

4. Cereals

WHEAT, BARLEY, OAT AND RYE INSECTS

Table 4-1. Chemical Control Options for Insects in Cereals (Wheat, Barley and Oats) — Wireworms, European Chafer

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, re-entry periods, etc.)
WIREWORMS (<i>Limonius</i> spp. and others)				
Seed Treatment				
See OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> , for sampling methods. 1 wireworm/bait trap warrants control.	thiamethoxam	Cruiser 5 FS	33–50 mL/ 100 kg seed	For use in wheat, barley and rye. For use in on-farm or commercial seed treatment facilities. Use higher rate in fields with a history of high infestations of larvae. Do not graze or feed livestock on treated areas for 45 days after planting.
	imidacloprid	Alias 240 SC	42–125 mL/ 100 kg seed	Use higher rates for fields with history of moderate-to-high wireworm pressure.
	clothianidin	NipsIt Inside 600	(17 mL/ 100 kg seed for suppression) 33–100 mL/ 100 kg seed	For use in commercial seed treatment facilities or on-farm. Use higher rates on wheat seed to be planted into fields known to have a history of severe wireworm infestations for protection to seed and seedlings.
	clothianidin + metalaxyl + metconazole	NipsIt SUITE Cereals OF	326 mL/ 100 kg seed	Suppression only. The product is formulated for use as an on-farm and commercial seed treatment product. Do not make any subsequent application of a Group 4 insecticide (e.g., in-furrow or foliar application) following treatment with NipsIt SUITE Cereals OF seed protectant.
GRUB — EUROPEAN CHAFER (<i>Rhizotrogus majalis</i>)				
High-risk areas for chafer within a field include sandy knolls and areas bordering turf, pasture and tree lines. Chafer grub infestations can occur 1 year after soybean crops on sandy soils. Avoid planting winter wheat if chafer grub populations are extreme (more than four grubs per 30 cm x 30 cm (1 ft ²)). See OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> , for more details.	thiamethoxam	Cruiser 5 FS	50 mL/ 100 kg seed	For use in wheat and barley. For use in on-farm or commercial seed treatment facilities. Do not graze or feed livestock on treated areas for 45 days after planting.
	imidacloprid	Stress Shield 600	17–50 mL/ 100 kg seed (10–30 g ai/ 100 kg seed)	For use in commercial seed treatment equipment only in Eastern Canada. For fields with a history of moderate-to-high wireworm pressure, treat crops at 50 mL/100 kg seed. For control of certain seed and soil-borne pathogens in wheat, barley and oat seeds and seedlings, Stress Shield 600 may be mixed with Raxil T, Raxil MD or EverGol Energy. Follow all appropriate directions and precautions as specified on the fungicide labels. Use high rate for early seeding, when insect populations are expected to be high or extended control period for aphids is needed. This product contains no colourant. Seed treated with this product must be conspicuously coloured. Do not graze or feed livestock on treated areas for 4 weeks after planting. Do not apply any subsequent application of a Group 4 insecticide (e.g., in-furrow or foliar application) following treatment with Stress Shield 600.

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Table 4–2. Chemical Control Options for Insects in Cereals (Wheat, Barley and Oats) — Armyworm, Cereal Leaf Beetle

LEGEND: PHI = Pre-Harvest Interval (in days)

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, re-entry periods, etc.)
ARMYWORM (TRUE – <i>Pseudaletia unipuncta</i>, FALL – <i>Spodoptera frugiperda</i>)					
Chemical control is warranted by four to five larvae in a 30-cm-x-30-cm area. Treat if larvae are smaller than 2.0 cm long and threshold has been exceeded. If larvae have white eggs attached to them, they are parasitized and may not require treatment.	carbaryl	Sevin XLR Plus	2.5–5.25 L/ha (1.0–2.1 L/acre)	wheat, rye, oat: 14 barley: 28	This product is highly toxic to honeybees exposed to direct treatment on blooming crops or weeds. Apply SEVIN XLR PLUS from late evening to early morning or when bees are not foraging.
	methomyl	Lannate Toss-N-Go	270–540 g/ha (108–216 g/acre)	20	Ground and aerial application. 24-hr re-entry period. Toxic to bees exposed to direct treatment, drift or residues on flowering crops or weeds. DO NOT apply this product to flowering crops if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application.
	lambda-cyhalothrin	Matador 120 E	83 mL/ha (34 mL/acre)	wheat, barley, oat: 28 livestock foraging: 14	Ground and aerial application. Use 100–200 L of water/ha. Allow a 7-day interval between treatments. Maximum 3 applications/yr. Do not apply more than 2 applications by air. 24-hr re-entry period. This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. DO NOT apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.
	spinetoram	Delegate WG	100–200 g/ha (40–80 g/acre)	21	Ground application only. Use higher rate for heavy infestations or advanced pest stages. Spray tank solution pH should be between 6 and 8 for optimal control. Minimum 5 days between treatments. Maximum 3 applications/yr. 12-hr re-entry period. Toxic to bees exposed to direct treatment, drift or residues on flowering crops or weeds. DO NOT apply this product to flowering crops or weeds if bees are visiting the treatment area.
	chlorantraniliprole	Coragen	250–375 mL/ha (101–151 mL/acre)	1	Ground and aerial application. Maximum of 3 applications/yr. Do not exceed a total of 1.125 L of Coragen per season. Use a minimum 100 L/ha by ground or 50 L/ha aerial.
CEREAL LEAF BEETLE (<i>Oulema melanopus</i>)					
Control is warranted if an average of three larvae per tiller are found before boot stage. One CLB adult or larvae per stem warrants control after boot but prior to heading. If significant feeding is taking place on the flag leaf in the early heading stages, control may be warranted. Natural enemies are highly effective at controlling this pest. For the safety of these natural enemies, chemical control is not recommended unless pest population exceeds the action threshold. See OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> , for more information.	malathion	Malathion 500 EC	550–1100 mL/ha (202–445 mL/acre)	7	Product is less effective at temperatures below 20°C. Toxic to bees exposed to direct treatment, drift or residues on flowering crops or weeds. DO NOT apply this product to flower crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.

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Table 4–3. Chemical Control Options for Insects in Cereals (Wheat, Barley and Oats) — Grasshoppers

LEGEND: PHI = Pre-Harvest Interval (in days)

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, re-entry periods, etc.)
GRASSHOPPERS (various species)					
Grasshoppers are more abundant in drier years. If populations are high enough, wheat heads may be clipped. Seedling winter wheat is also at risk. Infestations usually begin along field borders. Early-season weed control can help eliminate food source for early-season nymphs, however, late-season weed control in and around the field will actually cause this insect to migrate from the weeds onto the crop and cause damage. If populations are high, spot spray in border areas that are infested before migration into the field occurs.	malathion	Malathion 500 EC	2.25–2.75 L/ha (900–1,100 mL/acre)	7	Product is less effective at temperatures below 20°C. Toxic to bees exposed to direct treatment, drift or residues on flowering crops or weeds. DO NOT apply this product to flower crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.
	cypermethrin	Mako	50–70 mL/ha (20–28 mL/acre)	wheat: 30 barley: 45	For use in wheat and barley. Ground application only. Use lower rates for small grasshoppers and when soil temperatures are cool (15°C–20°C). Avoid spraying when temperatures are above 25°C. Repeat treatment as necessary. Do not graze treated crop or cut for hay. Toxic to bees and other beneficial insects. Avoid spraying when bees are foraging.
	lambda-cyhalothrin	Matador 120 E	63–83 mL/ha (26–34 mL/acre)	wheat, barley, oat: 28 livestock foraging: 14	Ground and aerial application. Apply the low rate when grasshoppers are up to the 3rd nymph stage (up to 1 cm in length) or when insect numbers are low. Apply the high rate when grasshoppers are larger, up to but not including winged adults (up to 2.5 cm in length) or when insect numbers are high. Allow a 7-day interval between treatments. Maximum 3 applications/yr. Do not apply more than 2 applications by air. 24-hr re-entry period. This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. DO NOT apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.
		Silencer 120 EC			
	carbaryl	Sevin XLR Plus	1.25–2.5 L/ha (0.5–1.0 L/acre)	wheat, rye, oat: 14 barley: 28	This product is highly toxic to honeybees exposed to direct treatment on blooming crops or weeds. Apply SEVIN XLR PLUS from late evening to early morning or when bees are not foraging.
	spinetoram	Delegate WG	100–200 g/ha (40–80 mg/acre)	21	Ground application only. Minimum of 5 days between applications. Spray tank solution pH should be between 6 and 8 for optimal control. Maximum 3 applications/yr. 12-hr re-entry period. Toxic to bees exposed to direct treatment, drift or residues on flowering crops or weeds. DO NOT apply this product to flowering crops or weeds if bees are visiting the treatment area.
	chlorantraniliprole	Coragen	250–375 mL/ha (101–151 mL/acre)	1	Ground and aerial application. Maximum of 3 applications/yr. Do not exceed a total of 1.125 L of Coragen per season. Use a minimum 100 L/ha by ground or 50 L/ha aerial.

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Table 4–4. Chemical Control Options for Insects in Cereals (Wheat, Barley and Oats) — Cereal Aphids

LEGEND: PHI = Pre-Harvest Interval (in days) N/A = not applicable					
Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, re-entry periods, etc.)
CEREAL APHIDS (various species)					
Seed Treatment					
Fields planted in late summer or early fall (August/September) are at the highest risk of fall infestations. Volunteer cereals allow aphids to survive until the host crop is planted and can increase the risk of the virus being vectored into the crop.	clothianidin	NipsIt Inside 600	50 mL/ 100 kg seed	N/A	For commercial and on-farm treating. For early-season protection of wheat seedlings against aphid feeding.
Foliar Treatment					
Apply once the action threshold has been reached: Prior to the heading stage, 12–15 cereal aphids per stem and up to 50 aphids per head once headed.	dimethoate	Cygon 480 EC	1 L/ha (400 mL/acre)	2	Ground and aerial application. For ground application, use sufficient water to obtain good coverage (100–275 L/ha). With aerial application, use 10–30 L of water/ha. Maximum 2 applications/year. This product is toxic to bees. Restrict application to the period after dark when bees are inside the hives, or in the early morning before the bees are foraging in the fields. DO NOT apply to such crops as alfalfa when in full bloom.
	sulfoxaflor	Transform WG	25–50 g/ha (10–24 g/acre)	14	Wheat and barley only. Maximum 2 applications per year. Do not apply more than 22 g/ha per year. Ground and aerial application. For ground application, use a minimum of 100 L of water/ha. For aerial application, use a minimum of 30 L of water/ha. Toxic to bees. Do not apply this product during crop flowering period or when flowering weeds are present in the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site. Apply early in the morning or late in the evening when bees are not active. Toxic to certain beneficial insects.

Seed Rots and Seed-Borne Diseases

Use good-quality, clean seed. Apply fungicide seed treatment to all wheat seed to control soil-borne and seed-borne diseases such as seed rots and seedling blights, seed-borne septoria, seed-borne fusarium seedling blight, seed-borne dwarf bunt, common bunt and loose smut. The best protection against seedling blights, smut and the bunts can be achieved through the use of a seed treatment that contains a combination of fungicides, since no one fungicide is effective against all these diseases. Good coverage of the seed is essential, otherwise performance will be reduced.

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Table 4–5. Chemical Control Options for Seed Rots and Seed-Borne Diseases in Wheat — Seed-Borne Septoria

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, re-entry periods, etc.)
SEED-BORNE SEPTORIA (<i>Stagonospora nodorum</i>, formerly <i>Septoria nodorum</i>)				
Seed Treatment				
Infected seed is lightweight and shrivelled. Fungicide seed treatment is very effective against this disease. Other options include the use of tolerant varieties and disease-free seed. Consult with your seed company and the Ontario Cereal Crops Committee Variety Trial Results at www.gocereals.ca for variety profiles. Plant into a well-prepared seed bed under good growing conditions. Use wheat in at least a 3-yr rotation since the disease can survive in wheat residue.	difenoconazole + metalaxyl-M	Dividend XL RTA	650 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 35 days of planting.
	tebuconazole + thiram	Raxil T	225 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	tebuconazole + metalaxyl-M	Raxil MD	300 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provide good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	difenoconazole + metalaxyl-M + sedaxane	Vibrance XL	180–360 mL/ 100 kg seed	For use in commercial seed treatment facilities only. For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed. For control of seed-borne septoria and early-season septoria leaf blotch, use the 360 mL/100 kg seed rate.

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Table 4–6. Chemical Control Options for Seed Rots and Seed-Borne Diseases in Wheat — Fusarium

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, re-entry periods, etc.)
SEED-BORNE, SEED ROT and SEEDLING BLIGHT (<i>FUSARIUM</i> spp.)				
Seed Treatment				
Infected seed is lightweight and shrivelled. Fungicide seed treatment is very effective against this disease. Other options include the use of tolerant varieties and disease-free seed. Consult with your seed company and the Ontario Cereal Crops Committee Variety Trial Results at www.gocereals.ca for variety profiles. Plant into a well-prepared seedbed under good growing conditions. Use wheat in at least a 3-yr rotation since the disease can survive in wheat residue. Avoid planting wheat after corn.	tebuconazole + thiram	Raxil T	225 mL/100 kg seed	For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	tebuconazole + metalaxyl-M	Raxil MD	300 mL/100 kg seed	For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provides good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	difenoconazole + metalaxyl-M	Dividend XL RTA	325–650 mL/100 kg seed	For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 35 days of planting.
	triticonazole + thiram	Gemini	360 mL/100 kg seed	For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder.
	ipconazole	Rancona Apex	325 mL/100 kg seed	For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 30 days after planting.
	fludioxonil	Proseed	5.2–10.4 mL/100 kg seed	For use in commercial seed treatment facilities only. Use in combination with Dividend XL RTA for broad spectrum control.
	penflufen + prothioconazole + metalaxyl	EverGol Energy	65 mL/100 kg seed	For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.
	tebuconazole + prothioconazole + metalaxyl	Raxil Pro MD	325 mL/100 kg seed	For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provide good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	difenoconazole + metalaxyl-M + sedaxane	Vibrance XL	180–360 mL/100 kg seed	For use in commercial seed treatment facilities only. For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.
penflufen + prothioconazole + metalaxyl	EverGol Energy	65 mL/100 kg seed	For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.	

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Table 4–6. Chemical Control Options for Seed Rots and Seed-Borne Diseases in Wheat — Fusarium

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, re-entry periods, etc.)
SEED-BORNE, SEED ROT and SEEDLING BLIGHT (<i>FUSARIUM</i> spp.) (cont'd)				
Seed Treatment (cont'd)				
(cont'd)	clothianidin + metalaxyl + metconazole	NipsIt SUITE Cereals OF	326 mL/ 100 kg seed	For commercial and on-farm treating. Not for use in hopper-box, slurry-box or similar seed treatment applications used at planting. This product is to be used in liquid or slurry treaters. Mix thoroughly before use. Do not make any subsequent application of a Group 4 insecticide (e.g., in-furrow or foliar application) following treatment with NipsIt SUITE Cereals OF seed protectant. NipsIt SUITE Cereals OF seed protectant is a ready-to-use product, which includes red colourant (according to regulations pertaining to the <i>Seeds Act</i>). No additional colourant, dyes, binders, polymers or water are required.
	difenoconazole + metalaxyl-m + sedaxane + fludioxonil	Vibrance Quattro	325 mL/ 100 kg seed	For commercial and on-farm treating. Apply this product utilizing seed treatment equipment that provides uniform seed coverage. Uneven or incomplete seed coverage may not give the desired level of disease control. Do not graze or feed livestock on treated areas for 45 days after planting.

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Table 4–7. Chemical Control Options for Seedling Diseases in Wheat — Common Root Rot (Common Blight)

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, re-entry periods, etc.)
COMMON ROOT ROT (COMMON BLIGHT) (<i>Cochliobolus sativus</i>)				
Seed Treatment				
Infected plants can be found individually or in irregular patches. These plants are often stunted and yellow (chlorotic) with a dark browning or blackening of the subcrown internodes. Drought and warm temperatures favour root rot. Maintain sound soil health practices and use good 3-yr crop rotation using non-host crops. Avoid soil compaction and deep seeding.	difenoconazole + metalaxyl-M	Dividend XL RTA	325–650 mL/100 kg seed	Provides suppression only. For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 35 days of planting.
	ipconazole	Rancona Apex	325 mL/100 kg seed	Provides suppression only. For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 30 days after planting.
	tebuconazole + thiram	Raxil T	225 mL/100 kg seed	Provides suppression only. For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 6 weeks after planting.
	tebuconazole + metalaxyl-M	Raxil MD	300 mL/100 kg seed	Provides suppression only. For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provides good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	carbathiin + thiram	Vitaflor 280	230–330 mL/100 kg seed	Provides suppression only. For commercial seed treatment facilities only. Do not graze or feed livestock on treated areas for 6 weeks after planting.
	penflufen + prothioconazole + metalaxyl	EverGol Energy	65 mL/100 kg seed	For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.
	tebuconazole + prothioconazole + metalaxyl	Raxil Pro MD	325 mL/100 kg seed	For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provide good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	difenoconazole + metalaxyl-M + sedaxane	Vibrance XL	180–360 mL/100 kg seed	For use in commercial seed treatment facilities only. For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.
	difenoconazole + metalaxyl-m + sedaxane + fludioxonil	Vibrance Quattro	325 mL/100 kg seed	For commercial and on-farm treating. Apply this product utilizing seed treatment equipment that provides uniform seed coverage. Uneven or incomplete seed coverage may not give the desired level of disease control. Do not graze or feed livestock on treated areas for 45 days after planting.
	clothianidin + metalaxyl + metconazole	NipsIt SUITE Cereals OF	326 mL/100 kg seed	For commercial and on-farm treating. Not for use in hopper-box, slurry-box or similar seed treatment applications used at planting. This product is to be used in liquid or slurry treaters. Mix thoroughly before use. Do not make any subsequent application of a Group 4 insecticide (e.g., in-furrow or foliar application) following treatment with NipsIt SUITE Cereals OF seed protectant. NipsIt SUITE Cereals OF seed protectant is a ready-to-use product, which includes red colourant (according to regulations pertaining to the Seeds Act). No additional colourant, dyes, binders, polymers or water are required.

