne	Amazon , AC Cora, AC Elsa, Glenlea, AC Intrepid, Laura	All others
Durum	Kyle	AC Avonlea, AC Melita	All others
Soft White	none	AC Fielder, AC Nanda	All others

Chemical: None.

References:

1. Martens, J.W., W.L. Seaman and T.G. Atkinson (eds.) 1984. Diseases of Field Crops in Canada. Can. Phytopath. Soc. 160 pp.

2. Conner, R.L. 1990. Interrelationship of cultivar reaction to common root rot, black point, and spot blotch in spring wheat. Plant Dis. 74: 224-227.

3. Gold, J. 2000. Personal communication. Agric. & Agri-Food Canada, Cereal Res. Centre, Winnipeg MB.

STEM RUST

Puccinia graminis f. sp. *tritici*

Cultural: No susceptible barberry species may be imported into Canada and all susceptible species of barberry found should be eradicated (see Note 1).

Cultivar Resistance:

	Resistant	**Intermediate**	**Susceptible**
Common	Alikat, Amazon, AC Barrie, Benito, Biggar, Bluesky, BW 243, BW 259, BW 755, AC Cadillac, Conway, AC Cora, AC Crystal, Cutler, AC Domain, AC Corinne, AC Intrepid, AC Elsa, ES 21, AC Foremost, Genesis, AC Glenavon, Glenlea, Grandin, Invader, AC Ivory, AC Karma, Katepwa, Kenyon, Lancer, Laura, CDC Makwa, AC Majestic, McKenzie, CDC Merlin, AC Michael, AC Minto, Neepawa, Oslo, Pasqua, Prodigy, Roblin, Selkirk, Sinton, AC Snowbird, AC Splendor, AC Superb, AC Taber, CDC Teal, AC Vista, Wildcat, 5601HR, 5701PR	AC Abbey, Columbus, AC Eatonia, Laser, 5600HR	Canuck, Leader, Park
Durum	Arcola, AC Avonlea, Coulter, Hercules, Kyle, Medora, AC Melita, AC Morse, AC Napoleon, AC Navigator, AC Pathfinder, Plenty, Sceptre, Wakooma, Wascana	none	Pellisier
Soft White	none	none	Fielder, AC Nanda, AC Phil, AC Reed
Winter	CDC Falcon, CDC Harrier, CDC Raptor, UM5089	CDC Clair, Norwin, S96-33	AC Bellatrix, CDC Kestrel, Norstar, CDC Osprey, CDC Ptarmigan, AC Tempest, W279, W286, W337

Chemical: Spray plants with - propiconazole (COM) EC.

Limitations: Preharvest interval - 45 days (propiconazole).

Notes:

1. The sexual stages of the life cycle of the stem rust fungus develop on common barberry and other susceptible species. Infection of this host results in the production of early spring inoculum of new physiologic races. Barberry threatens the production of wheat, oats, rye, barley, and various grasses in Canada.

2. CDC Bavaria, a spelt wheat, is susceptible to stem rust.

References:

1. Fetch, T. 2002. Personal communication. Agric. & Agri-Food Can. Cereal Res. Centre, Winnipeg, MB.

2. Roelfs, A. 1995. Wheat and rye stem rust. Pages 4-37 *in* The Cereal Rusts, Volume II. A. Roelfs and B. Bushell (eds.), Academic Press, N.Y.

STRIPE RUST

Puccinia striiformis

Cultural: None.

Cultivar Resistance:

	Resistant	**Susceptible**
Common	Canuck, Glenlea, Lancer, Leader, Park, Selkirk	Bluesky, Columbus, Genesis, Katepwa, Laura, Neepawa, Roblin, Wildcat
Durum	none	all (see Note 1)
Soft White	AC Nanda, AC Reed, AC Phil	Fielder
Winter	none	Norstar

Chemical: Spray foliage with - propiconazole (COM) EC.

Limitations: Preharvest interval - 45 days.

Notes:

1. Hard red winter, spring and durum wheat are susceptible but normally do not suffer yield losses. A new race of stripe rust appeared in 2000 which could become a problem in hard red spring (common) wheat.

2. Ratings for cultivars marked (*) are based on seedling tests carried out in 1992.

3. Increases in the acreage of winter wheat in the eastern prairies may allow the stripe rust organism to over winter in this region.

References:

1. Conner, R.L. 2002. Personal communication. Agric. & Agri-Food Can. Res. Centre, Lethbridge AB.

2. Conner, R.L. and Kuzyk, A.D. 1988. Effectiveness of fungicides in controlling stripe rust, leaf rust, and black point in soft white spring wheat. Can. J. Plant Pathol. 10: 321-326.

