Field Crop Protection Guide

2021

Publication 812

Ministry of Agriculture,
Food and Rural Affairs

Ontario

Discard old editions of this publication. Each year a committee comprised of representatives from provincial government, industry, academia and grower organizations review the pesticides listed in the publication.

To the best knowledge of the committee, at the time of publishing, the pesticide products listed in this publication were federally registered.

The information in this publication is general information only. The Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) does not offer any warranty or guarantee, nor does it assume any liability for any crop loss, animal loss, health, safety or environmental hazard caused by the use of a pesticide mentioned in this publication.

This publication lists a number of brand names of pesticides. It is neither an endorsement of the product nor a suggestion that similar products are ineffective.

THE PESTICIDE LABEL

Consult each product label before you use a pesticide. The label provides specific information on how to use the product safely, hazards, restrictions on use, compatibility with other products, the effect of environmental conditions, etc.

The pesticide product label is a legal document. Follow all label directions.

REGISTRATION OF PESTICIDE PRODUCTS

The Pest Management Regulatory Agency (PMRA) of Health Canada registers pesticide products for use in Canada following an evaluation of scientific data to ensure that the product has value, and the human health and environmental risks associated with its proposed use are acceptable.

1. Full Registration

Pesticide registrations are normally granted for a period of 5 years, subject to renewal.

2. Emergency Registration

An emergency registration is a temporary, time-limited registration of no more than 1 year, approved to deal with serious pest outbreaks. An emergency is generally deemed to exist when both of the following criteria are met:

A. An unexpected and unmanageable pest outbreak or pest situation occurs that can cause significant health, environmental or economic problems; and

B. Registered pesticides and cultural control methods or practices are insufficient to address the pest outbreak.

MAXIMUM RESIDUE LIMITS

The PMRA has established maximum residue limits (MRLs) for pesticides. An MRL is the maximum amount of pesticide residue that may remain on food after a pesticide is applied as per label directions and which can safely be consumed. Processors or retailers may demand more restrictive limits. Growers should seek advice of their intended market to determine if more restrictive limitations apply. Keep accurate and up-to-date records on pesticide use in each crop.

SUPPLEMENTAL/AMENDED LABELS

Supplemental/amended labels provide label directions for new approved uses for a registered pesticide that do not appear on the current label. These label directions MUST be followed when using the pesticide for these purposes.

Examples of when you must use a supplemental/amended label include:

- **Emergency Use Registration**
- **Minor Use Label Expansion**

You can obtain a copy of a supplemental amended label from the pesticide manufacturer or pesticide vendor, the grower association that sponsored the emergency registration or minor use, from OMAFRA crop specialists or PMRA's Pest Management Information Service.

For more information on the federal registration status, check the PMRA website at www.healthcanada.gc.ca/pmra or call 1-800-267-6315.

REGULATION OF PESTICIDES IN ONTARIO

The Ontario Ministry of Environment, Conservation and Parks (MECP) is responsible for regulating pesticide sale, use, transportation, storage and disposal in Ontario.

Ontario regulates pesticides by placing appropriate education, licensing and/or permit requirements on their use, under the *Pesticides Act* and Regulation 63/09.

All pesticides must be used in accordance with requirements under the *Pesticides Act* and Regulation 63/09, which are available on the e-laws website at ontario.ca/laws or by calling the ServiceOntario Publications Toll-Free number: 1-800-668-9938 or 416-326-5300.

CLASSIFICATION OF PESTICIDES

As of May 1, 2020, Ontario's pesticides classes have been aligned with the federal government's pesticide categories to remove duplication and reduce complexity for the sale and use of pesticides in Ontario, while ensuring continued protection of human health and the environment. MECP automatically classifies pesticides in Ontario as Class A, B, C, D or E. The Ontario pesticide classification system provides the basis for regulating the distribution, availability and use of pesticide products in Ontario. For more information on the classification of pesticides, visit the MECP website at ontario.ca/pesticides.

CERTIFICATION AND LICENSING

Growers and Their Assistants

For information about farmer training and certification requirements, visit the MECP website at ontario.ca/pesticides and for information on courses check the Ontario Pesticide Education Program website at www.opep.ca or call 1-800-652-8573.