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Table 4–8. Chemical Control Options for Seedling Diseases in Wheat — Pythium Damping-Off

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, re-entry periods, etc.)
PYTHIUM DAMPING-OFF (<i>Pythium</i> spp.)				
Seed Treatment				
<p>This disease can occur on all soil types but losses are greatest in cold, wet clay soils. Minimize soil compaction and remove excess moisture through increased drainage. Seed treatments containing metalaxyl or metalaxyl-M can reduce infection. Delay planting until conditions will result in a rapid and uniform emergence.</p>	difenoconazole + metalaxyl-M	Dividend XL RTA	325–650 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 35 days of planting.
	difenoconazole + metalaxyl-M + sedaxane	Vibrance XL	180–360 mL/ 100 kg seed	For use in commercial seed treatment facilities only. For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.
	metalaxyl-M	Apron XL LS	20–40 mL/ 100 kg seed	For use in commercial seed treatment facilities only. Do not use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment applications at or immediately before planting. Read the label for information regarding resistant strains of fungus. Do not graze or feed livestock on seeded area for 4 weeks after planting.
	triticonazole + thiram	Gemini	360 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder.
	tebuconazole + metalaxyl-M	Raxil MD	300 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provides good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	tebuconazole + thiram	Raxil T	225 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	penflufen + prothioconazole + metalaxyl	EverGol Energy	65 mL/ 100 kg seed	For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.
	tebuconazole + prothioconazole + metalaxyl	Raxil Pro MD	325 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provide good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting.

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Table 4–8. Chemical Control Options for Seedling Diseases in Wheat — Pythium Damping-Off

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, re-entry periods, etc.)
PYTHIUM DAMPING-OFF (<i>Pythium</i> spp.) (cont'd)				
Seed Treatment (cont'd)				
(cont'd)	ethaboxam	Intego Solo Fungicide	13–17 mL/ 100 kg seed	<p>For commercial and on-farm treating. Regulations under the <i>Seeds Act</i> require that an appropriate colourant must be added when this product is applied to seed. A red colourant must be added when this product is applied to grain.</p> <p>For best results, use Intego Solo Fungicide combined with other oomycete-active seed treatment fungicides, such as metalaxyl, to broaden the spectrum of activity. Intego Solo Fungicide can also be used in combination with a broad-spectrum registered seed treatment fungicide having activity against <i>Rhizoctonia solani</i> and other fungal pathogens inciting seed and seedling disease.</p> <p>To deliver 5 g ai/100 kg seed, apply 0.44 mL per 100,000 seeds (equals 0.0017 mg ai/seed) based on 28,634 seed/kg count.</p>
	clothianidin + metalaxyl + metconazole	NipsIt SUITE Cereals OF	326 mL/ 100 kg seed	<p>For commercial and on-farm treating.</p> <p>Not for use in hopper-box, slurry-box or similar seed treatment applications used at planting. This product is to be used in liquid or slurry treaters. Mix thoroughly before use. Do not make any subsequent application of a Group 4 insecticide (e.g., in-furrow or foliar application) following treatment with NipsIt SUITE Cereals OF seed protectant.</p> <p>NipsIt SUITE Cereals OF seed protectant is a ready-to-use product that includes red colourant (according to regulations pertaining to the <i>Seeds Act</i>). No additional colourant, dyes, binders, polymers or water are required.</p>
	difenoconazole + metalaxyl-m + sedaxane + fludioxonil	Vibrance Quattro	325 mL/ 100 kg seed	<p>For commercial and on-farm treating. Apply this product utilizing seed treatment equipment that provides uniform seed coverage. Uneven or incomplete seed coverage may not give the desired level of disease control. Do not graze or feed livestock on treated areas for 45 days after planting.</p>

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Table 4–9. Chemical Control Options for Seedling Diseases in Wheat — *Penicillium*, *Aspergillus* Seed Rot, Dwarf Bunt

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, re-entry periods, etc.)
PENICILLIUM (<i>Penicillium</i> spp.) and ASPERGILLUS SEED ROT (<i>Aspergillus</i> spp.)				
Seed Treatment				
Both of these diseases are considered storage moulds. Their incidence increases when wheat is stored under warm temperatures and moist conditions. Seed that is damaged is especially susceptible under these conditions. Maintain grain at less than 14% moisture and below 20°C. Avoid damaging seed during harvest or handling.	difenoconazole + metalaxyl-M	Dividend XL RTA	325–650 mL/100 kg seed	For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 35 days of planting.
	ipconazole	Rancona Apex	325 mL/100 kg seed	For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 30 days after planting.
	tebuconazole + prothioconazole + metalaxyl	Raxil Pro MD	325 mL/100 kg seed	For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provide good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	penflufen + prothioconazole + metalaxyl	EverGol Energy	65 mL/100 kg seed	For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.
	difenoconazole + metalaxyl-m + sedaxane + fludioxonil	Vibrance Quattro	325 mL/100 kg seed	For commercial and on-farm treating. Apply this product utilizing seed treatment equipment that provides uniform seed coverage. Uneven or incomplete seed coverage may not give the desired level of disease control. Do not graze or feed livestock on treated areas for 45 days after planting.
DWARF BUNT (<i>Tilletia controversa</i>) — SEED AND SOIL-BORNE BUNTS (COMMON, DWARF)				
Seed Treatment				
Wheat infected with dwarf bunt will be substantially shorter than healthy plants. Infected seed has a “fishy” smell. Dwarf bunt occurs on winter wheat, primarily in counties bordering Georgian Bay and Lake Huron where snow cover is deep and persistent in late winter and early spring. Plant seed that is free of bunt spores (black). Treat seed when bunt has been observed in the crop. Cut the crop high when harvesting. Raising the header reduces the amount of bunt balls being harvested. Ensure good coverage of fungicide seed treatment on the seed. Avoid planting wheat in fields with soil-borne dwarf bunt for 5–7 yr, since the fungus is very persistent.	difenoconazole + metalaxyl-M	Dividend XL RTA	325–650 mL/100 kg seed	For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 35 days of planting.
	difenoconazole + metalaxyl-M + sedaxane	Vibrance XL	180–360 mL/100 kg seed	For use in commercial seed treatment facilities only. For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.
	carbathiin + thiram	Vitaflo 280	230–330 mL/100 kg seed	For use in commercial seed treatment facilities only. For control of seed-borne dwarf bunt only. Do not graze or feed livestock on treated areas for 6 weeks after planting.
	difenoconazole + metalaxyl-m + sedaxane + fludioxonil	Vibrance Quattro	325 mL/100 kg seed	For commercial and on-farm treating. Apply this product utilizing seed treatment equipment that provides uniform seed coverage. Uneven or incomplete seed coverage may not give the desired level of disease control. Do not graze or feed livestock on treated areas for 45 days after planting.

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Table 4–10. Chemical Control Options for Seedling Diseases in Wheat — Loose Smut

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, re-entry periods, etc.)
LOOSE SMUT (<i>Ustilago tritici</i>)				
Seed Treatment				
This fungus infects the embryo at flowering, thus is seed-borne. Light rains or heavy dew and moderate temperature, 15°C–16°C, during flowering, favour infection. Use pedigreed seed that is treated with a fungicide seed treatment. This disease was quite important in Ontario wheat production, but the incidence and hence its impact has been reduced substantially due to the effectiveness of fungicide seed treatments. Good coverage of seed with fungicide seed treatment is important.	carbathiin + thiram	Vitaflo 280	330 mL/100 kg seed	For use in commercial seed treatment facilities only. Do not graze or feed livestock on treated areas for 6 weeks after planting.
	tebuconazole + thiram	Raxil T	225 mL/100 kg seed	For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	tebuconazole + metalaxyl-M	Raxil MD	300 mL/100 kg seed	For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provides good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	tebuconazole + prothioconazole + metalaxyl	Raxil Pro MD	325 mL/100 kg seed	For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provide good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	difenoconazole + metalaxyl-M	Dividend XL RTA	325–650 mL/100 kg seed	For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 55 days of planting.
	difenoconazole + metalaxyl-M + sedaxane	Vibrance XL	180–360 mL/100 kg seed	For use in commercial seed treatment facilities only. For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.
	triticonazole + thiram	Gemini	360 mL/100 kg seed	For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder.
	ipconazole	Rancona Apex	325 mL/100 kg seed	For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 30 days after planting.
	penflufen + prothioconazole + metalaxyl	EverGol Energy	65 mL/100 kg seed	For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.
	difenoconazole + metalaxyl-m + sedaxane + fludioxonil	Vibrance Quattro	325 mL/100 kg seed	For commercial and on-farm treating. Apply this product utilizing seed treatment equipment that provides uniform seed coverage. Uneven or incomplete seed coverage may not give the desired level of disease control. Do not graze or feed livestock on treated areas for 45 days after planting.
clothianidin + metalaxyl + metconazole	NipsIt SUITE Cereals OF	326 mL/100 kg seed	For commercial and on-farm treating. Not for use in hopper-box, slurry-box or similar seed treatment applications used at planting. This product is to be used in liquid or slurry treaters. Mix thoroughly before use. Do not make any subsequent application of a Group 4 insecticide (e.g., in-furrow or foliar application) following treatment with NipsIt SUITE Cereals OF seed protectant. NipsIt SUITE Cereals OF seed protectant is a ready-to-use product, which includes red colourant (according to regulations pertaining to the Seeds Act). No additional colourant, dyes, binders, polymers or water are required.	

WHEAT DISEASES

Table 4–11. Chemical Control Options for Seedling Diseases in Wheat — *Fusarium* Crown and Foot Rot, *Rhizoctonia*, Take-All

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, re-entry periods, etc.)
FUSARIUM CROWN and FOOT ROT (<i>Fusarium graminearum</i>, <i>F. culmorum</i>, <i>F. pseudograminearum</i>) — Suppression only				
Seed Treatment				
Cool, dry soils are favourable for disease development. Delay planting until conditions will result in a rapid and uniform emergence. Avoid planting after corn and maintain good soil fertility.	difenoconazole + metalaxyl-M	Dividend XL RTA	325–650 mL/ 100 kg seed	Provides suppression only. For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 35 days of planting.
	ipconazole	Rancona Apex	325 mL/ 100 kg seed	Provides suppression only. For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 30 days after planting.
	tebuconazole + metalaxyl-M	Raxil MD	300 mL/ 100 kg seed	Provides suppression only. For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provides good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	difenoconazole + metalaxyl-m + sedaxane + fludioxonil	Vibrance Quattro	325 mL/ 100 kg seed	For commercial and on-farm treating. Apply this product utilizing seed treatment equipment that provides uniform seed coverage. Uneven or incomplete seed coverage may not give the desired level of disease control. Do not graze or feed livestock on treated areas for 45 days after planting.
RHIZOCTONIA (<i>Rhizoctonia solani</i>)				
Seed Treatment				
Rhizoctonia root rot forms reddish-brown, sunken lesions on the stem and taproot, most frequently near the soil line. The lesion can girdle the entire stem, causing stunting or death of the plant. This lesion is distinctively “brick-red” in colour, noticeable immediately after removing the plant from the soil.	difenoconazole + metalaxyl-M + sedaxane	Vibrance XL	180–360 mL/ 100 kg seed	For use in commercial seed treatment facilities only. For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.
	penflufen + prothioconazole + metalaxyl	EverGol Energy	65 mL/ 100 kg seed	For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.
	clothianidin + metalaxyl + metconazole	NipsIt SUITE Cereals OF	326 mL/ 100 kg seed	For commercial and on-farm treating. Not for use in hopper-box, slurry-box or similar seed treatment applications used at planting. This product is to be used in liquid or slurry treaters. Mix thoroughly before use. Do not make any subsequent application of a Group 4 insecticide (e.g., in-furrow or foliar application) following treatment with NipsIt SUITE Cereals OF seed protectant. NipsIt SUITE Cereals OF seed protectant is a ready-to-use product that includes red colourant (according to regulations pertaining to the Seeds Act). No additional colourant, dyes, binders, polymers or water are required.
	difenoconazole + metalaxyl-m + sedaxane + fludioxonil	Vibrance Quattro	325 mL/ 100 kg seed	For commercial and on-farm treating. Apply this product utilizing seed treatment equipment that provides uniform seed coverage. Uneven or incomplete seed coverage may not give the desired level of disease control. Do not graze or feed livestock on treated areas for 45 days after planting.

WHEAT DISEASES

Table 4–11. Chemical Control Options for Seedling Diseases in Wheat — Fusarium Crown and Foot Rot, Rhizoctonia, Take-All

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, re-entry periods, etc.)
TAKE-ALL (<i>Gaeumannomyces graminis</i>) — Suppression only				
Seed Treatment				
Carefully manage your soil fertility to manage this disease. Neutral-to-alkaline and infertile soils are most at risk. Do not apply lime before planting. Potassium and phosphorus deficiencies in the soil cause plants to be more susceptible because of poor root development. Nitrate nitrogen increases disease severity. Control grass weeds and avoid early planting. Use a 3-yr crop rotation and avoid planting wheat after wheat.	difenoconazole + metalaxyl-M	Dividend XL RTA	325–650 mL/ 100 kg seed	Provides suppression only. For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 55 days of planting.
	difenoconazole + metalaxyl-m + sedaxane + fludioxonil	Vibrance Quattro	325 mL/ 100 kg seed	For commercial and on-farm treating. Apply this product utilizing seed treatment equipment that provides uniform seed coverage. Uneven or incomplete seed coverage may not give the desired level of disease control. Do not graze or feed livestock on treated areas for 45 days after planting.

WHEAT DISEASES

Table 4-12. Chemical Control Options for Seedling Diseases in Wheat — Common Bunt

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, re-entry periods, etc.)
COMMON BUNT (<i>Tilletia tritici</i> and <i>Tilletia laevis</i>) — Seed and soil-borne bunts (common, dwarf)				
Seed Treatment				
Cool soil temperatures after seeding favour this disease. This disease was quite important in Ontario wheat production, but the incidence and hence its impact has been reduced substantially due to the effectiveness of fungicide seed treatments. Use seed that is free of bunt spores (black). Infected seed produces a “fishy” smell.	carbathiin + thiram	Vitaflo 280	230–330 mL/ 100 kg seed	Do not graze or feed livestock on treated areas for 6 weeks after planting.
	difenoconazole + metalaxyl-M	Dividend XL RTA	325–650 mL/ 100 kg seed	Controls both seed- and soil-borne common bunt. For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 55 days of planting.
	difenoconazole + metalaxyl-M + sedaxane	Vibrance XL	180–360 mL/ 100 kg seed	For use in commercial seed treatment facilities only. For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.
	tebuconazole + thiram	Raxil T	225 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	tebuconazole + metalaxyl-M	Raxil MD	300 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provides good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	tebuconazole + prothioconazole + metalaxyl	Raxil Pro MD	325 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provide good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	triticonazole + thiram	Gemini	360 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder.
	ipconazole	Rancona Apex	325 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 30 days after planting.
	difenoconazole + metalaxyl-m + sedaxane + fludioxonil	Vibrance Quattro	325 mL/ 100 kg seed	For commercial and on-farm treating. Apply this product utilizing seed treatment equipment that provides uniform seed coverage. Uneven or incomplete seed coverage may not give the desired level of disease control. Do not graze or feed livestock on treated areas for 45 days after planting.
	clothianidin + metalaxyl + metconazole	NipsIt SUITE Cereals OF	326 mL/ 100 kg seed	For commercial and on-farm treating. Not for use in hopper-box, slurry-box or similar seed treatment applications used at planting. This product is to be used in liquid or slurry treaters. Mix thoroughly before use. Do not make any subsequent application of a Group 4 insecticide (e.g., in-furrow or foliar application) following treatment with NipsIt SUITE Cereals OF seed protectant. NipsIt SUITE Cereals OF seed protectant is a ready-to-use product that includes red colourant (according to regulations pertaining to the Seeds Act). No additional colourant, dyes, binders, polymers or water are required.