TAKE-ALL

Gaeumannomyces graminis var. *tritici*

Cultural: Reduced tillage decreases disease incidence. Rotations of 2 years to resistant crops, such as legumes or oats, or keeping land fallow 1 year will help to reduce disease incidence. Good soil fertility, including adequate phosphorus, potassium, sulphur and micronutrient levels are beneficial. Nitrogen applied in spring will normally support lower levels of disease than autumn applications. In acid soils, nitrogen applied in the ammoniacal form can enhance disease control. Grassy weeds and volunteer wheat plants should be destroyed (see Note 1).

Resistant Cultivars: None.

Chemical: Treat seed with triadimenol SN; difenoconazole + metalaxyl SN (all COM) (See Note 2).

Notes:

1. When wheat follows hay crops severe levels of take-all may develop.

2. Seed treatment will not provide control throughout the entire growing season.

4. Later seeding of winter wheat tends to enhance incidence of take-all.

5. Copper-deficient crops of wheat, particularly when treated with certain herbicides, may exhibit symptoms resembling severe take-all.

References:

1. Conner, R.L. 2002. Personal communication. Agric. and Agri-Food Can. Res. Centre, Lethbridge AB.

2. Evans, I.R. 1998. Personal communication. Alberta Agr., Food and Rural Development, Edmonton AB.

3. Evans, I.R., D. Penney and K. Briggs. 1995. Effects of soil pH and continuous cropping on take-all root rot of wheat. Proc. Western Canada Agronomy Workshop, Red Deer, AB, July 5-8, pp. 216-220.

4. Evans, I.R., D. Penney and K. Briggs. 1995. Take-all versus fake-all. Can. J. Plant Pathol. 17: 289-291.

5. Martens, J.W., W.L. Seaman and T.G. Atkinson (eds.). 1984. Diseases of Field Crops in Canada. Can. Phytopath. Soc. 160 pp.

6. Huber, D.M. 1981. Role of nutrients and chemicals. Page 317-341 *in* Asher and Shipton (eds.), Biology and Control of Take-All. Academic Press, New York.

7. Wiese, M.V. 1987. Compendium of Wheat Diseases. 2nd ed. Am. Phytopathol. Soc., St. Paul, Minn. 106 pp.

TAN SPOT (YELLOW LEAF BLOTCH)

Pyrenophora tritici-repentis

Cultural: Rotation with crops other than wheat (flax, lentil) for more than one year and the turning under of wheat straw and stubble help reduce disease incidence.

Cultivar Resistance:

	Resistant	Intermediate	Susceptible
Common	none	Amazon, AC Barrie, AC Cora, AC Crystal, AC Elsa, Genesis, AC Glenavon, AC Taber, AC Vista, 5600HR	all others
Durum	none	Plenty	all others

Chemical: Spray foliage with chlorothalonil (COM) SU; mancozeb (COM) WG; propiconazole (COM) EC.

Limitations: Preharvest interval - 30 days (chlorothalonil); 40 days (mancozeb); 45 days (propiconazole).

Notes: Common wheat is generally less susceptible than durum wheat.

References:

1. Fernandez, M.R., McConkey, B.G., and R.P. Zentner. 1999. Effects of tillage method and fallow frequency on leaf spotting diseases of spring wheat in the semiarid Canadian prairies. Soil Till. Res. 50: 259-269.

2. Fernandez, M.R. 2002. Personal communication. Agric. & Agri-Food Can. Res. Centre, Swift Current SK.

3. Fernandez, M.R. and R.M. DePauw. 1998. Reaction of common wheat cultivars to leaf spots in southern Saskatchewan. Proc. of 'Soils and Crops '98', Saskatoon, SK. pp. 430-439.

4. Fernandez, M.R., J.M. Clark and R.M. DePauw. 1996. Comparison of durum and common wheat cultivars to leaf spotting fungi in the field. Plant Dis. 80: 793-797.

5. Fernandez, M.R., J.M. Clark and R.M. DePauw. 1994. Response of durum wheat kernels and leaves at different growth stages to *Pyrenophora tritici-repentis*. Plant Dis. 78: 597-600.

6. Fernandez, M.R., *et al.* 1998. Effects of crop rotations and fertilizer management on leaf spotting diseases of spring wheat in southern Saskatchewan. Can. J. Plant Sci. 78: 489-496.

7. Gilbert, J., S.M. Woods, and A. Tekauz. 1999. Relationship between environmental variables and the prevalence and isolation frequency of leaf-spotting pathogens in spring wheat. Can. J. Plant Pathol. 20: 158-164.