Pesticide Commercial Applicators (Exterminators) and Their Assisting Technicians

For more information about exterminator licensing and technician training, visit:

- the Ontario Pesticide Training and Certification website at www.ontariopesticide.com or call 1-888-620-9999 or 519-674-1575
- the Pesticide Industry Council's Pesticide Technician Program website at www.horttrades.com/pesticide-technician or call 1-800-265-5656 or e-mail pic@hort- trades.com
- the Pesticide Industry Regulatory Council (PIRC) at www.oipma.ca.

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Acknowledgements

The information contained in this publication is supplied by Pest and Crop Specialists of the Agriculture Development Branch OMAFRA, University of Guelph, Ridgetown Campus, Agriculture and Agri-Food Canada, the Canadian Corn Pest Coalition and the Pest Management Regulatory Agency (Health Canada).

Need technical or business information?

Contact the Agricultural Information Contact Centre at
1-877-424-1300
or ag.info.omafra@ontario.ca

Looking for field crop production information on the Internet?

Check the OMAFRA website at
ontario.ca/crops

You will find a comprehensive collection of Factsheets, articles and photos regarding the production and maintenance of field crops.

This publication contains pesticide products that have been registered as of October 2020, for the control of major field crop pests of Ontario. For information related to production, harvest, storage and pest life cycles, identification and other management strategies, see OMAFRA Publication 811, Agronomy Guide for Field Crops. Information on ordering OMAFRA publications is found on the inside back cover of this book. Supplements to this publication will be posted to the OMAFRA website (ontario.ca/crops).

Cover Images

FRONT COVER:
left: soldier beetle

middle: tar spot on corn

right: brown marmorated stink bug

BACK COVER:
left: cereal leaf beetle

right: sudden death syndrome on soybean plant

COMING SOON!

For the 2022 growing season, you will be able to access the information currently listed in this publication through a new, digital application.

The application will replace OMAFRA's crop protection publications and provide you with information in one single location.

This one-stop tool for crop protection information will allow you to:

- ✔ customize and navigate through information based on your specific needs;
- ✔ access information when you need it to make important business decisions; and
- ✔ access information digitally, either through desktop, tablet or mobile.

Updates can be found at:

ontario.ca/crops

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Introduction

The information contained in this publication is supplied by Pest and Crop Specialists of the Agriculture Development Branch OMAFRA, University of Guelph Ridgetown Campus, Agriculture and Agri-Food Canada, the Canadian Corn Pest Coalition and the Pest Management Regulatory Agency (Health Canada).

Products Listed in This Publication

Products listed in this book are registered for use on field crops and are organized by pest for each field crop. Consult each product label before using a pest control product. Labels for registered pest control products are available at the Pest Management Regulatory Agency (PMRA) website at pr-rp.hc-sc.gc.ca/ls-re/index-eng.php.

Within this publication, where rate ranges exist, consult the product label to determine what rate is most appropriate for your pest or disease situation.

The Pesticide Label

Consult each product label before you use a pesticide. The label provides specific information on how to use the product safety hazards, restriction on use, compatibilities with other products, the effect of environmental conditions, etc.

The pesticide product label is a legal document. Follow all label directions.

Crop Group Information

A crop group is a grouping of plant species based on botany and taxonomy (e.g., plant families), as well as on how the crops are produced. Crop groups are often further divided into smaller and more closely related subgroups. A pest control product may be registered on a subgroup, rather than the entire crop group. Crop groupings are used primarily to set maximum residue limits and establish a common pre-harvest interval (PHI) for a similar set of crops. It is important to remember that not all products have a crop group registration, and products registered on one crop are not necessarily registered on all members of its crop group. There are some crops that do not belong in a crop group. A complete list of all crops included in both original and revised crop groups can be found on the Health Canada website: www.hc-sc.gc.ca/cps-spc/pest/part/protect-proteger/food-nourriture/rccg-gcpcr-eng.php.

Levels of Control for Fungicides and Insecticides

The Efficacy Guidelines for Plant Protection Products in the *Pest Management Regulatory Agency Directive (DIR2003–04)* define levels of control as follows:

Fungicides

Control: The product, when applied in accordance with the label directions, consistently reduces disease incidence and severity to a commercially acceptable level.

Suppression: Consistent control at a level that is not optimal but still of commercial benefit. Suppression is not used for products that show highly variable performance.