WHEAT DISEASES

Table 4–13. Chemical Control Options for Foliar, Stem and Head Diseases in Wheat — Early-Season Septoria, Spot Blotch
See Appendix H. Cereal Growth Stages, on page 193.

LEGEND: PHI = Pre-Harvest Interval (in days) N/A = not applicable					
Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, re-entry periods, etc.)
EARLY-SEASON SEPTORIA (<i>Septoria</i> spp.)					
Seed Treatment					
Early-season septoria control may reduce the risk of later infection. However, if the flag leaf is disease-free at the time of head emergence, a fungicide will not likely be necessary.	difenoconazole + metalaxyl-M	Dividend XL RTA	650 mL/ 100 kg seed	N/A	Provides control for the first 6 weeks after planting. For full-season control, apply a foliar fungicide. For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeders. Do not graze, feed green forage or cut for hay within 55 days of planting.
SPOT BLOTCH (<i>Cochliobolus sativus</i>)					
Avoid growing wheat after barley, wheat or grasses in a rotation. Removal of residue/straw will lower risk.	pyraclostrobin + metconazole	Twinline	380–500 mL/ha (150–200 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Ensure thorough coverage of foliage. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 6-day re-entry period.

WHEAT DISEASES

Table 4–14. Chemical Control Options for Foliar, Stem and Head Diseases in Wheat — Septoria Leaf Spot
See Appendix H. Cereal Growth Stages, on page 193.

LEGEND: PHI = Pre-Harvest Interval (in days)					
Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, re-entry periods, etc.)
SEPTORIA LEAF SPOT (<i>Septoria tritici</i>)					
Foliar Treatment					
Wet, windy weather and moderate temperatures favour the development of this disease. Destroying volunteer wheat, reducing crop residue and crop rotation can help reduce risk of infection. Plant less susceptible varieties. Consult with your seed company and the Ontario Cereal Crops Committee Variety Trial Results at www.gocereals.ca for variety profiles.	pyraclostrobin	Headline EC	300–600 mL/ha (120–240 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 2 applications/yr. 12-hr re-entry period.
	azoxystrobin + propiconazole	Quilt	750 mL/ha (305 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 1 application/yr. Do not harvest for forage. 12-hr re-entry period.
	propiconazole	Tilt 250 E	250–500 mL/ha (100–200 mL/acre)	45	Ground and aerial application. Early application at Zadok's 12–23. Use low rate for early-season disease suppression. Use higher rate for fields with high disease pressure history or field conditions favourable for disease development. Later application at first sign of disease (Zadok's 29–37) or before head is half emerged (Zadok's 49–55). Apply only the high rate on any application from Zadok's 29–55. Maximum 2 applications/yr.
		Bumper 418 EC	150–300 mL/ha (60–121 mL/acre)	45	Ground and aerial application. For early-season disease suppression, use the lower rate at Zadok's 12–23 (as early as the two-leaf stage). Use the high rate for fields with a history of disease pressure. For later-season application, apply at early signs of disease from the beginning of stem elongation (Zadok's 29–37). If conditions favourable to disease continue, apply again, if necessary, before head is half emerged (Zadok's 49–55). Apply only the high rate from Zadok's 29–55. Maximum 2 applications/yr.
	prothioconazole	Proline 480 SC	315 mL/ha (128 mL/acre)	30	Ground and aerial application. Use as a preventive when earliest disease symptoms appear on the leaves and stems. Use with the registered non-ionic surfactant, Agral 90 or AgSurf at 0.125% vol/vol. Minimum 7-day interval between applications. Maximum 2 applications/yr. 24-hr re-entry period.
	azoxystrobin + propiconazole	Blanket AP	200–300 mL/ha (80–120 mL/acre)	Do not apply at boot stage and beyond.	For commercial and on-farm treating. Apply once between stem elongation and half-head emergence. Good spray coverage and canopy penetration are important for best results.

WHEAT DISEASES

Table 4–14. Chemical Control Options for Foliar, Stem and Head Diseases in Wheat — Septoria Leaf Spot
See Appendix H. Cereal Growth Stages, on page 193.

LEGEND: PHI = Pre-Harvest Interval (in days)

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, re-entry periods, etc.)
SEPTORIA LEAF SPOT (<i>Septoria tritici</i>) (cont'd)					
Foliar Treatment (cont'd)					
(cont'd)	prothioconazole + tebuconazole	Prosaro 250 EC	800 mL/ha (324 mL/acre)	36	Ground and aerial application. Use a minimum of 100 L/ha of water for ground application, 50 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.
	tebuconazole	Folicur 250 EW	375–500 mL/ha (152–200 mL/acre)	36	Ground and aerial application. Apply to leaf foliage at very early stage of disease, especially if weather conditions are conducive to disease development, up to the end of the flowering stage. Use the higher rate when weather conditions are conducive to heavy disease development. The use of a non-ionic surfactant (Agral 90 or Agsurf) is NOT required, as it is built into the formulation. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period. Before using Folicur for control of wheat leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.
		Folicur 432 F	220–292 mL/ha (90–118 mL/acre)	36	Ground and aerial application. Apply to leaf foliage at the first sign or very early stage of disease, especially if weather conditions are conducive to disease development, up to the end of the flowering stage. Use the higher rate when weather conditions are conducive to heavy disease development. Always use non-ionic surfactant such as Agral 90 or Agsurf at 0.125% vol/vol. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period. Before using Folicur for control of wheat leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.
	picoxystrobin	Acapela	0.44–0.88 L/ha (180–350 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply prior to disease development and continue on a 7–14-day interval. Use high rate and shorter interval when disease pressure is high. Optimum protection of flag leaf is provided when applied at “flag leaf out” (Zadok’s 39). Do not apply after flowering (Zadok’s 59). Apply no more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 2.64 L/ha/season. 12-hr re-entry period.

WHEAT DISEASES

Table 4–14. Chemical Control Options for Foliar, Stem and Head Diseases in Wheat — Septoria Leaf Spot
See Appendix H. Cereal Growth Stages, on page 193.

LEGEND: PHI = Pre-Harvest Interval (in days)					
Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, re-entry periods, etc.)
SEPTORIA LEAF SPOT (<i>Septoria tritici</i>) (cont'd)					
Foliar Treatment (cont'd)					
(cont'd)	penthiopyrad	Vertisan	1.2–1.75 L/ha (0.48–0.7 L/acre)	Do not apply at boot stage and beyond.	Suppression only. Ground and aerial application. Begin applications prior to disease development and continue on a 7–14-day interval. Use higher rate and shorter interval when disease pressure is high. To optimize flag leaf protection, apply at “flag leaf out” (Zadok’s 39). Do not apply after flowering (Zadok’s 59). Do not apply more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 3.5 L/ha/yr. 12-hr re-entry period.
	mancozeb	Dithane DG Rainshield NT	early: 1.1 kg/ha (440 g/acre) late: 2.25 kg/ha (900 g/acre)	40	Ground and aerial application. Use lower rate for applications at Zadok’s 12–21 growth stage, when crop is in 3rd leaf to tillering. Higher rate for applications at Zadok’s 59 growth stage when head is fully emerged but prior to flowering. Do not graze crop or cut for hay. Maximum 2 applications/yr.
	trifloxystrobin + prothioconazole	Stratego Pro	440 mL/ha (178 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply Stratego Pro as a preventive disease control measure. Stratego Pro may be tank-mixed with either Buctril M or Infinity herbicides only during the 2- to 4-leaf stage in the fall or from the time growth commences in the spring to the early flag leaf stage. Do not tank-mix Stratego Pro with graminicide herbicides.
	azoxystrobin + propiconazole	Quilt	0.5–1.0 L/ha (202–406 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply at first sign of disease starting at the 2-leaf stage and up to the flag leaf fully emerged stage. Do not apply at boot stage and beyond. Where a rate range is indicated, use the higher rate if there is a history of high disease pressure in the field or if field conditions favour disease development. 12-hr re-entry period. Maximum 2 applications/yr.
	pyraclostrobin + fluxapyroxad	Priaxor	0.225–0.3 L/ha (90–120 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. For optimal disease control, begin applications prior to disease development at the onset of disease symptoms. Applications should be made prior to head emergence. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 12-hr re-entry period.

WHEAT DISEASES

Table 4–15. Chemical Control Options for Foliar, Stem and Head Diseases in Wheat — Powdery Mildew
See Appendix H. Cereal Growth Stages, on page 193.

LEGEND: PHI = Pre-Harvest Interval (in days)

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, re-entry periods, etc.)
POWDERY MILDEW (<i>Erysiphe graminis</i> f. sp. <i>tritici</i>)					
Seed Treatment					
The fungus is very susceptible to weather conditions that promote drying of the crop environment, such as hot, dry, sunny weather. Management includes the use of tolerant varieties, crop rotation, tillage and fungicides. Consult with your seed company and the Ontario Cereal Crops Committee Variety Trial Results at www.gocereals.ca for variety profiles. See OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> , for thresholds and more information.					
Foliar Treatment					
Foliar fungicide applications may be necessary if disease levels will result in yield losses and/or a susceptible variety has been used. Consult with your seed company and the Ontario Cereal Crops Committee Variety Trial Results at www.gocereals.ca for variety profiles. Thresholds for fungicide applications differ, depending on the age of the crop. If 5%–10% of the lower leaves are infested early in the season, control is warranted. This may limit later infection. Later in the season, powdery mildew symptoms on the flag leaf (1% of the leaf) and the second leaf (3%–5% of the leaf) require immediate attention, especially if prolonged wet, humid weather is forecast.	pyraclostrobin	Headline EC	400–600 mL/ha (160–240 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 2 applications/yr. 12-hr re-entry period.
	propiconazole	Tilt 250 E	500 mL/ha (200 mL/acre)	45	Ground and aerial application. Apply at early signs of disease from the beginning of stem elongation (Zadok's 29–37). If conditions favourable to disease continue, apply a second spray before the head is half emerged (Zadok's 49–55). Can be tank-mixed with several cereal herbicides. Maximum 2 applications/yr.
		Bumper 418 EC	300 mL/ha (121 mL/acre)		
	picoxystrobin	Acapela	0.44–0.88 L/ha (180–350 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply prior to disease development and continue on a 7–14-day interval. Use high rate and shorter interval when disease pressure is high. Optimum protection of flag leaf is provided when applied at “flag leaf out” (Zadok's 39). Do not apply after flowering (Zadok's 59). Apply no more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 2.64 L/ha/season. 12-hr re-entry period.
	prothioconazole + tebuconazole	Prosaro 250 EC	800 mL/ha (324 mL/acre)	36	Ground and aerial application. Use a minimum of 100 L/ha of water for ground application, 50 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.
	pyraclostrobin + metconazole	Twinline	380–500 mL/ha (150–200 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Ensure thorough coverage of foliage. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 6-day re-entry period.

WHEAT DISEASES

Table 4–15. Chemical Control Options for Foliar, Stem and Head Diseases in Wheat — Powdery Mildew
See Appendix H. Cereal Growth Stages, on page 193.

LEGEND: PHI = Pre-Harvest Interval (in days)					
Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, re-entry periods, etc.)
POWDERY MILDEW (<i>Erysiphe graminis</i> f. sp. <i>tritici</i>) (cont'd)					
Foliar Treatment (cont'd)					
(cont'd)	tebuconazole	Folicur 250 EW	500 mL/ha (200 mL/acre)	36	Ground and aerial application. Apply to leaf foliage at the first sign or very early stage of disease, especially if weather conditions are conducive to disease development, up to the end of the flowering stage. The use of a non-ionic surfactant (Agral 90 or Agsurf) is NOT required as it is built into the formulation. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period. Before using Folicur for control of wheat leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.
		Folicur 432 F	292 mL/ha (118 mL/acre)	36	Ground and aerial application. Apply to leaf foliage at the first sign or very early stage of disease, especially if weather conditions are conducive to disease development, up to the end of the flowering stage. Use the higher rate when weather conditions are conducive to heavy disease development. Use non-ionic surfactant such as Agral 90 or Agsurf at 0.125% vol/vol. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period. Before using Folicur for wheat leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.
	trifloxystrobin + propiconazole	Stratego 250 EC	500 mL/ha (200 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Do not apply the second application within 14 days of the first. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Can be tank-mixed with Buctril M in wheat. Maximum 2 applications/yr. 12-hr re-entry period.
	trifloxystrobin + prothioconazole	Stratego Pro	440 mL/ha (178 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply Stratego Pro as a preventive disease control measure or at the very early stages of disease development. Do not apply after early heading (the head is half emerged). Stratego Pro may be tank-mixed with either Buctril M or Infinity herbicides only during the 2- to 4-leaf stage in the fall or from the time growth commences in the spring to the early flag leaf stage. Do not tank-mix Stratego Pro with graminicide herbicides.
	pyraclostrobin + fluxapyroxad	Priaxor	0.225–0.3 L/ha (90–120 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. For optimal disease control, begin applications prior to disease development at the onset of disease symptoms. Applications should be made prior to head emergence. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 12-hr re-entry period.

WHEAT DISEASES

Table 4–16. Chemical Control Options for Foliar, Stem and Head Diseases in Wheat — Leaf Rust, Stem Rust
See Appendix H. Cereal Growth Stages, on page 193.

LEGEND: PHI = Pre-Harvest Interval (in days)

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, re-entry periods, etc.)
RUST (LEAF — <i>Puccinia triticina</i> and STEM — <i>P. graminis</i> f. sp. <i>tritici</i>)					
Leaf rust blows in from the southern U.S. late in the season. Minimize stem rust by removing its alternate host, common barberry. Use tolerant or resistant varieties to reduce risk of disease. There are many different phenotypes (races), and wheat varieties vary in their resistance/tolerance. The development of new races could result in a once-resistant variety becoming susceptible over time. Consult with your seed company and the Ontario Cereal Crops Committee Variety Trial Results at www.gocereals.ca for variety profiles. Use foliar treatments when flag leaf has 5–10 pustules (1% leaf area).	azoxystrobin + propiconazole	Blanket AP	200–300 mL/ha (80–120 mL/acre)	Do not apply at boot stage and beyond.	For commercial and on-farm treating. Apply once between stem elongation and half-head emergence. Good spray coverage and canopy penetration are important for best results.
	tebuconazole	Folicur 250 EW	375–500 mL/ha (152–200 mL/acre)	36	Ground and aerial application. Apply to leaf foliage at the first sign or very early stage of disease, especially if weather conditions are conducive to disease development, up to the end of the flowering stage. Use the higher rate when weather conditions are conducive to heavy disease development. The use of a non-ionic surfactant (Agral 90 or Agsurf) is NOT required as it is built into the formulation. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period. Before using Folicur for wheat leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.
		Folicur 432 F	220–292 mL/ha (90–118 mL/acre)	36	Ground and aerial application. Apply to leaf foliage at very early stage of disease, especially if weather conditions are conducive to disease development, up to the end of the flowering stage. Use the higher rate when weather conditions are conducive to heavy disease development. Use non-ionic surfactant such as Agral 90 or Agsurf at 0.125% vol/vol. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period. Before using Folicur for wheat leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.
	prothioconazole + tebuconazole	Prosaro 250 EC	800 mL/ha (324 mL/acre)	36	Ground and aerial application. Use a minimum of 100 L/ha of water for ground application, 50 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.
	pyraclostrobin	Headline EC	300–600 mL/ha (121–240 mL/acre)	Do not apply at boot stage and beyond.	For leaf rust control only. Ground and aerial application. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 2 applications/yr. 12-hr re-entry period.
	azoxystrobin + propiconazole	Quilt	0.75–1.0 L/ha (305–406 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. When expecting high disease pressure from stripe rust and wheat leaf rust, use the higher application rate of 1 L/ha. Do not harvest for forage. Maximum 1 application/yr. 12-hr re-entry period.

WHEAT DISEASES

Table 4–16. Chemical Control Options for Foliar, Stem and Head Diseases in Wheat — Leaf Rust, Stem Rust
See Appendix H. Cereal Growth Stages, on page 193.