8. Hosford, R.M. Jr. 1976. Fungal leaf spot diseases of wheat in North Dakota (Nature, importance and control). N.D. Agric, Exp. Sta., Bull. 500. 12 pp.

9. Lamari, L. and Bernier, C.C. 1989. Evaluation of wheat lines and cultivars to tanspot (*Pyrenophora tritici-repentis*) based on lesion type. Can. J. Plant Pathol. 11: 49-56.

WHEAT STREAK MOSAIC

Wheat streak mosaic virus

Cultural: Do not sow winter wheat near spring wheat until the latter is completely ripe. Eradicate volunteer wheat and barley and keep land free of living plants for at least one week before sowing (see Notes 1, 2).

Resistant Cultivars: W337 winter wheat (see Notes 3, 4).

Chemical: None.

Notes:

1. The virus is spread by the wheat curl mite. Both virus and mite need susceptible living plants to survive and multiply.

2. This disease is a problem only in winter wheat-growing areas.

3. The cvs. AC Barrie, Kyle, Laura and AC Minto are extremely susceptible; Columbus, AC Elsa, AC Superb, and AC Taber have some tolerance.

4. W337 is resistant to the mite vector of WSMV.

References:

1. Atkinson, T.G. 1972. Wheat streak mosaic control. Alta. Dep. Agric., Publ. 631. 8 pp.

2. Conner, R.L. 2000. Personal communication. Agric. & Agri-Food Can. Res. Centre, Lethbridge AB.

3. Haber, S. 2002. Personal communication. Agric. & Agri-Food Can. Res. Centre, Winnipeg MB.

OTHER DISEASES

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

Ascochyta Leaf Spot (*Ascochyta sorghi*)

Bacterial Blight (*Xanthomonas campestris* pv. *translucens*, *Pseudomonas syringae* pv. *syringae*)

Bacterial Black Chaff (*Xanthomonas campestris* pv. *translucens*)

Brome Mosaic (brome mosaic virus)

Cottony Snow Mold (*Coprinus psychromorbidus*)

Head Discolorations (genetic, physiological)

Snow Scald (*Myriosclerotinia borealis*)

Stem Melanosis (copper deficiency, *Pseudomonas cichorii*)

QUARANTINE DISEASES

The following diseases are absent, or of limited distribution in Canada and are under strict quarantine regulations:

Dwarf Bunt (*Tilletia controversa*)

Karnal Bunt (*Tilletia indica*)

APPENDIX I. Cultivar reaction to specific diseases

Legend: R = Resistant I = Intermediate S = Susceptible - = Unknown * = Two-row barley

BARLEY

	Barley Yellow Dwarf	Common Root Rot	Covered/ False Loose Smut	Leaf Stripe	Loose Smut	Net Blotch	Scald	Speckled Leaf Blotch	Stem** Rust
Abee*	S	I	I	R	S	S	S	S	S
CDC Alamo*	-	R	R	-	I	S	I	S	S
AC Albright	S	S	I	-	S	S	S	S	S
Argyle	S	I	S	I	S	S	S	S	R
B1215*	-	S	I	R	S	-	-	-	R
B1602	-	R	I	I	S	S	S	S	I
AC Bacon	S	I	R	-	S	S	I	I	I
CDC Battleford	S	I	R	-	S	I	S	S	I
Bedford	S	I	I	I	S	S	S	S	R
CDC Bold*	-	R	R	-	S	S	I	S	R
Bonanza	S	I	S	R	S	S	S	S	R
AC Bountiful*	S	I	R	-	R	I	S	S	R
Brier	S	S	R	R	S	I	I	R	R
Bridge*	S	I	I	I	S	S	S	S	I
Bronco	S	I	R	-	S	I	I	S	R
BT 421	S	I	I	-	S	I	S	S	R
BT 435	S	I	S	-	S	S	S	S	R
BT 926	-	I	I	-	S	S	S	S	R
BT 941	S	I	R	-	S	S	S	S	S
CDC Buck	S	I	S	R	S	S	S	R	R
AC Buffalo	S	I	I	-	S	S	S	S	R
Calder	S	I	R	-	R	R	S	S	I
CDC Candle*	-	-	-	-	-	-	-	-	R
Condor*	S	I	S	R	S	S	S	S	R
Conlon*	S	R	I	-	S	I	S	S	R
Conquest	I	I	I	I	S	S	S	S	R
CDC Copeland*	S	I	R	-	S	I	S	S	R
CDC Creme	S	I	I	S	S	S	S	S	S
CDC Dawn*	S	I	I	-	S	I	I	S	I
Deuce*	S	I	R	S	S	S	S	S	R
Diamond	S	S	R	R	S	I	S	I	R
CDC Dolly*	S	I	R	-	S	S	I	S	I
Duel*	-	I	I	I	S	S	S	S	R
Duke	S	I	I	I	S	S	R	S	R
CDC Earl	S	I	R	-	S	I	S	S	R
Ellice*	S	S	S	I	S	I	S	S	I
Elrose*	-	-	-	S	-	S	S	S	-
Empress	S	I	S	S	S	S	S	S	R
Excel	-	-	-	-	-	S	S	S	R
Falcon	S	I	R	-	S	I	I	R	I
CDC Fleet*	S	S	S	-	S	I	I	S	S
Foster	S	-	-	-	S	S	S	S	R
CDC Freedom*	S	I	R	-	S	R	S	S	I
CDC Gainer*	S	I	R	-	S	I	I	S	R
Galt	S	S	R	S	S	S	S	R	R
CDC Guardian*	S	I	R	-	S	I	S	S	R