Insecticides

Control: The product, when applied in accordance with the label directions, consistently reduces pest numbers or pest damage to a commercially acceptable level.

Suppression: The product, when applied in accordance with the label directions, does not consistently reduce pest numbers or pest damage to a commercially acceptable level. Under such situations, the level of performance offered by the product must still have value in a pest management program.

Resistance Management Strategies

Different pesticides control pests or diseases in different ways. This is called the mode of action. Pesticides are grouped into chemical families and/or groups based on their mode of action. Using the same pesticide with the same mode of action season after season or several times within the same season could result in the target pest or disease becoming resistant to the chemical family. A pest or disease can develop resistance to one chemical family but still be very susceptible to another. Therefore, to reduce the risk of a pest or disease developing resistance, rotate between chemical groups and/or families within the same season or during successive growing seasons for control of the same pest or disease. For example, if using a Group 11 fungicide (e.g., Headline) to control rust in corn, and more than one application is required that season to manage the disease, use a product from a different group (e.g., Tilt, which is a Group 3 fungicide) for the second application, because it controls the disease using a different mode of action. Pesticide labels indicate the chemistry group or family for the product. For a list of insecticide and fungicide chemical groups, see Appendix F. *Pesticide Groups Based on Sites of Action — Insecticides*, and Appendix G. *Pesticide Groups Based on Sites of Action — Fungicides*.

Only use chemical control when necessary and consider implementing an integrated pest management strategy, including cultural control (e.g., crop rotation, disease/pest resistant varieties, scouting, use of certified seed, etc.) or biological control, which will also help reduce the risk of a pest or disease developing resistance to a pesticide.

Do not exceed the total number of applications allowed per year for each product. Do not apply the product at rates lower than the recommended rate on the label. Labels for registered pest control products are available at the Pest Management Regulatory Agency (PMRA) website at pr-rp.hc-sc.gc.ca/ls-re/index-eng.php.

Monitor recently treated pest or disease populations for signs of resistance.

See the pesticide label for more information on resistance management. As well, for more information on resistance management strategies or integrated pest management (IPM) options for a specific pest, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*, or contact a certified crop advisor. IPM options are listed in the first column of the Control Options tables in this publication.

Pest Manager App

Pest Manager is a companion resource to this publication that can be downloaded from the Grain Farmers of Ontario website (www.gfo.ca/apps) for Apple, Blackberry and Android devices. *Pest Manager* allows you to identify, map and find integrated pest management options for common weeds, insects and diseases in corn, soybean and cereal crops. Any pesticide use information in the app is specific to Ontario only, and users should always read the product label — and ensure all directions on the label are followed — before applying any pesticide.

These management options are currently only pesticide-related. Pesticide options are ranked by their average control of all pests selected. A user can also look up information on a pest and a specific pesticide.

The development of this app is the result of a cooperative effort between the Grain Farmers of Ontario and OMAFRA. Funding was provided through the Growing Forward 2 program, a partnership between Agriculture and Agri-Food Canada and the Ontario Ministry of Agriculture, Food and Rural Affairs.

1. Corn (Field and Seed)

Bee kill incidences in Ontario have been found to be associated with the planting of corn and soybean seed treated with neonicotinoid insecticides. Growers are encouraged to follow best management practices to protect pollinators at planting. See Health Canada's pollinator protection web page: www.canada.ca/pollinators. Adhere to label precaution statements and restrictions for each product and refer to the *Integrated Pest Management (IPM) Course for Corn and Soybeans* at www.ipmcertified.ca/ for the latest information.

See OMAFRA Publication 811, *Agronomy Guide for Field Crops*, for further information on insect biology and management options. Consult your seed company and the Ontario Corn Committee (OCC) at www.gocorn.net/ for hybrid information.