LEGEND: PHI = Pre-Harvest Interval (in days)

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, re-entry periods, etc.)
RUST (LEAF — <i>Puccinia triticina</i> and STEM — <i>P. graminis</i> f. sp. <i>tritici</i>) (cont'd)					
(cont'd)	pyraclostrobin + metconazole	Twinline	380–500 mL/ha (150–200 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Ensure thorough coverage of foliage. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 6-day re-entry period.
	picoxystrobin	Acapela	0.44–0.88 L/ha (180–350 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply prior to disease development and continue on a 7–14-day interval. Use high rate and shorter interval when disease pressure is high. Optimum protection of flag leaf is provided when applied at “flag leaf out” (Zadok’s 39). Do not apply after flowering (Zadok’s 59). Apply no more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 2.64 L/ha/season. 12-hr re-entry period.
	penthiopyrad	Vertisan	1.2–1.75 L/ha (0.48–0.7 L/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Begin applications prior to disease development and continue on a 7–14-day interval. Use higher rate and shorter interval when disease pressure is high. To optimize flag leaf protection, apply at “flag leaf out” (Zadok’s 39). Do not apply at boot stage (Zadok’s 47) and beyond. Do not apply more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 3.5 L/ha/yr. 12-hr re-entry period.
	propiconazole	Tilt 250 E	500 mL/ha (200 mL/acre)	45	Ground and aerial application. Apply at early signs of disease from the beginning of stem elongation (Zadok’s 29–37). If conditions favourable to disease continue, apply again, if necessary, before head is half emerged (Zadok’s 49–55). Can be tank-mixed with several cereal herbicides. Maximum 2 applications/yr.
		Bumper 418 EC	300 mL/ha (121 mL/acre)		
	prothioconazole	Proline 480 SC	315 mL/ha (128 mL/acre)	30	Ground and aerial application. Use as a preventive when earliest disease symptoms appear on the leaves and stems. Use with the registered non-ionic surfactant, Agral 90 or AgSurf at 0.125% vol/vol. Minimum 7-day interval between applications. Maximum 2 applications/yr. 24-hr re-entry period.
	trifloxystrobin + propiconazole	Stratego 250 EC	500 mL/ha (200 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Do not apply the second application within 14 days of the first. Apply only up to flag leaf fully emerged stage (Zadok’s 39). Do not apply at boot stage (Zadok’s 47) and beyond. Can be tank-mixed with Buctril M in wheat. Maximum 2 applications/yr. 12-hr re-entry period.
	mancozeb	Dithane DG Rainshield NT	early: 1.1 kg/ha (440 g/acre) late: 2.25 kg/ha (900 g/acre)	40	For leaf rust control only. Ground and aerial application. Use lower rate for applications at Zadok’s 12–21 growth stage, when crop is in 3rd leaf to tillering. Higher rate for applications at Zadok’s 59 growth stage when head is fully emerged but prior to flowering. Do not graze crop or cut for hay. Maximum 2 applications/yr.
	pyraclostrobin + fluxapyroxad	Priaxor	0.225–0.3 L/ha (90–120 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. For optimal disease control, begin applications prior to disease development at the onset of disease symptoms. Applications should be made prior to head emergence. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 12-hr re-entry period.

WHEAT DISEASES

Table 4–17. Chemical Control Options for Foliar, Stem and Head Diseases in Wheat — Tan Spot
See Appendix H. Cereal Growth Stages, on page 193.

LEGEND: PHI = Pre-Harvest Interval (in days)

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, re-entry periods, etc.)
TAN SPOT (<i>Pyrenophora tritici-repentis</i>)					
Foliar Treatment					
Reduced tillage and cool, cloudy, humid weather promote this disease. Tan spot survives in crop residues. Avoid planting wheat in conservation tillage fields in which wheat was grown during the preceding 2 yr.	azoxystrobin + propiconazole	Quilt	750 mL/ha (305 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Do not harvest for forage. Maximum 1 application/yr. 12-hr re-entry period.
		Blanket AP	200–300 mL/ha (80–120 mL/acre)	Do not apply at boot stage and beyond.	For commercial and on-farm treating. Apply once up to boot stage. Good spray coverage and canopy penetration are important for best results.
	pyraclostrobin	Headline EC	300–600 mL/ha (121–240 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 2 applications/yr. 12-hr re-entry period.
	picoxystrobin	Acapela	0.44–0.88 L/ha (180–350 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply prior to disease development and continue on a 7–14-day interval. Use high rate and shorter interval when disease pressure is high. Optimum protection of flag leaf is provided when applied at “flag leaf out” (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Apply no more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 2.64 L/ha/season. 12-hr re-entry period.
	propiconazole	Tilt 250 E	250–500 mL/ha (100–200 mL/acre)	45	Ground and aerial application. Early application at Zadok's 12–23. Use low rate for early-season disease suppression. Use higher rate for fields with high disease pressure history or field conditions favourable for disease development. Later application at first sign of disease (Zadok's 29–37) or before head is half emerged (Zadok's 49–55). Apply only the high rate on any application from Zadok's 29–55. Maximum 2 applications/yr.
		Bumper 418 EC	150–300 mL/ha (60–121 mL/acre)	45	Ground and aerial application. For early-season disease suppression, use the lower rate at Zadok's 12–23 (as early as the two-leaf stage). Use the high rate for fields with a history of disease pressure. For later-season application, apply at early signs of disease from the beginning of stem elongation (Zadok's 29–37). If conditions favourable to disease continue, apply again, if necessary, before head is half emerged (Zadok's 49–55). Apply only the high rate from Zadok's 29–55. Maximum 2 applications/yr.

WHEAT DISEASES

Table 4–17. Chemical Control Options for Foliar, Stem and Head Diseases in Wheat — Tan Spot
See Appendix H. Cereal Growth Stages, on page 193.

LEGEND: PHI = Pre-Harvest Interval (in days)

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, re-entry periods, etc.)
TAN SPOT (<i>Pyrenophora tritici-repentis</i>) (cont'd)					
(cont'd)	prothioconazole	Proline 480 SC	315 mL/ha (128 mL/acre)	30	Ground and aerial application. Use as a preventive when earliest disease symptoms appear on the leaves and stems. Use with the registered non-ionic surfactant, Agral 90 or AgSurf at 0.125% vol/vol. Minimum 7-day interval between applications. Maximum 2 applications/yr. 24-hr re-entry period.
	tebuconazole	Folicur 250 EW	375–500 mL/ha (152–200 mL/acre)	36	Ground and aerial application. Apply to leaf foliage at the first sign or very early stage of disease, especially if weather conditions are conducive to disease development, up to the end of the flowering stage. Use the higher rate when weather conditions are conducive to heavy disease development. The use of a non-ionic surfactant (Agral 90 or Agsurf) is NOT required as it is built into the formulation. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period. Before using Folicur for wheat leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.
		Folicur 432 F	220–292 mL/ha (90–118 mL/acre)	36	Ground and aerial application. Apply to leaf foliage at the first sign or very early stage of disease, especially if weather conditions are conducive to disease development, up to the end of the flowering stage. Use the higher rate when weather conditions are conducive to heavy disease development. Use non-ionic surfactant such as Agral 90 or Agsurf at 0.125% vol/vol. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period. Before using Folicur for wheat leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.
	trifloxystrobin + propiconazole	Stratego 250 EC	500 mL/ha (200 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Do not apply the second application within 14 days of the first. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Can be tank-mixed with Buctril M in wheat. Maximum 2 applications/yr. 12-hr re-entry period.

WHEAT DISEASES

Table 4–17. Chemical Control Options for Foliar, Stem and Head Diseases in Wheat — Tan Spot
See Appendix H. Cereal Growth Stages, on page 193.

LEGEND: PHI = Pre-Harvest Interval (in days)

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, re-entry periods, etc.)
TAN SPOT (<i>Pyrenophora tritici-repentis</i>) (cont'd)					
(cont'd)	mancozeb	Dithane DG Rainshield NT	early: 1.1 kg/ha (440 g/acre) late: 2.25 kg/ha (900 g/acre)	40	Ground and aerial application. Use lower rate for applications at Zadok's 12–21 growth stage, when crop is in 3rd leaf to tillering. Higher rate for applications at Zadok's 59 growth stage when head is fully emerged but prior to flowering. Do not graze crop or cut for hay. Maximum 2 applications/yr.
	prothioconazole + tebuconazole	Prosaro 250 EC	800 mL/ha (324 mL/acre)	36	Ground and aerial application. Use a minimum of 100 L/ha of water for ground application, 50 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.
	pyraclostrobin + metconazole	Twinline	380–500 mL/ha (150–200 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Ensure thorough coverage of foliage. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 6-day re-entry period.
	azoxystrobin + propiconazole	Quilt	0.5–1.0 L/ha (202–406 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply at first sign of disease starting at the 2-leaf stage and up to the flag leaf fully emerged stage. Do not apply at boot stage and beyond. Where a rate range is indicated, use the higher rate if there is a history of high disease pressure in the field or if field conditions favour disease development. 12-hr re-entry period. Maximum 2 applications/yr.
	pyraclostrobin + fluxapyroxad	Priaxor	0.225–0.3 L/ha (90–120 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. For optimal disease control, begin applications prior to disease development at the onset of disease symptoms. Applications should be made prior to head emergence. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 12-hr re-entry period.

WHEAT DISEASES

Table 4–18. Chemical Control Options for Foliar, Stem and Head Diseases in Wheat — Fusarium Head Blight
See Appendix H. Cereal Growth Stages, on page 193.

LEGEND: PHI = Pre-Harvest Interval (in days)

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, re-entry periods, etc.)
FUSARIUM HEAD BLIGHT (<i>Fusarium graminearum</i>)					
Warm and prolonged wet conditions during flowering are necessary for infection to occur. Avoid planting into corn stubble, since the fungus also causes gibberella stalk rot in corn. Follow soybeans with wheat in the rotation. See the <i>Fusarium</i> forecasting web page at www.weathercentral.ca/register.cfm to determine the fusarium head blight risk for your area and for current recommendations. Consult your local crop advisor for forecast information.	metconazole	Caramba	0.5–1 L/ha (200–400 mL/acre)	30	Ground and aerial application. For foliar diseases only. Apply to leaf foliage at the first sign or very early stage of disease up to the end of the flowering stage. Use the higher rate when weather conditions are conducive to heavy disease development. Use highest rate (1.0 L/ha (400 mL/acre)) at flowering when targeting FHB (suppression only) and leaf disease control. Use a minimum of 100 L/ha of water for ground application and 50 L/ha of water for aerial application. Maximum 1 application/yr. 5-day re-entry.
	prothioconazole + tebuconazole	Prosaro 250 EC	800 mL/ha (324 mL/acre)	36	Provides suppression only. Ground and aerial application. Timing of application is critical. Apply as a preventive spray within the time period from when at least 75% of the wheat head on the main stem is fully emerged (Zadok's 59) to when 50% of the heads on the main stem are in flower (Zadok's 65). Use a minimum of 100 L/ha of water for ground application, 50 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.
	prothioconazole	Proline 480 SC	315–420 mL/ha (128–170 mL/acre)	30	Provides suppression only. Ground and aerial application. Timing of application is critical. Apply from when at least 75% of the wheat heads on main stem are fully emerged (Zadok's 59) to when 50% of the heads on the main stem are in flower (Zadok's 65). Use with the registered non-ionic surfactant, Agral 90 or AgSurf at 0.125% vol/vol. Maximum 2 applications/yr (735 mL/ha) with a minimum 7-day interval between applications. 24-hr re-entry period.
	tebuconazole	Folicur 250 EW	500 mL/ha (200 mL/acre)	36	Provides suppression only. Ground and aerial application. Timing of application is critical. The optimum window for application is 1–4 days after 75% of the heads have emerged or cleared the head (Day 0). Apply at the very early stages of disease development. Use higher rate when disease pressure is severe. The use of a non-ionic surfactant (Agral 90 or Agsurf) is NOT required as it is built into the formulation. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.
		Folicur 432 F	292 mL/ha (118 mL/acre)	36	Provides suppression only. Ground and aerial application. Timing of application is critical. The optimum window for application is 1–4 days after 75% of the heads have emerged or cleared the head (Day 0). Ensure thorough coverage of all wheat heads. Use with the registered non-ionic surfactant, Agral 90 or AgSurf at 0.125% vol/vol. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.
	pyraclostrobin + metconazole	Twinline	500–700 mL/ha (200–280 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. For foliar diseases only, so apply to leaf foliage at the first sign or very early stage of disease up to the boot stage. Use the higher rate to obtain extended protection and maximum yield benefits. Use a minimum of 100 L/ha of water for ground application and 50 L/ha of water for aerial application. Maximum 2 applications/yr with a minimum spray interval of 10–14 days. 6-day re-entry period.

WHEAT DISEASES

Table 4–19. Chemical Control Options for Foliar, Stem and Head Diseases in Wheat — *Stagonospora* Glume Blotch
See Appendix H. Cereal Growth Stages, on page 193.

LEGEND: PHI = Pre-Harvest Interval (in days)

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, re-entry periods, etc.)
STAGONOSPORA GLUME BLOTCH (<i>Stagonospora nodorum</i>)					
Foliar Treatment					
Prolonged wet periods in May and early June result in increased disease incidence. Rotate with crops other than cereals, plow down cereal residues and remove volunteer wheat to reduce survivability of the fungi.	prothioconazole + tebuconazole	Prosaro 250 EC	800 mL/ha (324 mL/acre)	36	Ground and aerial application. Use a minimum of 100 L/ha of water for ground application, 50 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.
	prothioconazole	Proline 480 SC	315–420 mL/ha (128–170 mL/acre)	30	Ground and aerial application. Timing of application is critical. Apply from when at least 75% of the wheat heads on the main stem are fully emerged (Zadok's 59) to when 50% of the heads on the main stem are in flower (Zadok's 65). Use higher rate when expecting high disease pressure. Use with the registered non-ionic surfactant, Agral 90 or AgSurf at 0.125% vol/vol. Maximum 2 applications/yr (735 mL/ha) with a minimum 7-day interval between applications. 24-hr re-entry period.
	tebuconazole	Folicur 250 EW	500 mL/ha (200 mL/acre)	36	Ground and aerial application. Apply from when at least 75% of the wheat heads on the main stem are fully emerged (Zadok's 59) to when 50% of the heads on the main stem are in flower (Zadok's 65). The use of a non-ionic surfactant (Agral 90 or Agsurf) is NOT required as it is built into the formulation. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period. Before using Folicur for wheat leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.
		Folicur 432 F	292 mL/ha (118 mL/acre)	36	Ground and aerial application. Apply from when at least 75% of the wheat heads on the main stem are fully emerged (Zadok's 59) to when 50% of the heads on the main stem are in flower (Zadok's 65). Use non-ionic surfactant such as Agral 90 or Agsurf at 0.125% vol/vol. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period. Before using Folicur for wheat leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.
	chlorothalonil	Bravo 500	1.5–2.5 mL/ha (0.6–1.0 L/acre)	30	Ground and aerial application. Apply at Zadok's growth stage 37 (flag leaf emergence) and repeat 10–14 days later at growth stage 51–55 (visible ear). A 3rd application at growth stage 59–69 (ear fully emerged) may be necessary if conditions favour disease spread. Maximum 3 applications/yr.
	propiconazole	Tilt 250 E	500 mL/ha (200 mL/acre)	45	Ground and aerial application. Apply at early signs of disease from the beginning of stem elongation (Zadok's 29–37). If conditions favourable to disease continue, apply again, if necessary, before head is half emerged (Zadok's 49–55). Can be tank-mixed with several cereal herbicides. Maximum 2 applications/yr.
Bumper 418 EC		300 mL/ha (121 mL/acre)			

WHEAT DISEASES

Table 4–20. Chemical Control Options for Foliar, Stem and Head Diseases in Wheat — Stripe Rust
See Appendix H. Cereal Growth Stages, on page 193.

LEGEND: PHI = Pre-Harvest Interval (in days)					
Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, re-entry periods, etc.)
STRIPE RUST (<i>Puccinia striiformis</i>)					
Foliar Treatment					
<p>Stripe rust can be confused with cephalosporium stripe since both will produce a yellow striping (interveinal) that can extend the entire length of the leaf. If rust is the cause, orange-yellow pustules (blisters) can be found, whereas no blistering is found in cephalosporium stripe. This disease is most noticeable in seasons with a prolonged cool spring (3°C–15°C). Symptoms often disappear as temperatures increase.</p>	azoxystrobin + propiconazole	Blanket AP	200–300 mL/ha (80–120 mL/acre)	Do not apply at boot stage and beyond.	For commercial and on-farm treating. Apply once between stem elongation and half-head emergence. Good spray coverage and canopy penetration are important for best results.
	pyraclostrobin	Headline EC	400–600 mL/ha (160–240 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 2 applications/yr. 12-hr re-entry period.
	pyraclostrobin + metconazole	Twinline	380–500 mL/ha (150–200 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Ensure thorough coverage of foliage. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 6-day re-entry period. No later than end of flowering.
	azoxystrobin + propiconazole	Quilt	0.75–1.0 L/ha (305–406 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Use higher application rate of 1 L/ha when expecting high disease pressure from stripe rust and wheat leaf rust. Maximum 1 application/yr. Do not harvest for forage. 12-hr re-entry period.
	propiconazole	Tilt 250 E	500 mL/ha (200 mL/acre)	45	Ground and aerial application. Apply at early signs of disease from the beginning of stem elongation (Zadok's 29–37). If conditions favourable to disease continue, apply again, if necessary, before head is half emerged (Zadok's 49–55). Can be tank-mixed with several cereal herbicides. Maximum 2 applications/yr.
		Bumper 418 EC	300 mL/ha (121 mL/acre)		
	picoxystrobin	Acapela	0.44–0.88 L/ha (178–356 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply prior to disease development and continue on a 7–14-day interval. Use high rate and shorter interval when disease pressure is high. Optimum protection of flag leaf is provided when applied at “flag leaf out” (Zadok's 39). Do not apply after flowering (Zadok's 59). Apply no more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 2.64 L/ha/season. 12-hr re-entry period.