** All cultivars are susceptible to QCC, which may occur in the prairie region.

BARLEY, continued

	Barley Yellow Dwarf	Common Root Rot	Covered/ False Loose Smut	Leaf Stripe	Loose Smut	Net Blotch	Scald	Speckled Leaf Blotch	Stem** Rust
AC Harper	S	I	I	-	S	I	I	S	I
Harrington*	S	I	S	S	S	S	S	S	S
AC Hawkeye	S	I	I	-	S	I	I	S	I
HB 803	S	I	I	-	S	S	S	S	S
HB 805*	S	I	R	-	I	S	I	S	R
HB 903*	-	-	-	-	-	I	S	S	-
Heartland	S	I	I	I	S	R	S	S	R
CDC Helgason*	S	I	-	-	S	R	S	S	-
Herta*	-	-	-	I	-	S	S	S	-
Iona*	-	-	I	-	S	-	-	-	-
Jackson	S	S	S	S	S	S	S	S	S
Jaeger	S	S	I	-	I	S	I	S	I
Johnston	S	S	S	S	S	S	S	S	R
Kasota	S	I	R	-	S	I	R	I	R
CDC Kendall*	S	I	S	-	S	I	S	S	R
Klages*	S	I	R	I	S	S	S	S	S
Klondike	S	I	I	S	S	S	S	S	R
AC Lacombe	S	S	R	-	S	I	I	I	R
Leduc	S	I	R	S	I	I	S	S	R
Legacy	S	R	R	-	I	S	S	S	R
Mahigan	S	S	R	-	S	I	R	I	R
Manley*	S	I	I	I	S	I	S	S	R
CDC McGuire*	-	R	I	-	S	R	I	S	I
Melvin	S	S	I	S	S	S	S	S	R
Merlin	S	I	R	-	I	S	S	S	S
Merit*	S	I	R	-	S	I	S	S	I
AC Metcalfe*	S	I	I	-	R	S	S	S	R
AC Newdale*	S	I	R	-	S	I	S	S	R
Niobe	S	I	R	-	S	I	I	S	I
Niska	-	S	R	-	S	S	R	S	R
Noble	S	S	I	I	S	S	S	S	R
Olli	S	S	I	S	S	S	S	S	S
Otal	S	S	I	S	S	S	S	S	S
AC Oxbow*	S	S	I	-	R	I	S	S	R
Parkland	-	-	-	S	-	S	S	S	-
Peregrine	-	R	I	-	S	S	I	S	I
Phoenix*	S	I	I	-	S	S	S	S	S
Prospect*	S	S	I	-	S	S	S	S	I
CDC Richard	S	I	I	I	S	S	S	S	R
Robust	-	-	-	-	-	S	S	S	R
AC Rosser	S	R	R	-	S	I	I	S	R
Samson	S	I	I	I	S	S	S	S	R
SD 904	S	I	R	-	S	S	S	S	S
Seebe*	S	S	R	R	S	S	R	S	S
CDC Select*	-	-	-	-	-	I	S	S	-
CDC Silky	S	I	I	-	I	I	I	I	R
CDC Sisler	S	I	S	-	S	S	S	S	R
CDC Speedy*	-	R	I	-	S	S	S	S	I
AC Stacey	-	S	R	S	S	I	S	S	S
Stander	S	I	-	-	S	S	S	S	R