CORN INSECTS

Table 1–1. Control Options for Insects in Field and Seed Corn — Corn Rootworm

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
CORN ROOTWORM *(Diabrotica virgifera* and *Diabrotica barberi)*				
Seed Treatment				
In Ontario, the use of neonicotinoid seed treatments on corn and soybean seed is restricted. See the Ontario website on Neonicotinoid Regulations at www.ontario.ca/page/neonicotinoid-regulations for more information on the requirements to use these products. Seed treatments are best suited for those fields with low-to-moderate rootworm infestations in fields planted after corn. **NOTE:** The planting of neonicotinoid-treated corn and soybean seed can pose a risk to pollinators. This includes all clothianidin, imidacloprid and thiamethoxam products. The contaminated insecticide dust emitted from pneumatic planters can drift onto flowers and water sources and expose bees to these insecticides. Only a dust-reducing fluency agent is permitted to be used as a seed flow lubricant for corn or soybean seed treated with neonicotinoid insecticides clothianidin, thiamethoxam or imidacloprid. Talc and graphite are not permitted for use in this way. Growers are encouraged to follow best management practices (BMPs) to protect pollinators at planting. To help minimize the dust generated during planting, refer to *Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices* on the Health Canada website at www.canada.ca/pollinators. If treated seeds are spilled outdoors or in areas accessible to birds, promptly clean up or bury to prevent ingestion.	clothianidin **(See NOTE.)**	NipsIt INSIDE 600 Poncho 1250	166.7 mL/ 80,000 kernels	**For use in commercial seed treatment facilities only.** For low-to-moderate rootworm populations. Seed-applied insecticides can affect seed drop and final plant stands. Use approved lubricant as required to minimize dust and ensure planting accuracy. A 30-day plant-back interval for cereal grains, grasses, soybeans and dry beans is required. This product contains no colourant. An appropriate colourant must be added when this product is applied. Toxic to birds and small wild mammals. Any spilled or exposed granules must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to aquatic organisms. Do not apply when weather conditions favour runoff from treated areas into adjacent aquatic sites.
	thiamethoxam **(See NOTE.)**	Cruiser 5 FS	166.7 mL/ 80,000 kernels	**For use in commercial seed treatment facilities only.** For low-to-moderate rootworm populations. Do not graze or feed livestock on treated areas for 45 days after planting. This product contains no colourant. An appropriate colourant must be added when this product is applied. Toxic to birds and small wild mammals. Any spilled or exposed seed must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to fish and aquatic organisms. Do not apply directly to water or to areas where surface water is present.

CORN INSECTS

Table 1–1. Control Options for Insects in Field and Seed Corn — Corn Rootworm

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
CORN ROOTWORM (*Diabrotica virgifera* and *Diabrotica barberi*) (continued)				
Soil-Applied at Planting Only				
Avoid planting corn following corn. Crop rotation is the best strategy for rootworm management. Risk factors include continuous corn production, heavier soil (clay), high beetle populations in corn of previous season and being the latest field planted in the previous season. If there are 1 or more beetles per corn plant on average throughout the month of August, root protection is warranted on the following season's corn crop. In-furrow application is safer to the applicator and non-target mammals than T-band application.	chlorpyrifos	Lorsban 15 G Pyrifos 15 G	75 g/ 100-m (328-ft) row	Must be applied in a 15–18-cm band over the row, behind the planter shoe, in front of the press wheel. Do not place in direct contact with seed. 24-hr restricted entry interval. Toxic to birds and small wild mammals. Any spilled or exposed granules must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to fish and aquatic organisms. Do not apply when weather conditions favour runoff from treated areas into adjacent aquatic sites.
	tefluthrin	Force 3.0G	37.5 g/ 100-m (328-ft) row	May be applied in a T-band or in-furrow. For banded applications, place directly over the furrow in a 15–20-cm band ahead of the press wheel. For in-furrow applications, place all material directly in the open seed furrow, behind the planter disc openers. Toxic to birds and small wild mammals. Any spilled or exposed granules must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to aquatic organisms. Do not apply when weather conditions favour runoff from treated areas into adjacent aquatic sites.
Transgenic				
There were multiple reports of rootworm injury on pyramid Bt hybrids (containing two Bt-RW proteins) in several areas of Ontario. This suggests cross resistance is occurring in rootworm populations that are able to tolerate multiple Bt proteins. High risk areas for resistance include heavy continuous corn production areas of three or more years of corn, with repeated use of Bt-RW hybrids. Resistance will now always remain in the population. We can no longer rely solely on Bt-RW hybrids for rootworm management. To mitigate these resistance rootworm populations, continuous corn producers are encouraged to rotate out of corn for the next 2 years. After mitigation, long term sustainable rootworm practices include only planting corn for three years in the same field, followed by rotation out of corn in year 4. This will enable only needing Bt-RW hybrids in the highest risk year (year 3) and results in rootworm populations only being exposed to Bt-RW proteins, every one in four years. For more information on the short-term mitigation measures and long-term rootworm management in Ontario, refer to Field Crop News at: fieldcropnews.com/ for more information. Notify your company agronomist and OMAFRA entomologist if signs of unexpected root clipping, goosenecking, lodging and/or significant adult populations are noticed in fields planted to Bt-RW hybrids.	Bt corn	Agrisure 3000GT Agrisure 3122 E-Z Refuge Agrisure 3111 Viptera Agrisure Duracade 5122 E-Z Refuge Agrisure Duracade 5222 E-Z Hybrid Genuity VT Triple Pro Optimum AcreMax XTreme Qrome SmartStax SmartStax Enlist SmartStax Refuge Advanced	See Table 9–7. *Bt Corn Products/Traits Currently Available in Canada — as of October 2020* for Bt corn options.	These products should not be considered the primary solution for rootworm management in continuous corn production. Only use Bt-RW hybrids in high-risk rootworm years, typically third year corn. Using Bt-RW hybrids in first- and second-year corn is unnecessary use of the technology. Monitor adult rootworm populations in August. If one beetle per plant is observed, rootworm protection is needed on next year's corn crop.