WHEAT DISEASES

Table 4–20. Chemical Control Options for Foliar, Stem and Head Diseases in Wheat — Stripe Rust
See Appendix H. Cereal Growth Stages, on page 193.

LEGEND: PHI = Pre-Harvest Interval (in days)

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, re-entry periods, etc.)
STRIPE RUST (<i>Puccinia striiformis</i>) (cont'd)					
(cont'd)	tebuconazole	Folicur 250 EW	375–500 mL/ha (152–200 mL/acre)	36	Ground and aerial application. Apply to leaf foliage at the first sign or very early stage of disease, especially if weather conditions are conducive to disease development, up to the end of the flowering stage. Use the higher rate when weather conditions are conducive to heavy disease development. The use of a non-ionic surfactant (Agral 90 or Agsurf) is NOT required as it is built into the formulation. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period. Before using Folicur for wheat leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.
		Folicur 432 F	220–292 mL/ha (90–118 mL/acre)	36	Ground and aerial application. Apply to leaf foliage at the first sign or very early stage of disease, especially if weather conditions are conducive to disease development, up to the end of the flowering stage. Use the higher rate when weather conditions are conducive to heavy disease development. Use non-ionic surfactant such as Agral 90 or Agsurf at 0.125% vol/vol. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period. Before using Folicur for wheat leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.
	trifloxystrobin + propiconazole	Stratego 250 EC	500 mL/ha (200 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Do not apply the second application within 14 days of the first. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Can be tank-mixed with Buctril M in wheat. Maximum 2 applications/yr. 12-hr re-entry period.
	prothioconazole + tebuconazole	Prosaro 250 EC	800 mL/ha (324 mL/acre)	36	Ground and aerial application. Use a minimum of 100 L/ha of water for ground application, 50 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.
	pyraclostrobin + fluxapyroxad	Priaxor	0.225–0.3 L/ha (90–120 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. For optimal disease control, begin applications prior to disease development at the onset of disease symptoms. Applications should be made prior to head emergence. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 12-hr re-entry period.

BARLEY DISEASES

Table 4–21. Chemical Control Options for Seed and Seedling Diseases in Barley — Seed Rot and Seedling Blight

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, re-entry periods, etc.)
SEED ROT and SEEDLING BLIGHT				
Seed Treatment				
Ensure good coverage of seed treatment on the seeds. Rotation with non-host crops for at least 2 yr will reduce risk of disease. Avoid deep seeding.	tebuconazole + thiram	Raxil T	225 mL/100 kg seed	For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	tebuconazole + metalaxyl	Raxil MD	300 mL/100 kg seed	For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provides good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	carbathiin + thiram	Vitaflo 280	230–330 mL/100 kg seed	For use in commercial seed treatment facilities only. Do not graze or feed livestock on treated areas for 6 weeks after planting.
	triticonazole + thiram	Gemini	360 mL/100 kg seed	For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder.
	ipconazole	Rancona Apex	325 mL/100 kg seed	For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 30 days after planting.
	penflufen + prothioconazole + metalaxyl	EverGol Energy	65 mL/100 kg seed	For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.
	tebuconazole + prothioconazole + metalaxyl	Raxil Pro MD	325 mL/100 kg seed	Use only in treating equipment that can accurately control application rates and provide good distribution of the chemical onto the seed in the mixing chamber. Uniform application to seed is necessary to ensure best disease protection and seed safety. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	difenoconazole + metalaxyl-M + sedaxane	Vibrance XL	180–360 mL/100 kg seed	For use in commercial seed treatment facilities only. For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.

BARLEY DISEASES

Table 4–22. Chemical Control Options for Seed and Seedling Diseases in Barley — Rhizoctonia, Common Seedling Blight

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, re-entry periods, etc.)
RHIZOCTONIA (<i>Rhizoctonia solani</i>)				
Seed Treatment				
Sow into a well-prepared seedbed under good growing conditions. Avoid cool, wet conditions that will reduce emergence and increase seed rots and blights. Treat seed with a fungicide seed treatment and ensure good coverage of seed treatment on seeds.	difenoconazole + metalaxyl-M + sedaxane	Vibrance XL	180–360 mL/ 100 kg seed	For use in commercial seed treatment facilities only. For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.
	penflufen + prothioconazole + metalaxyl	EverGol Energy	65 mL/ 100 kg seed	For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but refer to the label of the tank-mix partner for application rates, precautions and directions.
COMMON SEEDLING BLIGHT (<i>Cochliobolus sativus</i>)				
Seed Treatment				
Avoid frequent or continuous barley crops in a rotation. Avoid deep seeding. Turn under crop stubble to help reduce infection levels. Plant resistant varieties. Consult with your seed company for variety profiles.	tebuconazole + thiram	Raxil T	225 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	tebuconazole + metalaxyl	Raxil MD	300 mL/ 100 kg seed	Provides suppression only. For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provides good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	ipconazole	Rancona Apex	325 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 30 days after planting.
	penflufen + prothioconazole + metalaxyl	EverGol Energy	65 mL/ 100 kg seed	For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.
	tebuconazole + prothioconazole + metalaxyl	Raxil Pro MD	325 mL/ 100 kg seed	Use only in treating equipment that can accurately control application rates and provide good distribution of the chemical onto the seed in the mixing chamber. Uniform application to seed is necessary to ensure best disease protection and seed safety. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	difenoconazole + metalaxyl-M + sedaxane	Vibrance XL	180–360 mL/ 100 kg seed	For use in commercial seed treatment facilities only. For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.

BARLEY DISEASES

Table 4–23. Chemical Control Options for Seed and Seedling Diseases in Barley — Covered Smut (Common Bunt)

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, re-entry periods, etc.)
COVERED SMUT (COMMON BUNT) (<i>Ustilago hordei</i>)				
Seed Treatment				
This disease is spread from year to year primarily through infected seed. Wind-blown spores will infect florets within season. Use pedigreed seed that is treated with a fungicide seed treatment.	tebuconazole + thiram	Raxil T	225 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	tebuconazole + metalaxyl	Raxil MD	300 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provides good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	carbathiin + thiram	Vitaflo 280	230–330 mL/ 100 kg seed	For use in commercial seed treatment facilities only. Do not graze or feed livestock on treated areas for 6 weeks after planting.
	triticonazole + thiram	Gemini	360 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder.
	ipconazole	Rancona Apex	325 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 30 days after planting.
	penflufen + prothioconazole + metalaxyl	EverGol Energy	65 mL/ 100 kg seed	For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.
	tebuconazole + prothioconazole + metalaxyl	Raxil Pro MD	325 mL/ 100 kg seed	Use only in treating equipment that can accurately control application rates and provide good distribution of the chemical onto the seed in the mixing chamber. Uniform application to seed is necessary to ensure best disease protection and seed safety. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	difenoconazole + metalaxyl-M + sedaxane	Vibrance XL	180–360 mL/ 100 kg seed	For use in commercial seed treatment facilities only. For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.

BARLEY DISEASES

Table 4–24. Chemical Control Options for Seed and Seedling Diseases in Barley — True Loose Smut

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, re-entry periods, etc.)
TRUE LOOSE SMUT (<i>Ustilago nuda</i>)				
Seed Treatment				
<p>Infection occurs during flowering. Conditions that promote the disease are wet, cloudy weather and moderate temperatures 16°C–22°C. Sow pedigreed seed to ensure that seed is not infected. Moist weather at flowering promotes this disease. Disease incidence has been increasing in Ontario where no seed treatment has been used. Seed treatments are beneficial in reducing loose smut infection.</p>	tebuconazole + thiram	Raxil T	225 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treatment. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	tebuconazole + metalaxyl	Raxil MD	300 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provide good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	carbathiin + thiram	Vitaflo 280	230–330 mL/ 100 kg seed	For use in commercial seed treatment facilities only. Do not graze or feed livestock on treated areas for 6 weeks after planting.
	triticonazole + thiram	Gemini	360 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder.
	ipconazole	Rancona Apex	325–433 mL/ 100 kg seed	For commercial and on-farm treating. Use higher rate for highly infected seed lots only. Do not graze or feed livestock on treated areas for 30 days after planting.
	penflufen + prothioconazole + metalaxyl	EverGol Energy	65 mL/ 100 kg seed	For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.
	tebuconazole + prothioconazole + metalaxyl	Raxil Pro MD	325 mL/ 100 kg seed	Use only in treating equipment that can accurately control application rates and provide good distribution of the chemical onto the seed in the mixing chamber. Uniform application to seed is necessary to ensure best disease protection and seed safety. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	difenoconazole + metalaxyl-M + sedaxane	Vibrance XL	180–360 mL/ 100 kg seed	For use in commercial seed treatment facilities only. For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.

BARLEY DISEASES

Table 4–25. Chemical Control Options for Seed and Seedling Diseases in Barley — Pythium

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, re-entry periods, etc.)
PYTHIUM (<i>Pythium</i> spp.)				
Seed Treatment				
This disease can occur on all soil types, but losses are greatest in cold, wet clay soils. Minimize soil compaction and remove excess moisture through improved drainage. Seed treatments containing metalaxyl and metalaxyl-M can reduce infection. Delay planting until conditions will result in a rapid and uniform emergence.	tebuconazole + thiram	Raxil T	225 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treatment. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	tebuconazole + metalaxyl	Raxil MD	300 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provides good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	carbathiin + thiram	Vitaflo 280	230–330 mL/ 100 kg seed	For use in commercial seed treatment facilities only. Do not graze or feed livestock on treated areas for 6 weeks after planting.
	triticonazole + thiram	Gemini	360 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder.
	ipconazole	Rancona Apex	325–433 mL/ 100 kg seed	For commercial and on-farm treating. Use higher rate for highly infected seed lots only. Do not graze or feed livestock on treated areas for 30 days after planting.
	penflufen + prothioconazole + metalaxyl	EverGol Energy	65 mL/ 100 kg seed	For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.
	tebuconazole + prothioconazole + metalaxyl	Raxil Pro MD	325 mL/ 100 kg seed	Use only in treating equipment that can accurately control application rates and provide good distribution of the chemical onto the seed in the mixing chamber. Uniform application to seed is necessary to ensure best disease protection and seed safety. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	difenoconazole + metalaxyl-M + sedaxane	Vibrance XL	180–360 mL/ 100 kg seed	For use in commercial seed treatment facilities only. For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.

BARLEY DISEASES

Table 4–26. Chemical Control Options for Seed and Seedling Diseases in Barley — False Loose Smut

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, re-entry periods, etc.)
FALSE LOOSE SMUT (<i>Ustilago nuda</i>)				
Seed Treatment				
Infection occurs during flowering. Conditions that promote the disease are wet, cloudy weather and moderate temperatures 16°C–22°C. Sow pedigreed seed to ensure that seed is not infected. Moist weather at flowering promotes this disease. Disease incidence has been increasing in Ontario where no seed treatment has been used. Seed treatments are beneficial in reducing loose smut infection.	tebuconazole + thiram	Raxil T	225 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treatment. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	tebuconazole + metalaxyl	Raxil MD	300 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provides good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	carbathiin + thiram	Vitaflo 280	230–330 mL/ 100 kg seed	For use in commercial seed treatment facilities only. Do not graze or feed livestock on treated areas for 6 weeks after planting.
	triticonazole + thiram	Gemini	360 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder.
	ipconazole	Rancona Apex	325–433 mL/ 100 kg seed	For commercial and on-farm treating. Use higher rate for highly infected seed lots only. Do not graze or feed livestock on treated areas for 30 days after planting.
	penflufen + prothioconazole + metalaxyl	EverGol Energy	65 mL/ 100 kg seed	For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.
	tebuconazole + prothioconazole + metalaxyl	Raxil Pro MD	325 mL/ 100 kg seed	Use only in treating equipment that can accurately control application rates and provide good distribution of the chemical onto the seed in the mixing chamber. Uniform application to seed is necessary to ensure best disease protection and seed safety. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	difenoconazole + metalaxyl-M + sedaxane	Vibrance XL	180–360 mL/ 100 kg seed	For use in commercial seed treatment facilities only. For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.

BARLEY DISEASES

Table 4–27. Chemical Control Options for Seed and Seedling Diseases in Barley — Fusarium

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, re-entry periods, etc.)
FUSARIUM spp. (seed and soil borne, damping off and seedling blight)				
Seed Treatment				
Ensure good coverage of seed treatment on seeds. Rotation with non-host crops for at least 2 yr will reduce risk. Use disease-free seed and avoid deep seeding.	tebuconazole + thiram	Raxil T	225 mL/100 kg seed	For both commercial seed treatment plants and on-farm treatment. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	tebuconazole + metalaxyl	Raxil MD	300 mL/100 kg seed	For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provides good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	carbathiin + thiram	Vitaflo 280	230–330 mL/100 kg seed	For use in commercial seed treatment facilities only. Do not graze or feed livestock on treated areas for 6 weeks after planting.
	triticonazole + thiram	Gemini	360 mL/100 kg seed	For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder.
	ipconazole	Rancona Apex	325–433 mL/100 kg seed	For commercial and on-farm treating. Use higher rate for highly infected seed lots only. Do not graze or feed livestock on treated areas for 30 days after planting.
	penflufen + prothioconazole + metalaxyl	EverGol Energy	65 mL/100 kg seed	For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.
	tebuconazole + prothioconazole + metalaxyl	Raxil Pro MD	325 mL/100 kg seed	Use only in treating equipment that can accurately control application rates and provide good distribution of the chemical onto the seed in the mixing chamber. Uniform application to seed is necessary to ensure best disease protection and seed safety. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	difenoconazole + metalaxyl-M + sedaxane	Vibrance XL	180–360 mL/100 kg seed	For use in commercial seed treatment facilities only. For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.

BARLEY DISEASES

Table 4–28. Chemical Control Options for Seed and Seedling Diseases in Barley — Aspergillus

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, re-entry periods, etc.)
ASPERGILLUS				
Seed Treatment				
Sow into a well-prepared seed bed under good growing conditions. Avoid cool, wet conditions that will reduce emergence and increase seed rots and blights. Treat seed with a fungicide seed treatment and ensure good coverage of seed treatment on seeds.	tebuconazole + thiram	Raxil T	225 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treatment. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	tebuconazole + metalaxyl	Raxil MD	300 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provides good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	carbathiin + thiram	Vitaflo 280	230–330 mL/ 100 kg seed	For use in commercial seed treatment facilities only. Do not graze or feed livestock on treated areas for 6 weeks after planting.
	triticonazole + thiram	Gemini	360 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder.
	ipconazole	Rancona Apex	325–433 mL/ 100 kg seed	For commercial and on-farm treating. Use higher rate for highly infected seed lots only. Do not graze or feed livestock on treated areas for 30 days after planting.
	penflufen + prothioconazole + metalaxyl	EverGol Energy	65 mL/ 100 kg seed	For commercial seed treating only. May be tank-mixed, but see the registered label of the tank-mix partner for application rates, precautions and directions.
	tebuconazole + prothioconazole + metalaxyl	Raxil Pro MD	325 mL/ 100 kg seed	Use only in treating equipment that can accurately control application rates and provide good distribution of the chemical onto the seed in the mixing chamber. Uniform application to seed is necessary to ensure best disease protection and seed safety. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	difenoconazole + metalaxyl-M + sedaxane	Vibrance XL	180–360 mL/ 100 kg seed	For use in commercial seed treatment facilities only. For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.

BARLEY DISEASES

Table 4–29. Chemical Control Options for Seed and Seedling Diseases in Barley — Barley Leaf Stripe

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, re-entry periods, etc.)
BARLEY LEAF STRIPE				
Seed Treatment				
The disease is seed-borne and causes long brown stripes on the leaves, usually around heading. Use good-quality seed and a fungicide seed treatment.	tebuconazole + thiram	Raxil T	225 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treatment. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	tebuconazole + metalaxyl	Raxil MD	300 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provides good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	carbathiin + thiram	Vitaflo 280	230–330 mL/ 100 kg seed	For use in commercial seed treatment facilities only. Do not graze or feed livestock on treated areas for 6 weeks after planting.
	triticonazole + thiram	Gemini	360 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder.
	ipconazole	Rancona Apex	325–433 mL/ 100 kg seed	For commercial and on-farm treating. Use higher rate for highly infected seed lots only. Do not graze or feed livestock on treated areas for 30 days after planting.
	penflufen + prothioconazole + metalaxyl	EverGol Energy	65 mL/ 100 kg seed	For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.
	tebuconazole + prothioconazole + metalaxyl	Raxil Pro MD	325 mL/ 100 kg seed	Use only in treating equipment that can accurately control application rates and provide good distribution of the chemical onto the seed in the mixing chamber. Uniform application to seed is necessary to ensure best disease protection and seed safety. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	difenoconazole + metalaxyl-M + sedaxane	Vibrance XL	180–360 mL/ 100 kg seed	For use in commercial seed treatment facilities only. For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.