** All cultivars are susceptible to QCC, which may occur in the prairie region.

BARLEY, continued

	Barley Yellow Dwarf	Common Root Rot	Covered/ False Loose Smut	Leaf Stripe	Loose Smut	Net Blotch	Scald	Speckled Leaf Blotch	Stem** Rust
Stein*	S	S	I	I	S	S	S	S	R
Stetson	S	I	R	-	S	I	S	S	R
CDC Stratus*	S	I	I	-	S	I	S	S	R
Tankard	S	I	S	R	S	S	S	S	R
Tercel*	S	I	R	-	S	S	S	S	R
CDC Thompson*	S	I	R	R	-	I	S	I	I
CDC Tisdale	S	I	R	-	I	I	S	S	I
TR 118	S	I	I	-	S	I	S	S	-
TR 145*	S	I	-	-	S	S	S	S	-
TR 166	S	I	R	-	R	I	S	S	I
TR 229	S	I	R	-	R	I	S	S	R
TR 256*	S	I	R	-	R	R	S	S	R
TR 359	S	R	R	-	S	R	S	S	I
TR 361	S	R	R	-	R	I	S	S	I
TR 975*	-	-	-	-	-	-	-	-	R
Trochu	-	R	R	-	S	S	I	S	R
Tukwa	S	I	R	-	S	S	I	S	I
Tupper	S	I	S	I	I	S	S	S	S
Tyto	S	I	R	-	S	S	S	S	I
CDC Unity*	S	R	S	-	S	I	S	S	R
Virden	S	R	I	I	S	I	S	S	R
Vivar	-	I	R	-	I	I	I	S	R
CDC Yorkton	S	R	R	-	S	I	S	S	R
Winchester	S	I	R	S	S	I	S	S	S
Xena*	S	R	-	-	S	S	I	S	R

** All cultivars are susceptible to QCC, which may occur in the prairie region.

OAT

	Covered/Loose Smut	BYD	Crown Rust	Stem Rust*
AC Antoine	I	S	S	S
AC Assiniboia	R	R	R	R
Athabasca	S	S	S	S
AC Belmont	R	I	S	R
AC Boudrias	R	I	R	R
Boullion	S	S	S	S
CDC Boyer	I	-	S	R
Calibre	S	S	S	S
Cascade	S	S	S	S
CDC Dancer	R	S	S	R
Derby	I	S	S	S
Dumont	R	S	S	R
Elvy	R	S	S	S
SW Exactor	I	I	S	S
Fidler	R	S	S	I
Foothill	S	S	S	S
Fraser	I	S	S	S
Garry	I	S	S	S
Grizzly	S	S	S	S
AC Gwen	R	R	R	R
Harmon	I	S	S	S
Jasper	S	S	S	S
AC Juniper	I	S	S	S
Kaufmann	R	S	R	R
Kelsey	I	S	S	S
AC Marie	R	S	S	R
AC Medallion	R	S	R	R
AC Morgan	I	S	S	S
CDC Orrin	R	S	S	S
OT 382	R	S	S	S
OT 7001	R	S	S	S
OT 2009	R	R	R	R
OT 7008	R	R	R	R
CDC Pacer	R	S	S	S
AC Pinnacle	R	I	R	R
AC Preakness	R	I	S	R
Random	S	S	S	S
AC Rebel	R	I	S	R
Riel	R	S	S	R
Robert	R	I	S	R
Rodney	I	S	S	S
AC Ronald	R	R	R	R
Sioux	I	S	S	S
Terra	S	S	S	S
Triple Crown	R	S	S	S
Vicar	S	S	S	S
Victory	S	S	S	S
Waldern	I	-	S	S

* All oat cultivars are susceptible to race NA67, which occurs frequently in the prairie region.

RYE

	Stem Smut
Antelope	I
Cougar	S
Dakota	-
Frontier	I
Gazelle (spring)	-
Kodiak	I
Musketeer	I
Prima	I
Puma	I
AC Remington	-
AC Rifle	R
RT 178	I
Rymin	R
Sangaste	R

TRITICALE

	Common Bunt	Common Root Rot	Leaf Rust	Stem Rust
AC Alta	R	I	R	R
Banjo	R	I	R	R
Bobcat	-	-	-	-
Carman	R	I	R	R
AC Certa	R	I	R	R
AC Copia	R	I	R	R
Frank	R	I	R	R
Pronghorn	R	I	R	I
T150	R	-	R	R
AC Ultima	R	I	R	R
Wapiti	R	I	I	R
Welsh	R	S	S	R
88DL01076 (winter)	R	-	-	-