BARLEY DISEASES

Table 4–30. Chemical Control Options for Foliar, Stem and Head Diseases in Barley — Net Blotch

LEGEND: PHI = Pre-Harvest Interval (in days)

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, re-entry periods, etc.)
NET BLOTCH (<i>Pyrenophora teres</i>)					
Foliar Treatment					
Avoid growing barley after barley, wheat or grasses in a rotation. Plow down stubble and straw, and plant early to avoid serious disease in July.	pyraclostrobin	Headline EC	300–600 mL/ha (121–240 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 2 applications/yr. 12-hr re-entry period.
	azoxystrobin + propiconazole	Quilt	750 mL/ha (305 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 1 application/yr. Do not harvest for forage. 12-hr re-entry period.
	prothioconazole	Proline 480 SC	210–315 mL/ha (85–128 mL/acre)	30	Ground and aerial application. Use as a preventive treatment when earliest disease symptoms appear on the leaves and stems. Use with the registered non-ionic surfactant, Agral 90 or AgSurf at 0.125% vol/vol. Maximum 2 applications/yr with a minimum 7-day interval between applications. 24-hr re-entry period.
	pyraclostrobin + metconazole	Twinline	380–500 mL/ha (150–200 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Ensure thorough coverage of foliage. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 6-day re-entry period.
	prothioconazole + tebuconazole	Prosaro 250 EC	800 mL/ha (324 mL/acre)	36	Ground and aerial application. Use a minimum of 100 L/ha of water for ground application, 50 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.
	azoxystrobin + propiconazole	Blanket AP	200–300 mL/ha (80–120 mL/acre)	Do not apply at boot stage and beyond.	For commercial and on-farm treating. Apply once up to boot stage. Good spray coverage and canopy penetration are important for best results.
	trifloxystrobin + propiconazole	Stratego 250 EC	500 mL/ha (200 mL/acre)	Do not apply at boot stage and beyond.	For use in spring barley only. Ground and aerial application. Do not apply the second application within 14 days of the first. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 2 applications/yr. 12-hr re-entry period.

BARLEY DISEASES

Table 4-30. Chemical Control Options for Foliar, Stem and Head Diseases in Barley — Net Blotch

LEGEND: PHI = Pre-Harvest Interval (in days)

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, re-entry periods, etc.)
NET BLOTCH (<i>Pyrenophora teres</i>) (cont'd)					
(cont'd)	metconazole	Caramba	500–700 mL/ha (200–280 mL/acre)	30	Ground and aerial application. Apply to leaf foliage at the first sign or very early stage of disease up to the end of the flowering stage. Use the higher leaf disease rate when weather conditions are conducive to heavy disease development. Use a minimum of 100 L/ha of water for ground application and 50 L/ha of water for aerial application. Maximum 1 application/yr. 5-day re-entry.
	tebuconazole	Folicur 250 EW	375–500 mL/ha (152–200 mL/acre)	36	Ground and aerial application. Apply at the very early stages of disease development. Use higher rate when disease pressure is severe. The use of a non-ionic surfactant (Agral 90 or Agsurf) is NOT required as it is built into the formulation. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period. Before using Folicur for control of leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.
		Folicur 432 F	220–292 mL/ha (90–118 mL/acre)	36	Ground and aerial application. Apply at the very early stages of disease development. Use higher rate when disease pressure is severe. Use non-ionic surfactant such as Agral 90 or Agsurf at 0.125% vol/vol. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period. Before using Folicur for control of leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.
	propiconazole	Tilt 250 E	250–500 mL/ha (100–200 mL/acre)	45	Ground and aerial application. Early application at Zadok's 12–23. For early-season disease suppression, use low rate. Use higher rate for fields with high disease pressure history or field conditions favourable for disease development. Use for later application at first sign of disease (Zadok's 29–37) or before head is half emerged (Zadok's 49–55). Apply only the high rate on any application from Zadok's 29–55. Maximum 2 applications/yr.
Bumper 418 EC		150–300 mL/ha (60–121 mL/acre)	45	For use in spring barley only. Ground and aerial application. For early-season disease suppression, use the lower rate at Zadok's 12–23 (as early as the two-leaf stage). Use the high rate on fields with a history of disease pressure. For later-season application, apply at early signs of disease from the beginning of stem elongation (Zadok's 29–37). If conditions favourable to disease continue, apply again, if necessary, before head is half emerged (Zadok's 49–55). Apply only the high rate from Zadok's 29–55. Maximum 2 applications/yr.	

BARLEY DISEASES

Table 4–30. Chemical Control Options for Foliar, Stem and Head Diseases in Barley — Net Blotch

LEGEND: PHI = Pre-Harvest Interval (in days)

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, re-entry periods, etc.)
NET BLOTCH (<i>Pyrenophora teres</i>) (cont'd)					
(cont'd)	azoxystrobin + propiconazole	Quilt	0.5–1.0 L/ha (202–406 mL/acre)	30	Ground and aerial application. Apply at first sign of disease starting at the 2-leaf stage and up to flag leaf fully emerged stage. Do not apply at boot stage and beyond. Where a rate range is indicated, use the higher rate if there is a history of high disease pressure in the field or field conditions favour disease development. 12-hr re-entry period. Maximum 2 applications/yr.
	picoxystrobin	Acapela	0.44–0.88 L/ha (178–356 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply prior to disease development and continue on a 7–14-day interval. Use high rate and shorter interval when disease pressure is high. Optimum protection of flag leaf is provided when applied at “flag leaf out” (Zadok’s 39). Do not apply at boot stage (Zadok’s 47) and beyond. Apply no more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 2.64 L/ha/season. 12-hr re-entry period.
	pyraclostrobin + fluxapyroxad	Priaxor	0.225–0.3 L/ha (90–120 mL/acre)	21	Ground and aerial application. For optimal disease control, begin applications prior to disease development at the onset of disease symptoms. Applications should be made prior to head emergence. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 12-hr re-entry period.

BARLEY DISEASES

Table 4–31. Chemical Control Options for Foliar, Stem and Head Diseases in Barley — Spot Blotch

LEGEND: PHI = Pre-Harvest Interval (in days)

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, re-entry periods, etc.)
SPOT BLOTCH (<i>Cochliobolus sativus</i>)					
Foliar Treatment					
Avoid growing barley after barley, wheat or grasses in a rotation. Plow down stubble and straw and plant early to avoid serious disease in July.	pyraclostrobin	Headline EC	400–600 mL/ha (160–240 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 2 applications/yr. 12-hr re-entry period.
	prothioconazole	Proline 480 SC	210–315 mL/ha (85–128 mL/acre)	30	Ground and aerial application. Use as a preventive treatment when earliest disease symptoms appear on the leaves and stems. Use with the registered non-ionic surfactant, Agral 90 or AgSurf at 0.125% vol/vol. Maximum 2 applications/yr with a minimum 7-day interval between applications. 24-hr re-entry period.
	prothioconazole + tebuconazole	Prosaro 250 EC	800 mL/ha (324 mL/acre)	36	Ground and aerial application. Use a minimum of 100 L/ha of water for ground application, 50 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.
	pyraclostrobin + metconazole	Twinline	380–500 mL/ha (150–200 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Ensure thorough coverage of foliage. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 6 day re-entry period.
	tebuconazole	Folicur 250 EW	375–500 mL/ha (152–200 mL/acre)	36	Ground and aerial application. Apply at the very early stages of disease development. Use higher rate when disease pressure is severe. The use of a non-ionic surfactant (Agral 90 or Agsurf) is NOT required as it is built into the formulation. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period. Before using Folicur for control of leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.
		Folicur 432 F	220–292 mL/ha (90–118 mL/acre)	36	Ground and aerial application. Apply at the very early stages of disease development. Use higher rate when disease pressure is severe. Use non-ionic surfactant such as Agral 90 or Agsurf at 0.125% vol/vol. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period. Before using Folicur for control of leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.

BARLEY DISEASES

Table 4–31. Chemical Control Options for Foliar, Stem and Head Diseases in Barley — Spot Blotch

LEGEND: PHI = Pre-Harvest Interval (in days)

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, re-entry periods, etc.)
SPOT BLOTCH (<i>Cochliobolus sativus</i>) (cont'd)					
(cont'd)	propiconazole	Tilt 250 E	500 mL/ha (200 mL/acre)	45	For use in spring barley only. Ground and aerial application. Apply at early signs of disease from the beginning of stem elongation (Zadok's 29–37). If conditions favourable to disease continue, apply again, if necessary, before head is half emerged (Zadok's 49–55). Maximum 2 applications/yr.
		Bumper 418 EC	300 mL/ha (121 mL/acre)		
	trifloxystrobin + propiconazole	Stratego 250 EC	500 mL/ha (200 mL/acre)	Do not apply at boot stage and beyond.	For use in spring barley only. Ground and aerial application. Do not apply the second application within 14 days of the first. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 2 applications/yr. 12-hr re-entry period.
	pyraclostrobin + metconazole	Twinline	500–700 mL/ha (200–280 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply to leaf foliage at the first sign or very early stage of disease up to the boot stage. Use the higher rate to obtain extended protection and maximum yield benefits. Use a minimum of 100 L/ha of water for ground application and 50 L/ha of water for aerial application. Maximum 2 applications/yr with a minimum spray interval of 10–14 days. 6-day re-entry.
	pyraclostrobin + fluxapyroxad	Priaxor	0.225–0.3 L/ha (90–120 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. For optimal disease control, begin applications prior to disease development at the onset of disease symptoms. Applications should be made prior to head emergence. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 12-hr re-entry period.

BARLEY DISEASES

Table 4–32. Chemical Control Options for Foliar, Stem and Head Diseases in Barley — Scald

LEGEND: PHI = Pre-Harvest Interval (in days)

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, re-entry periods, etc.)
SCALD (<i>Rhynchosporium secalis</i>)					
Foliar Treatment					
Avoid growing barley after barley, wheat or grasses in a rotation. Plow down stubble and straw and plant early to avoid serious disease in July.	azoxystrobin + propiconazole	Blanket AP	200–300 mL/ha (80–120 mL/acre)	Do not apply at boot stage and beyond.	For commercial and on-farm treating. Apply once up to boot stage. Good spray coverage and canopy penetration are important for best results.
	pyraclostrobin	Headline EC	400–600 mL/ha (160–240 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 2 applications/yr. 12-hr re-entry period.
	azoxystrobin + propiconazole	Quilt	750 mL/ha (305 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Do not apply at boot stage and beyond. Maximum 1 application/yr. Do not harvest for forage. 12-hr re-entry period.
	prothioconazole + tebuconazole	Prosaro 250 EC	800 mL/ha (324 mL/acre)	36	Ground and aerial application. Use a minimum of 100 L/ha of water for ground application, 50 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.
	tebuconazole	Folicur 250 EW	375–500 mL/ha (152–200 mL/acre)	36	Ground and aerial application. Apply at the very early stages of disease development. Use higher rate when disease pressure is severe. The use of a non-ionic surfactant (Agral 90 or Agsurf) is NOT required as it is built into the formulation. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period. Before using Folicur for control of leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.
Folicur 432 F		220–292 mL/ha (90–118 mL/acre)	36	Ground and aerial application. Apply at the very early stages of disease development. Use higher rate when disease pressure is severe. Use non-ionic surfactant such as Agral 90 or Agsurf at 0.125% vol/vol. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period. Before using Folicur for control of leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.	

BARLEY DISEASES

Table 4–32. Chemical Control Options for Foliar, Stem and Head Diseases in Barley — Scald

LEGEND: PHI = Pre-Harvest Interval (in days)

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, re-entry periods, etc.)
SCALD (<i>Rhynchosporium secalis</i>) (cont'd)					
(cont'd)	propiconazole	Tilt 250 E	500 mL/ha (200 mL/acre)	45	Ground and aerial application. Apply at early signs of disease from tillering to head half-emerged. Can be tank-mixed with several cereal herbicides.
		Bumper 418 EC	300 mL/ha (121 mL/acre)	45	For use in spring barley only. Ground and aerial application. Apply at early signs of disease from the beginning of stem elongation (Zadok's 29–37). If conditions favourable to disease continue, apply again, if necessary, before head is half emerged (Zadok's 49–55). Maximum 2 applications/yr.
	prothioconazole	Proline 480 SC	210–315 mL/ha (85–128 mL/acre)	30	Ground and aerial application only. Use as a preventive when earliest disease symptoms appear on the leaves and stems. Use with the registered non-ionic surfactant, Agral 90 or AgSurf at 0.125% vol/vol. Maximum 2 applications/yr with a minimum 7-day interval between applications. 24-hr re-entry period.
	trifloxystrobin + propiconazole	Stratego 250 EC	500 mL/ha (200 mL/acre)	Do not apply at boot stage and beyond.	For use in spring barley only. Ground and aerial application. Do not apply the second application within 14 days of the first. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 2 applications/yr. 12-hr re-entry period.
	metconazole	Caramba	500–700 mL/ha (200–280 mL/acre)	30	Ground and aerial application. Apply to leaf foliage at the first sign or very early stage of disease up to the end of the flowering stage. Use the higher rate when weather conditions are conducive to heavy disease development. Use a minimum of 100 L/ha of water for ground application and 50 L/ha of water for aerial application. Maximum 1 application/yr. 5-day re-entry.
	pyraclostrobin + metconazole	Twinline	380–500 mL/ha (150–200 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Ensure thorough coverage of foliage. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 6-day re-entry period.
	picoxystrobin	Acapela	0.44–0.88 L/ha (178–356 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply prior to disease development and continue on a 7–14-day interval. Use high rate and shorter interval when disease pressure is high. Optimum protection of flag leaf is provided when applied at “flag leaf out” (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Apply no more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 2.64 L/ha/season. 12-hr re-entry period.
	pyraclostrobin + fluxapyroxad	Priaxor	0.225–0.3 L/ha (90–120 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. For optimal disease control, begin applications prior to disease development at the onset of disease symptoms. Applications should be made prior to head emergence. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 12-hr re-entry period.

BARLEY DISEASES

Table 4–33. Chemical Control Options for Foliar, Stem and Head Diseases in Barley — Septoria Leaf Spot

LEGEND: PHI = Pre-Harvest Interval (in days)

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, re-entry periods, etc.)
SEPTORIA LEAF SPOT (<i>Septoria tritici</i>)					
Foliar Treatment					
Avoid growing barley after barley, wheat or grasses in a rotation. Plow-down stubble and straw and plant early to avoid serious disease in July.	azoxystrobin + propiconazole	Blanket AP	200–300 mL/ha (80–120 mL/acre)	Do not apply at boot stage and beyond.	For commercial and on-farm treating. Apply once up to boot stage. Good spray coverage and canopy penetration are important for best results.
		Quilt	750 mL/ha (305 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Do not apply at boot stage and beyond. Maximum 1 application/yr. Do not harvest for forage. 12-hr re-entry period.
	propiconazole	Tilt 250 E	500 mL/ha (200 mL/acre)	45	Ground and aerial application. Apply at early signs of disease from tillering to head half emerged.
		Bumper 418 EC	300 mL/ha (121 mL/acre)	45	For use in spring barley only. Ground and aerial application. Apply at early signs of disease from the beginning of stem elongation (Zadok's 29–37). If conditions favourable to disease continue, apply again, if necessary, before head is half emerged (Zadok's 49–55). Maximum 2 applications/yr.
	prothioconazole + tebuconazole	Prosaro 250 EC	800 mL/ha (324 mL/acre)	36	Ground and aerial application. Use a minimum of 100 L/ha of water for ground application, 50 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.
	tebuconazole	Folicur 250 EW	375–500 mL/ha (152–200 mL/acre)	36	Ground and aerial application. Apply at the very early stages of disease development. Use higher rate when disease pressure is severe. The use of a non-ionic surfactant (Agral 90 or Agsurf) is NOT required, as it is built into the formulation. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period. Before using Folicur for control of leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.
		Folicur 432 F	220–292 mL/ha (90–118 mL/acre)	36	Ground and aerial application. Apply at the very early stages of disease development. Use higher rate when disease pressure is severe. Use non-ionic surfactant such as Agral 90 or Agsurf at 0.125% vol/vol. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period. Before using Folicur for control of leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.

BARLEY DISEASES

Table 4–33. Chemical Control Options for Foliar, Stem and Head Diseases in Barley — Septoria Leaf Spot

LEGEND: PHI = Pre-Harvest Interval (in days)

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, re-entry periods, etc.)
SEPTORIA LEAF SPOT (<i>Septoria tritici</i>) (cont'd)					
(cont'd)	trifloxystrobin + propiconazole	Stratego 250 EC	500 mL/ha (200 mL/acre)	Do not apply at boot stage and beyond.	For spring barley only. Ground and aerial application. Do not apply second application within 14 days of the first. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 2 applications/yr. 12-hr re-entry period.
	pyraclostrobin + metconazole	Twinline	380–500 mL/ha (150–200 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Ensure thorough coverage of foliage. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 6-day re-entry period.
	picoxystrobin	Acapela	0.44–0.88 L/ha (180–350 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply prior to disease development and continue on a 7–14-day interval. Use high rate and shorter interval when disease pressure is high. Optimum protection of flag leaf is provided when applied at “flag leaf out” (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Apply no more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 2.64 L/ha/season. 12-hr re-entry period.

BARLEY DISEASES

Table 4–34. Chemical Control Options for Foliar, Stem and Head Diseases in Barley — Leaf Rust, Stem Rust

LEGEND: PHI = Pre-Harvest Interval (in days)

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, re-entry periods, etc.)
RUST (LEAF — <i>Puccinia hordei</i>, STEM — <i>Puccinia graminis f. sp. tritici</i>)					
Foliar Treatment					
<p>Leaf rust spores are blown in from the south, and in most years, late-planted fields are most likely to show the disease. The alternate host is barberry. Remove or destroy alternate host from fence rows, etc. Plant early to reduce risk of disease incidence.</p>	azoxystrobin + propiconazole	Blanket AP	200–300 mL (80–120 mL/acre)	Do not apply at boot stage and beyond.	For commercial and on-farm treating. Apply once up to boot stage. Good spray coverage and canopy penetration are important for best results.
	tebuconazole	Folicur 250 EW	375–500 mL/ha (152–200 mL/acre)	36	Ground and aerial application. Apply at the very early stages of disease development. Use higher rate when disease pressure is severe. The use of a non-ionic surfactant (Agral 90 or Agsurf) is NOT required as it is built into the formulation. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period. Before using Folicur for control of leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.
		Folicur 432 F	220–292 mL/ha (90–118 mL/acre)	36	Ground and aerial application. Apply at the very early stages of disease development. Use higher rate when disease pressure is severe. Use non-ionic surfactant such as Agral 90 or Agsurf at 0.125% vol/vol. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period. Before using Folicur for control of leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.
	prothioconazole + tebuconazole	Prosaro 250 EC	800 mL/ha (324 mL/acre)	36	Ground and aerial application. Use a minimum of 100 L/ha of water for ground application, 50 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.
	azoxystrobin + propiconazole	Quilt	1.0 L/ha (406 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Use higher application rate of 1 L/ha when expecting high disease pressure from stripe rust and wheat leaf rust. Maximum 1 application/yr. Do not harvest for forage. 12-hr re-entry period.
	propiconazole	Tilt 250 E	500 mL/ha (200 mL/acre)	45	Ground and aerial application. Apply at early signs of disease from tillering to head half emerged.
		Bumper 418 EC	300 mL/ha (121 mL/acre)	45	For use in spring barley only. Ground and aerial application. Apply at early signs of disease from the beginning of stem elongation (Zadok's 29–37). If conditions favourable to disease continue, apply again, if necessary, before head is half emerged (Zadok's 49–55). Maximum 2 applications/yr.

BARLEY DISEASES

Table 4–34. Chemical Control Options for Foliar, Stem and Head Diseases in Barley — Leaf Rust, Stem Rust

LEGEND: PHI = Pre-Harvest Interval (in days)

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, re-entry periods, etc.)
RUST (LEAF — <i>Puccinia hordei</i>, STEM — <i>Puccinia graminis f. sp. tritici</i>) (cont'd)					
(cont'd)	metconazole	Caramba	1 L/ha (0.4 L/acre)	30	Provides suppression only. Ground and aerial application. Timing of application is critical. Apply at 20% flowering (Zadok's 61–63) using sprayer nozzles configured to provide excellent coverage of the cereal head. Use a minimum of 100 L/ha of water for ground application, 50 L/ha of water for aerial application. Maximum 1 application/yr. 5-day re-entry period.
	penthiopyrad	Vertisan	1.2–1.75 L/ha (0.48–0.7 L/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Begin applications prior to disease development and continue on a 7–14-day interval. Use higher rate and shorter interval when disease pressure is high. To optimize flag leaf protection, apply at “flag leaf out” (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Do not apply more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 3.5 L/ha/yr. 12-hr re-entry period.

BARLEY DISEASES

Table 4–35. Chemical Control Options for Foliar, Stem and Head Diseases in Barley — Stripe Rust, Fusarium Head Blight

LEGEND: PHI = Pre-Harvest Interval (in days)

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, re-entry periods, etc.)
STRIPE RUST (<i>Puccinia striiformis f. sp. hordei</i>)					
Foliar Treatment					
<p>This disease is most noticeable in seasons with a prolonged cool spring (3°C–15°C). Symptoms often disappear as temperatures increase.</p>	azoxystrobin + propiconazole	Blanket AP	200–300 mL/ha (80–120 mL/acre)	Do not apply at boot stage and beyond.	For commercial and on-farm treating. Apply once up to boot stage. Good spray coverage and canopy penetration are important for best results.
	pyraclostrobin + metconazole	Twinline	380–500 mL/ha (150–200 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Ensure thorough coverage of foliage. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 6-day re-entry period.
	picoxystrobin	Acapela	0.44–0.88 L/ha (178–356 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply prior to disease development and continue on a 7–14-day interval. Use high rate and shorter interval when disease pressure is high. Optimum protection of flag leaf is provided when applied at “flag leaf out” (Zadok’s 39). Do not apply at boot stage (Zadok’s 47) and beyond. Apply no more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 2.64 L/ha/season. 12-hr re-entry period
	pyraclostrobin + fluxapyroxad	Priaxor	0.225–0.3 L/ha (90–120 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. For optimal disease control, begin applications prior to disease development at the onset of disease symptoms. Applications should be made prior to head emergence. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 12-hr re-entry period.
FUSARIUM HEAD BLIGHT (<i>Fusarium graminearum</i>)					
<p>Fusarium head blight infection in barley is often not as noticeable as in wheat, so examine developing heads carefully for bleached or tan spikelets. Avoid planting barley into corn residue.</p> <p>For information on this disease, see Table 4–18. <i>Chemical Control Options for Foliar, Stem and Head Diseases in Wheat — Fusarium Head Blight</i>, on page 87, as well as OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i>.</p>	metconazole	Caramba	1 L/ha (0.4 L/acre)	30	Provides suppression only. Ground and aerial application. Timing of application is critical. Apply at 20% flowering (Zadok’s 61–63) using sprayer nozzles configured to provide excellent coverage of the cereal head. Use a minimum of 100 L/ha of water for ground application, 50 L/ha of water for aerial application. Maximum 1 application/yr. 5-day re-entry period.
	prothioconazole + tebuconazole	Prosaro 250 EC	800 mL/ha (324 mL/acre)	36	Provides suppression only. Ground and aerial application. Timing of application is critical. For optimum suppression, apply as a preventive spray from when 70%–100% of the barley main stem heads are fully emerged to 3 days after full head emergence. Use a minimum of 100 L/ha of water for ground application, 50 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.
	prothioconazole	Proline 480 SC	315–420 mL/ha (128–170 mL/acre)	30	Provides suppression only. Ground and aerial application. Timing is critical. For optimum suppression, apply as a preventive spray from when 70%–100% of the barley main stem heads are fully emerged to 3 days after full head emergence. Maximum 2 applications/yr (735 mL/ha) with a minimum 7-day interval between applications. 24-hr re-entry period.

BARLEY DISEASES

Table 4–36. Chemical Control Options for Seed and Seedling Diseases in Barley — Seed-Borne Septoria

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, re-entry periods, etc.)
SEED-BORNE SEPTORIA				
Seed Treatment				
Sow into a well-prepared seedbed under good growing conditions. Avoid cool, wet conditions that will reduce emergence and increase seed rots and blights. Treat seed with a fungicide seed treatment.	tebuconazole + thiram	Raxil T	225 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treatment. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	tebuconazole + metalaxyl	Raxil MD	300 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provides good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	carbathiin + thiram	Vitaflo 280	230–330 mL/ 100 kg seed	For use in commercial seed treatment facilities only. Do not graze or feed livestock on treated areas for 6 weeks after planting.
	triticonazole + thiram	Gemini	360 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder.
	ipconazole	Rancona Apex	325–433 mL/ 100 kg seed	For commercial and on-farm treating. Use higher rate for highly infected seed lots only. Do not graze or feed livestock on treated areas for 30 days after planting.
	penflufen + prothioconazole + metalaxyl	EverGol Energy	65 mL/ 100 kg seed	For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.
	tebuconazole + prothioconazole + metalaxyl	Raxil Pro MD	325 mL/ 100 kg seed	Use only in treating equipment that can accurately control application rates and provide good distribution of the chemical onto the seed in the mixing chamber. Uniform application to seed is necessary to ensure best disease protection and seed safety. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	difenoconazole + metalaxyl-M + sedaxane	Vibrance XL	180–360 mL/ 100 kg seed	For use in commercial seed treatment facilities only. For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.

BARLEY DISEASES

Table 4–37. Chemical Control Options for Foliar, Stem and Head Diseases in Barley — Powdery Mildew

LEGEND: PHI = Pre-Harvest Interval (in days)

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, re-entry periods, etc.)
POWDERY MILDEW (<i>Erysiphe graminis</i>)					
Foliar fungicide applications may be necessary if disease levels will result in yield losses and a susceptible variety has been used. Consult with your seed company for variety profiles.	propiconazole	Bumper 418 EC	300 mL/ha (121 mL/acre)	45	For use in spring barley only. Ground and aerial application. Apply at early signs of disease from the beginning of stem elongation (Zadok's 29–37). If conditions favourable to disease continue, apply again, if necessary, before head is half emerged (Zadok's 49–55). Maximum 2 applications/yr.
	tebuconazole	Folicur 250 EW	375–500 mL/ha (152–200 mL/acre)	36	Ground and aerial application. Apply to leaf foliage at the first sign or very early stage of disease, especially if weather conditions are conducive to disease development, up to the end of the flowering stage. The use of a non-ionic surfactant (Agral 90 or Agsurf) is NOT required as it is built into the formulation. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period. Before using Folicur for control of leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.
		Folicur 432 F	220–292 mL/ha (90–118 mL/acre)	36	Ground and aerial application. Apply at the very early stages of disease development. Use higher rate when disease pressure is severe. Use non-ionic surfactant such as Agral 90 or Agsurf at 0.125% vol/vol. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period. Before using Folicur for control of leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.
	trifloxystrobin + propiconazole	Stratego 250 EC	500 mL/ha (200 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Do not apply the second application within 14 days of the first. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 2 applications/yr. 12-hr re-entry period.
	prothioconazole + tebuconazole	Prosaro 250 EC	800 mL/ha (324 mL/acre)	36	Ground and aerial application. Use a minimum of 100 L/ha of water for ground application, 50 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.
	picoxystrobin	Acapela	0.44–0.88 L/ha (180–350 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply prior to disease development and continue on a 7–14-day interval. Use high rate and shorter interval when disease pressure is high. Optimum protection of flag leaf is provided when applied at “flag leaf out” (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Apply no more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 2.64 L/ha/season. 12-hr re-entry period.

OAT DISEASES

Table 4–38. Chemical Control Options for Seed and Seedling Diseases in Oat — Seed Rot, Seedling Blight

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, re-entry periods, etc.)
SEED ROT and SEEDLING BLIGHT (<i>Pyrenopeziza avenae</i>, <i>Fusarium</i> spp. and others)				
Seed Treatment				
Ensure good coverage of seed treatment on seeds. Rotation with non-host crops for at least 2 yr will reduce risk. Use disease-free seed and avoid deep seeding.	carbathiin + thiram	Vitaflo 280	330 mL/ 100 kg seed	For use in commercial seed treatment facilities only. Do not graze or feed livestock on treated areas for 6 weeks after planting.
	difenoconazole + metalaxyl-M	Dividend XL RTA	325–650 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treatment, using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 35 days of planting.
	ipconazole	Rancona Apex	325 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 30 days after planting.
	tebuconazole + metalaxyl-M	Raxil MD	300 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provides good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	penflufen + prothioconazole + metalaxyl	EverGol Energy	65 mL/ 100 kg seed	For commercial seed treating only. May be tank-mixed but see the registered label of the tank-mix partner for application rates, precautions and directions.
	tebuconazole + prothioconazole + metalaxyl	Raxil Pro MD	325 mL/ 100 kg seed	Use only in treating equipment that can accurately control application rates and provide good distribution of the chemical onto the seed in the mixing chamber. Uniform application to seed is necessary to ensure best disease protection and seed safety. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	difenoconazole + metalaxyl-M + sedaxane	Vibrance XL	180–360 mL/ 100 kg seed	For use in commercial seed treatment facilities only. For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.

OAT DISEASES

Table 4–39. Chemical Control Options for Seed and Seedling Diseases in Oat — Covered Smut (Common Bunt), Loose Smut, Aspergillus

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, re-entry periods, etc.)
COVERED SMUT (COMMON BUNT) (<i>Ustilago kollerii</i>), LOOSE SMUT (<i>Ustilago avenae</i>)				
Seed Treatment				
This disease is spread from year to year primarily through infected seed. Wind-blown spores will infect florets within season. Use pedigreed seed that is treated with a fungicide seed treatment.	carbathiin + thiram	Vitaflo 280	330 mL/100 kg seed	For use in commercial seed treatment facilities only. Do not graze or feed livestock on treated areas for 6 weeks after planting.
	difenoconazole + metalaxyl-M	Dividend XL RTA	325–650 mL/100 kg seed	For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 35 days of planting.
	triticonazole + thiram	Gemini	360 mL/100 kg seed	For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder.
	tebuconazole + thiram	Raxil T	225 mL/100 kg seed	For both commercial seed treatment plants and on-farm treatment. For loose smut control only. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	tebuconazole + metalaxyl-M	Raxil MD	300 mL/100 kg seed	For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provides good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	ipconazole	Rancona Apex	325 mL/100 kg seed	For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 30 days after planting.
	penflufen + prothioconazole + metalaxyl	EverGol Energy	65 mL/100 kg seed	For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.
	tebuconazole + prothioconazole + metalaxyl	Raxil Pro MD	325 mL/100 kg seed	Use only in treating equipment that can accurately control application rates and provide good distribution of the chemical onto the seed in the mixing chamber. Uniform application to seed is necessary to ensure best disease protection and seed safety. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	difenoconazole + metalaxyl-M + sedaxane	Vibrance XL	180–360 mL/100 kg seed	For use in commercial seed treatment facilities only. For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.
ASPERGILLUS (<i>Aspergillus</i> spp.)				
Sow into a well-prepared seed bed under good growing conditions. Avoid cool, wet conditions that will reduce emergence and increase seed rots and blights. Treat seed with a fungicide seed treatment and ensure good coverage of seed treatment on seeds.	tebuconazole + prothioconazole + metalaxyl	Raxil Pro MD	325 mL/100 kg seed	Use only in treating equipment that can accurately control application rates and provide good distribution of the chemical onto the seed in the mixing chamber. Uniform application to seed is necessary to ensure best disease protection and seed safety. Do not graze or feed livestock on treated areas for 4 weeks after planting.

OAT DISEASES

Table 4–40. Chemical Control Options for Seed and Seedling Diseases in Oat — Common Root Rot, Rhizoctonia, Pythium Damping-Off

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, re-entry periods, etc.)
COMMON ROOT ROT (<i>Cochliobolus</i>)				
Sow into a well-prepared seed bed under good growing conditions. Avoid cool, wet conditions that will reduce emergence and increase seed rots and blights. Treat seed with a fungicide seed treatment and ensure good coverage of seed treatment on seeds.	tebuconazole + prothioconazole + metalaxyl	Raxil Pro MD	325 mL/ 100 kg seed	Use only in treating equipment that can accurately control application rates and provide good distribution of the chemical onto the seed in the mixing chamber. Uniform application to seed is necessary to ensure best disease protection and seed safety. Do not graze or feed livestock on treated areas for 4 weeks after planting.
RHIZOCTONIA (<i>Rhizoctonia solani</i>)				
Sow into a well-prepared seed bed under good growing conditions. Avoid cool, wet conditions that will reduce emergence and increase seed rots and blights. Treat seed with a fungicide seed treatment and ensure good coverage of seed treatment on seeds.	difenoconazole + metalaxyl-M + sedaxane	Vibrance XL	180–360 mL/ 100 kg seed	For use in commercial seed treatment facilities only. For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.
PYTHIUM DAMPING-OFF (<i>Pythium</i> spp.)				
This disease can occur on all soil types but losses are greatest in cold, wet clay soils. Minimize soil compaction and remove excess moisture through improved drainage. Seed treatments containing metalaxyl-M can reduce infection. Delay planting until conditions will result in a rapid and uniform emergence.	carbathiin + thiram	Vitaflo 280	330 mL/ 100 kg seed	For use in commercial seed treatment facilities only. Do not graze or feed livestock on treated areas for 6 weeks after planting.
	difenoconazole + metalaxyl-M	Dividend XL RTA	325–650 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 35 days of planting.
	tebuconazole + metalaxyl-M	Raxil MD	300 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provide good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	tebuconazole + thiram	Raxil T	225 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treatment. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	penflufen + prothioconazole + metalaxyl	EverGol Energy	65 mL/ 100 kg seed	For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.
	tebuconazole + prothioconazole + metalaxyl	Raxil Pro MD	325 mL/ 100 kg seed	Use only in treating equipment that can accurately control application rates and provide good distribution of the chemical onto the seed in the mixing chamber. Uniform application to seed is necessary to ensure best disease protection and seed safety. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	difenoconazole + metalaxyl-M + sedaxane	Vibrance XL	180–360 mL/ 100 kg seed	For use in commercial seed treatment facilities only. For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.