WHEAT

	Barley Yellow Dwarf	Common Bunt	Common Root Rot	Leaf Rust	Loose Smut	Powdery Mildew	Septoria nodorum blotch*	Stem Rust	Stripe Rust	Wheat Streak Mosaic
COMMON										
5600 HR	S	R	-	-	R	-	I	I	-	-
5601 HR	S	I	-	I	I	-	-	R	-	-
5701 PR	S	S	-	I	I	-	-	R	-	-
AC Abbey**	-	R	I	S	I	-	S	I	-	I
Alikat	-	I	I	S	R	-	-	R	-	-
Amazon	-	I	R	R	R	-	-	R	-	-
AC Barrie	S	R	I	S	R	-	I	R	S	SS
Benito	S	I	I	S	R	-	-	R	S	-
Biggar	S	S	I	S	S	-	S	R	S	-
Bluesky	S	I	R	S	R	-	I	R	S	-
CDC Bounty	S	I	-	I	R	-	I	-	-	-
BW 243	S	I	-	R	I	-	-	R	-	-
BW 259	S	S	-	R	R	-	-	R	-	-
AC Cadillac	S	R	I	I	R	-	I	R	-	-
Canuck	S	R	I	S	I	-	-	S	R	-
Columbus	S	R	I	S	I	-	I	I	S	I
Conway	S	I	I	I	R	-	S	R	-	-
AC Cora	S	R	I	R	R	-	-	R	-	-
AC Corinne	-	I	I	R	R	-	I	R	-	-
AC Crystal	S	R	I	S	S	-	S	R	-	-
Cutler	-	S	I	S	S	-	-	R	-	-
AC Domain	S	R	I	I	R	-	S	R	-	S
AC Eatonia	S	R	I	S	S	-	S	I	-	-
AC Elsa	S	I	I	I	R	-	I	R	-	I
ES 21	S	R	-	R	R	-	-	R	-	-
AC Foremost	S	R	I	S	R	-	-	R	S	-
Genesis	S	S	I	S	I	-	I	R	S	-
AC Glenavon	-	I	I	I	R	-	I	R	-	-
Glenlea	S	I	R	I	R	-	S	R	R	S
Grandin	S	R	I	R	I	-	S	R	-	S
AC Intrepid	-	R	R	R	I	-	S	R	S	-
Invader	S	I	I	R	I	-	S	R	-	-
AC Ivory	-	-	-	-	-	-	-	R	-	-

* Ratings to septoria nodorum blotch only, not entire "septoria complex". ** Sawfly resistant

WHEAT

	Barley Yellow Dwarf	Common Bunt	Common Root Rot	Leaf Rust	Loose Smut	Powdery Mildew	Septoria nodorum blotch*	Stem Rust	Stripe Rust	Wheat Streak Mosaic
COMMON con't										
AC Karma	S	R	I	I	R	-	I	R	S	S
Katepwa	S	R	I	S	R	-	I	R	S	S
Kenyon	S	I	I	R	I	-	S	R	-	-
Lancer	S	R	I	S	R	-	S	R	R	-
Laser	S	S	I	S	R	-	S	I	-	-
Laura	S	S	R	I	I	-	I	R	S	SS
Leader	S	R	S	S	I	-	-	S	R	-
AC Majestic	S	R	I	S	I	-	I	R	-	-
CDC Makwa	-	I	I	S	R	-	S	R	-	-
Manitou	S	-	I	-	-	-	-	-	-	-
McKenzie	-	R	I	R	S	-	S	R	-	-
CDC Merlin	S	R	I	I	I	-	-	R	-	-
AC Michael	S	R	I	S	R	-	-	R	S	-
AC Minto	S	R	I	R	R	-	-	R	-	SS
Napayo	S	-	I	S	R	-	-	-	-	-
Neepawa	S	I	I	S	R	-	S	R	S	-
Oslo	S	I	I	I	S	-	I	R	-	S
Park	S	I	I	S	R	-	S	S	R	-
Pasqua	S	R	I	R	I	-	S	R	-	S
Pitic 62	S	-	I	-	-	-	-	-	-	-
Prodigy	-	R	I	R	S	-	-	R	-	-
Roblin	S	S	R	I	R	-	S	R	S	S
Selkirk	S	R	I	I	R	-	-	R	R	-
Sinton	I	I	I	R	S	-	-	R	R	-
AC Splendor	S	I	I	R	I	-	I	R	-	-
AC Snowbird	-	-	-	-	-	-	-	R	-	-
AC Superb	I	-	-	I	-	-	-	R	-	I
AC Taber	S	R	I	I	S	-	I	R	-	I
CDC Teal	S	I	I	I	I	-	I	R	-	-
Thatcher	S	-	I	-	-	-	-	-	-	-
CDC Trilogy	S	R	-	R	I	-	-	R	-	-
AC Vista	I	R	I	S	S	-	I	R	-	S
Wildcat	S	S	R	S	R	-	-	R	S	-

* Ratings to septoria nodorum blotch only, not entire "septoria complex".