OAT DISEASES

Table 4-41. Chemical Control Options for Foliar, Stem and Head Diseases in Oat — Crown (Leaf) Rust

LEGEND: PHI = Pre-Harvest Interval (in days)

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, re-entry periods, etc.)
CROWN (LEAF) RUST (<i>Puccinia coronata</i> var. <i>avenae</i>)					
Foliar Treatment					
European buckthorn is the alternate host for this disease. Remove or destroy buckthorn where possible. Crown rust can be a problem in central and eastern Ontario. Use resistant oat varieties. Consult with your seed company and the Ontario Cereal Crops Committee Variety Trial Results at www.gocereals.ca for variety profiles. Plant oat early to allow plants to mature before inoculum levels are high. Observe fields closely for early disease symptoms, particularly when susceptible varieties are planted and/or under prolonged conditions that favour disease development. These conditions include mild-to-warm temperatures (20°C–25°C) during the day and mild temperatures at nights (15°C–20°C) with adequate moisture (rains, frequent dews).	tebuconazole	Folicur 250 EW	375 mL/ha (152 mL/acre)	36	Ground and aerial application. Apply to leaf foliage at the first sign or very early stage of disease, especially if weather conditions are conducive to disease development, up to the end of the flowering stage. The use of a non-ionic surfactant (Agral 90 or Agsurf) is NOT required as it is built into the formulation. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period. Before using Folicur for control of leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.
		Folicur 432 F	220 mL/ha (90 mL/acre)	36	Ground and aerial application. Apply at the very early stages of disease development. Use higher rate when disease pressure is severe. Use non-ionic surfactant such as Agral 90 or Agsurf at 0.125% vol/vol. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period. Before using Folicur for control of leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.
	propiconazole	Tilt 250 E	500 mL/ha (200 mL/acre)	45	Ground and aerial application. Apply at early signs of disease from tillering to head half emerged.
		Bumper 418 EC	300 mL/ha (121 mL/acre)	45	Ground and aerial application. Apply at early signs of disease from the beginning of stem elongation (Zadok's 29–37). If conditions favourable to disease continue, apply again, if necessary, before head is half emerged (Zadok's 49–55). Maximum 2 applications/yr.
	trifloxystrobin + propiconazole	Stratego 250 EC	500 mL/ha (200 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Do not apply the second application within 14 days of the first. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 2 applications/yr. 12-hr re-entry period.
	pyraclostrobin	Headline EC	300–400 mL/ha (121–160 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. For optimal disease control, apply immediately after flag leaf emergence (Zadok's 37). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 2 applications/yr. 12-hr re-entry period.

OAT DISEASES

Table 4–41. Chemical Control Options for Foliar, Stem and Head Diseases in Oat — Crown (Leaf) Rust**LEGEND:** PHI = Pre-Harvest Interval (in days)

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, re-entry periods, etc.)
CROWN (LEAF) RUST (<i>Puccinia coronata</i> var. <i>avenae</i>) (cont'd)					
(cont'd)	prothioconazole	Proline 480 SC	260 mL/ha (105 mL/acre)	30	Ground and aerial application. Apply as a preventive treatment when the earliest disease symptoms appear on the leaves and stems. Apply with a non-ionic surfactant such as Agral 90 or Agsurf at 0.125% vol/vol. Minimum of 7 days application interval. Maximum 2 applications/yr. 24-hr re-entry period.
	metconazole	Caramba	500–700 mL/ha (200–280 mL/acre)	30	Ground and aerial application. Apply to leaf foliage at the first sign or very early stage of disease up to the end of the flowering stage. Use the higher rate when weather conditions are conducive to heavy disease development. Use a minimum of 100 L/ha of water for ground application and 50 L/ha of water for aerial application. Maximum 1 application/yr. 5-day re-entry.
	pyraclostrobin + metconazole	Twinline	380–500 mL/ha (150–200 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Ensure thorough coverage of foliage. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 6 day re-entry period.
	picoxystrobin	Acapela	0.44–0.88 L/ha (178–356 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply prior to disease development and continue on a 7–14-day interval. Use high rate and shorter interval when disease pressure is high. Optimum protection of flag leaf is provided when applied at “flag leaf out” (Zadok’s 39). Do not apply at boot stage (Zadok’s 47) and beyond. Apply no more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 2.64 L/ha/season. 12-hr re-entry period.
	prothioconazole + tebuconazole	Prosaro 250 EC	800 mL/ha (324 mL/acre)	36	Ground and aerial application. Use a minimum of 100 L/ha of water for ground application. Maximum 1 application per year. 12-hr re-entry period.
	pyraclostrobin + fluxapyroxad	Priaxor	0.225–0.3 L/ha (90–120 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. For optimal disease control, begin applications prior to disease development at the onset of disease symptoms. Applications should be made prior to head emergence. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 12-hr re-entry period.

OAT DISEASES

Table 4-42. Chemical Control Options for Foliar, Stem and Head Diseases in Oat — Septoria Leaf Spot, Septoria Leaf Blotch, Fusarium Head Blight, Stem Rust**LEGEND:** PHI = Pre-Harvest Interval (in days)

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, re-entry periods, etc.)
SEPTORIA LEAF SPOT (<i>Septoria tritici</i>) and SEPTORIA LEAF BLOTCH (<i>Stagonospora avenae</i> f. sp. <i>avenaria</i> (<i>Septoria avenae</i>))					
Foliar Treatment					
Avoid planting oat after oat or mixed grains. Humid, wet, windy weather promotes this disease.	propiconazole	Tilt 250 E	500 mL/ha (200 mL/acre)	45	Ground and aerial application. Apply at early signs of disease from tillering to head half emerged.
		Bumper 418 EC	300 mL/ha (121 mL/acre)	45	Ground and aerial application. Apply at early signs of disease from the beginning of stem elongation (Zadok's 29–37). If conditions favourable to disease continue, apply again, before head is half emerged (Zadok's 49–55). Can be tank-mixed with several cereal herbicides. Maximum 2 applications/yr.
	pyraclostrobin + metconazole	Twinline	380–500 mL/ha (150–200 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Ensure thorough coverage of foliage. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 6-day re-entry period.
	trifloxystrobin + propiconazole	Stratego 250 EC	500 mL/ha (200 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Do not apply the second application within 14 days of the first. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 2 applications/yr. 12-hr re-entry period.
	metconazole	Caramba	500–700 mL/ha (200–280 mL/acre)	30	Ground and aerial application. Apply to leaf foliage at the first sign or very early stage of disease up to the end of the flowering stage. Use the higher rate when weather conditions are conducive to heavy disease development. Use a minimum of 100 L/ha of water for ground application and 50 L/ha of water for aerial application. Maximum 1 application/yr. 5-day re-entry.
FUSARIUM HEAD BLIGHT (<i>Fusarium graminearum</i>)					
For information on this disease, see Table 4-18. Chemical Control Options for Foliar, Stem and Head Diseases in Wheat — Fusarium Head Blight, on page 87, as well as OMAFRA Publication 811, Agronomy Guide for Field Crops.	metconazole	Caramba	1 L/ha (400 mL/acre)	30	Provides suppression only. Ground and aerial application. Timing of application is critical. Apply at 20% flowering (Zadok's 61–63) using sprayer nozzles configured to provide excellent coverage of the cereal head. Use a minimum of 100 L/ha of water for ground application, 50 L/ha of water for aerial application. Maximum 1 application/yr. 5-day re-entry period.
	prothioconazole + tebuconazole	Prosaro 250 EC	800 mL/ha (324 mL/acre)	36	Ground and aerial application. Use a minimum of 100 L/ha of water for ground application. Maximum 1 application per year. 12-hr re-entry period.
STEM RUST (<i>Puccinia graminis</i>)					
Stem rust begins as dark reddish-brown spots on both sides of the leaves, stems and heads. When developed, spots will rupture through the surface, releasing spores into the air. The surface of the tissue appears ragged and torn. Removal of alternate host, barberry and the use of resistant varieties can reduce risk.	prothioconazole + tebuconazole	Prosaro 250 EC	800 mL/ha (324 mL/acre)	36	Ground and aerial application. Use a minimum of 100 L/ha of water for ground application. Maximum 1 application/yr. 12-hr re-entry period.

RYE DISEASES

Table 4–43. Chemical Control Options for Diseases in Rye — Seedling Blight, Pythium Damping-Off, Seed-Borne Septoria, Common Bunt, Dwarf Bunt

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, re-entry periods, etc.)
SEEDLING BLIGHT (<i>Pythium</i> spp., <i>Rhizoctonia</i> spp., <i>Fusarium</i> spp.)				
Seed Treatment				
Sow into a well-prepared seedbed under good growing conditions. Avoid cool, wet conditions that will reduce emergence and increase seed rots and blights. Treat seed with a fungicide seed treatment.	carbathiin + thiram	Vitaflo 280	230–330 mL/100 kg seed	For use in commercial seed treatment facilities only. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	difenoconazole + metalaxyl-M	Dividend XL RTA	325–650 mL/100 kg seed	For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 35 days of planting.
	ipconazole	Rancona Apex	325 mL/100 kg seed	For fusarium control only. For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 30 days after planting.
PYTHIUM DAMPING-OFF (<i>Pythium</i> spp.)				
Seed Treatment				
Sow into a well-prepared seedbed under good growing conditions. Avoid cool, wet conditions that will reduce emergence and increase seed rots and blights. Treat seed with a fungicide seed treatment.	carbathiin + thiram	Vitaflo 280	230–330 mL/100 kg seed	Do not graze or feed livestock on treated areas for 4 weeks after planting.
	difenoconazole + metalaxyl-M	Dividend XL RTA	325–650 mL/100 kg seed	For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 35 days of planting.
SEED-BORNE SEPTORIA (<i>Septoria</i> spp.)				
Seed Treatment				
Sow into a well-prepared seedbed under good growing conditions. Avoid cool, wet conditions that will reduce emergence and increase seed rots and blights. Treat seed with a fungicide seed treatment.	difenoconazole + metalaxyl-M	Dividend XL RTA	325–650 mL/100 kg seed	For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 35 days of planting.
COMMON BUNT (<i>Tilletia caries</i>), DWARF BUNT (<i>Tilletia controversa</i>)				
Seed Treatment				
Sow into a well-prepared seedbed under good growing conditions. Avoid cool, wet conditions that will reduce emergence and increase seed rots and blights. Treat seed with a fungicide seed treatment.	difenoconazole + metalaxyl-M	Dividend XL RTA	325–650 mL/100 kg seed	For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 35 days of planting.

RYE DISEASES

Table 4–44. Chemical Control Options for Diseases in Rye — Leaf Rust

LEGEND: PHI = Pre-Harvest Interval (in days)

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, re-entry periods, etc.)
LEAF RUST (<i>Puccinia recondita</i> f. sp. <i>recondita</i>)					
Foliar Treatment					
<p>Leaf rust in rye is caused by the same fungus that infects wheat.</p> <p>See Table 4–16. <i>Chemical Control Options for Foliar, Stem and Head Diseases in Wheat — Leaf Rust, Stem Rust</i>, on page 82, for management options and details.</p>	pyraclostrobin	Headline EC	300–600 mL/ha (120–240 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. For optimal disease control, apply immediately after flag leaf emergence (Zadok's 37). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 2 applications/yr. 12-hr re-entry period.
	pyraclostrobin + metconazole	Twinline	380–500 mL/ha (150–200 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Ensure thorough coverage of foliage. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 6 day re-entry period.
	picoxystrobin	Acapela	0.44–0.88 L/ha (180–350 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply prior to disease development and continue on a 7–14-day interval. Use high rate and shorter interval when disease pressure is high. Optimum protection of flag leaf is provided when applied at “flag leaf out” (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Apply no more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 2.64 L/ha/season. 12-hr re-entry period.
	metconazole	Caramba	500–700 mL/ha (200–280 mL/acre)	30	Ground and aerial application. Apply to leaf foliage at the first sign or very early stage of disease up to the end of the flowering stage. Use the higher rate when weather conditions are conducive to heavy disease development. Use a minimum of 100 L/ha of water for ground application and 50 L/ha of water for aerial application. Maximum 1 application/yr. 5-day re-entry.
	penthiopyrad	Vertisan	1.2–1.75 L/ha (0.48–0.7 L/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Begin applications prior to disease development and continue on a 7–14-day interval. Use higher rate and shorter interval when disease pressure is high. To optimize flag leaf protection, apply at “flag leaf out” (Zadok's 39). Do not apply after flowering (Zadok's 59). Do not apply more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 3.5 L/ha/yr. 12-hr re-entry period.
	pyraclostrobin + fluxapyroxad	Priaxor	0.225–0.3 L/ha (90–120 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. For optimal disease control, begin applications prior to disease development at the onset of disease symptoms. Applications should be made prior to head emergence. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 12-hr re-entry period.

RYE DISEASES

Table 4–45. Chemical Control Options for Diseases in Rye — Powdery Mildew, Fusarium Head Blight

LEGEND: PHI = Pre-Harvest Interval (in days)

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, re-entry periods, etc.)
POWDERY MILDEW (<i>Erysiphe graminis</i> f. sp. <i>secalis</i>)					
Foliar Treatment					
In most cases, powdery mildew has little impact on rye since the crop is very resistant to the disease.	pyraclostrobin	Headline EC	400–600 mL/ha (160–240 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. For optimal disease control, apply immediately after flag leaf emergence (Zadok's 37). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 2 applications/yr. 12-hr re-entry period.
	metconazole	Caramba	500–700 mL/ha (200–280 mL/acre)	30	Ground and aerial application. Apply to leaf foliage at the first sign or very early stage of disease up to the end of the flowering stage. Use the higher rate when weather conditions are conducive to heavy disease development. Use a minimum of 100 L/ha of water for ground application and 50 L/ha of water for aerial application. Maximum 1 application/yr. 5-day re-entry.
	pyraclostrobin + metconazole	Twinline	380–500 mL/ha (150–200 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Ensure thorough coverage of foliage. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 6-day re-entry period.
	pyraclostrobin + fluxapyroxad	Priaxor	0.225–0.3 L/ha (90–120 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. For optimal disease control, begin applications prior to disease development at the onset of disease symptoms. Applications should be made prior to head emergence. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 12-hr re-entry period.
FUSARIUM HEAD BLIGHT (<i>Fusarium graminearum</i>)					
For more information, see Table 4–18. <i>Chemical Control Options for Foliar, Stem and Head Diseases in Wheat — Fusarium Head Blight</i> , on page 87, as well as OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> .	metconazole	Caramba	1 L/ha (0.4 L/acre)	30	Provides suppression only. Ground and aerial application. Timing of application is critical. Apply at 20% flowering (Zadok's 61–63) using sprayer nozzles configured to provide excellent coverage of the cereal head. Use a minimum of 100 L/ha of water for ground application, 50 L/ha of water for aerial application. Maximum 1 application/yr. 5-day re-entry period.
	picoxystrobin	Acapela	0.44–0.88 L/ha (178–356 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply prior to disease development and continue on a 7–14-day interval. Use high rate and shorter interval when disease pressure is high. Optimum protection of flag leaf is provided when applied at "flag leaf out" (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Apply no more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 2.64 L/ha/season. 12-hr re-entry period.

CEREAL GROWTH REGULATORS

Table 4-46. Growth Regulators for Lodging Reduction In Cereals

LEGEND: PHI = Pre-Harvest Interval (in days)

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, re-entry periods, etc.)
Visit the Ontario Cereal Crops Committee website at www.gocereals.ca for performance trial information. High-risk factors for lodging include fields with a history of manure applications and legume hay.	ethephon	Ethrel	Spring barley: 1.0–1.5 L/ha (0.4–0.6 L/acre) <i>2-row cultivar</i> 1.0–2.0 L/ha (0.4–0.8 L/acre) <i>6-row cultivar</i> Spring wheat: 1.0–1.5 L/ha (0.4–0.6 L/acre) Winter wheat: 1.25–2.5 L/ha (0.5–1.0 L/acre)	35	Ground and aerial application. Timing of application is critical. Use lower rate unless expecting severe lodging conditions. Apply when most of the tillers are between early flag leaf emergence to swollen boot stage (Zadok's 37–45). Do not apply after more than 10% of the awns have emerged (Zadok's 49). Use higher rates on crops that are heavily fertilized (more than 100 kg/ha of total available nitrogen) and have ample moisture (more than 25 cm of precipitation) and are prone to lodging.