WHEAT

	Barley Yellow Dwarf	Common Bunt	Common Root Rot	Leaf Rust	Loose Smut	Powdery Mildew	Septoria nodorum blotch*	Stem Rust	Stripe Rust	Wheat Streak Mosaic
DURUM										
Arcola	S	R	I	R	-	-	-	R	S	-
AC Avonlea	-	R	I	R	S	-	I	R	-	SS
Coulter	-	R	I	R	-	-	-	R	-	-
Hercules	S	R	I	R	I	-	-	R	S	-
Kyle	S	R	I	R	I	-	I	R	S	S
Macoun	S	-	-	R	-	-	-	-	-	-
Medora	S	R	I	R	I	-	I	R	S	S
AC Melita	-	R	I	R	S	-	I	R	S	-
AC Morse	S	R	I	R	S	-	I	R	-	S
AC Napoleon	-	R	I	R	S	-	-	R	-	S
AC Navigator	-	R	I	R	S	-	I	R	-	S
AC Pathfinder	-	R	I	R	S	-	-	R	-	S
Pellisier	S	R	I	S	I	-	-	S	S	-
Plenty	-	R	I	R	S	-	I	R	-	S
Sceptre	S	R	I	R	S	-	I	R	S	S
Wakooma	S	R	I	R	I	-	I	R	S	-
Wascana	S	R	I	R	I	-	-	R	S	-
SOFT WHITE										
Fielder	S	S	I	S	S	I	S	S	S	-
AC Nanda	-	I	I	S	S	R	-	S	R	-
AC Phil	-	S	I	S	S	I	-	S	R	-
AC Reed	-	S	I	S	S	I	-	S	R	-
WINTER										
AC Bellatrix	-	R	-	S	-	S	R	S	-	-
CDC Clair	-	S	I	-	-	-	-	I	-	-
CDC Falcon	-	S	-	I	-	-	-	R	-	-
Harmil	-	-	-	-	S	-	-	-	-	-
CDC Harrier	-	S	-	-	-	-	S	R	-	-
Kestrel	-	S	-	-	-	-	-	S	-	-
Norstar	S	S	S	S	S	-	S	S	S	S
Norwin	S	S	S	S	S	-	S	I	S	-
CDC Osprey	-	S	I	-	-	-	-	S	-	-
CDC Ptarmigan	-	S	-	S	-	-	-	S	-	-

* Ratings to septoria nodorum blotch only, not entire "septoria complex".

WHEAT

	Barley Yellow Dwarf	Common Bunt	Common Root Rot	Leaf Rust	Loose Smut	Powdery Mildew	Septoria nodorum blotch*	Stem Rust	Stripe Rust	Wheat Streak Mosaic
WINTER con't										
CDC Raptor	-	S	-	I	-	-	-	R	-	-
Readymade	-	I	-	-	-	-	-	-	-	-
Rebecca	-	-	-	-	R	-	-	-	-	-
S 95-4	S	-	-	I	-	-	-	-	-	-
S 96-33	S	-	-	I	-	-	-	I	-	-
AC Tempest	-	I	-	S	-	S	-	S	-	-
UM 5089	S	-	-	R	-	-	-	R	-	-
W 279	-	S	-	S	-	S	-	S	-	-
W 286	-	S	-	S	-	S	-	S	-	-
W 337	S	S	-	-	S	-	-	S	-	R

* Ratings to septoria nodorum blotch only, not entire "septoria complex".

APPENDIX II. Fungicides registered for use against diseases of barley in Canada.

Trade Name	Active Ingredient	Formulation	PCP#	Barley Diseases									
				Loose Smut	Covered Smut & False L.Smut	Damping-off, seed rots	Common Root Rot*	powdery mildew	Septoria	Leaf, Stem Rust	Scald	Net Blotch	Stripe
Baytan 30	triadimenol	317 g/L	24677	x	x		x*				x*	x*	x
Apron FL	metalaxyl	317 g/L SN	24262			x (Pythium, export only)							
Raxil 312 FS	tebuconazole	312 g/L	25762	x	x	x	x*					x**	x**
Vitaflo-280	thiram + carbathiin	13.2%+ 14.9% SU	11423	x	x	x						x*	
Vitavax dual powder	carbathiin + thiram + lindane	20% + 28.9% + 18.7% DU	15537	x	x	x							
Vitavax dual solution	carbathiin + lindane	180+165 g/L SN	14115	x	x	x	x*					x*	x*
Vitavax powder	thiram + carbathiin	38.8%+ 26.7% DU	15538	x	x	x							
Vitavax single solution	carbathiin	230 g/L SN	14069	x	x	x	x*					x*	x*
Agsco DB-Green L	maneb + lindane	323 g/L + 108 g/L	23366		x	x							
IPCO N-M	maneb	50% DU	10660		x	x							
IPCO NM Dual Purpose	maneb + lindane	37.5%+ 18.75% DU	10662		x	x							
Formaldehyde	formaldehyde	37% SN	34		x								
Charter	triticonazole	2.5% LI	26455	x									
Tilt	propiconazole	25% EC	19346					x	x	x	x	x	

* suppression only
** seed-borne phase

APPENDIX III. Fungicides registered for use against diseases of oats and rye in Canada.

Trade Name	Active Ingredient	Formulation	PCP#	Oat and Rye Diseases					
				Loose Smut (Oats)	Covered Smut (Oats)	Stem Rust (Oats)	Stem Smut (Rye)	Damping-off, seed rots	Common Root Rot*
Apron Fl	metalaxyl	317 g/L SN	24262					x (Pythium, export only)	
Vitaflo-280	thiram + carbathiin	13.2%+ 14.9% SU	11423	x	x		x	x	
Vitavax dual powder	carbathiin + thiram + lindane	20% + 28.9% + 18.7% DU	15537	x	x		x	x	
Vitavax dual solution	carbathiin + lindane	180+165 g/L SN	14115	x	x		x	x	x*
Vitavax powder	thiram + carbathiin	38.8%+ 26.7% DU	15538	x	x		x	x	
Vitavax single solution	carbathiin	23O g/L SN	14069	x	x		x	x	x*
Agsco DB-Green L	maneb + lindane	323 g/L + 108 g/L	23366		x			x	
IPCO N-M	maneb	50% DU	10660	x	x		x	x	
IPCO NM Dual Purpose	maneb + lindane	37.5%+ 18.75% DU	10662	x	x		x	x	
Charter	triticonazole	2.5% LI	26455	x	x				
Raxil FL	tebuconazole	312 g/L	25762	x	x				
Tilt	propiconazole	25% EC	19346			x			

*Suppression only

APPENDIX IV. Fungicides registered for use against diseases of wheat and triticale in Canada.

Trade Name	Active Ingredient	Formulation	PCP#	Wheat and Triticale Diseases										
				Loose Smut	Common bunt	Damping-off, seed rots	Common Root Rot (supr*)	Take-all (supr*)	Powdery mildew	Septoria	Leaf Rust	Stem, Stripe Rust	Tan Spot	Fusarium Head Blight
Triticale														
Vitaflo-280	thiram + carbathiin	13.2%+ 14.9% SU	11423			x								
Wheat														
Agsco DB-Green L	maneb + lindane	323 g/L + 108 g/L	23366		x	x								
Apron Fl	metalaxyl	317 g/L SN	24262			x (Pythium, export only)								
Baytan 30	triadimenol	317 g/L	24677	x	x			x*****	x					
Bravo 500	chlorothalonil	500 g/L	15723							x			x	x
Dithane DG Rainshield NT	mancozeb	75% WG	20553							x	x		x	
Dividend XL	difenoconazole + metalaxyl	16.5% 1.38%	25778	x	x**	x	x*	x*		x*				
Dividend XL RTA	difenoconazole + metalaxyl	3.21% 0.27%	25777	x	x**	x	x*****	x*****		x*****				
Charter	triticonazole	2.5% LI	26455	x	x									
Folicur 432 F	tebuconazole	432 g/L	25940											x***
IPCO N-M	maneb	50% DU	10660		x	x								
IPCO NM Dual Purpose	maneb + lindane	37.5%+ 18.75% DU	10662		x	x								
Raxil 312 FS	tebuconazole	312 g/L	25762	x	x	x	x*							

*****Suppression only
******Also controls dwarf bunt
*** Temporary registration for Saskatchewan and Manitoba only.

APPENDIX IV. con't Fungicides registered for use against diseases of wheat and triticale in Canada.

Trade Name	Active Ingredient	Formulation	PCP#	Wheat and Triticale Diseases										
				Loose Smut	Common bunt	Damping-off, seed rots	Common Root Rot (supr*)	take-all (supr*)	powdery mildew	Sep-toria	Leaf Rust	Stem, Stripe Rust	Tan Spot	Fusarium Head Blight
Wheat														
Tilt	propiconazole	25% EC	19346						x	x	x	x	x	
Vitaflo-280	thiram + carbathiin	13.2%+ 14.9% SU	11423	x	x	x								
Vitavax dual powder	carbathiin + thiram + lindane	20% + 28.9% + 18.7% DU	15537	x	x	x								
Vitavax dual solution	carbathiin + lindane	180+165 g/L SN	14115	x	x	x	x*****							
Vitavax powder	thiram + carbathiin	38.8%+ 26.7% DU	15538	x	x	x								
Vitavax single solution	carbathiin	23O g/L SN	14069	x	x	x	x*****							

*****Suppression only