CORN INSECTS

Table 1–2. Control Options for Insects in Field and Seed Corn — Wireworms, Millipedes

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
WIREWORMS (*Limonius* spp. and others)				
Seed Treatment				
In Ontario, the use of neonicotinoid seed treatments on corn and soybean seed is restricted. See the Ontario website on Neonicotinoid Regulations at www.ontario.ca/page/neonicotinoid-regulations for more information on the requirements to use these products. The risk factors for wireworm infestations include fields with a history of cereal/corn/grassy weeds, sandy soils, history of wireworm problems and fields that are coming out of sod. **NOTE:** The planting of neonicotinoid-treated corn and soybean seed can pose a risk to pollinators. This includes all clothianidin, imidacloprid and thiamethoxam products. The contaminated insecticide dust emitted from pneumatic planters can drift onto flower and water sources and expose bees to these insecticides. Only a dust-reducing fluency agent is permitted to be used as a seed flow lubricant for corn or soybean seed treated with neonicotinoid insecticides clothianidin, thiamethoxam or imidacloprid. Talc and graphite are not permitted for use in this way. Growers are encouraged to follow best management practices (BMPs) to protect pollinators at planting. To help minimize the dust generated during planting, refer to *Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices* on the Health Canada website at www.canada.ca/pollinators. If treated seeds are spilled outdoors or in areas accessible to birds, promptly clean up or bury to prevent ingestion.	chlorantraniliprole	Lumivia	0.25–0.75 mg a.i./seed	**For use in commercial seed treatment facilities only.** It is not for use in on-farm treating systems such as hopper-box or slurry-box applications just prior to planting. Use higher rates in areas with high pressure. Do not make a subsequent foliar application of any Group 28 insecticide (e.g., Coragen or Voliam Xpress) for a minimum of 60 days after planting seed treated with Lumivia. This product contains no colourant. An appropriate colourant must be added when this product is applied. Toxic to birds and small wild mammals. Any spilled or exposed seed must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to aquatic organisms. Do not apply where contamination of groundwater or run-off into aquatic sites is possible.
	clothianidin **(See NOTE.)**	NipsIt INSIDE 600 Poncho 250	33.3 mL/ 80,000 kernels	**For use in commercial seed treatment facilities only.** Seed-applied insecticides can affect seed drop and final plant stands. A 30-day plant-back interval for cereal grains, grasses, soybeans and dry beans is required. This product contains no colourant. An appropriate colourant must be added when this product is applied. Toxic to birds and small wild mammals. Any spilled or exposed seed must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to aquatic organisms. Do not apply where contamination of groundwater or run-off into aquatic sites is possible.
	cyantraniliprole	Fortenza	167 mL/ 100 kg seed	**For use in commercial seed treatment facilities only.** Apply Fortenza as a water-based slurry utilizing standard slurry seed treatment equipment that provides uniform seed coverage. Follow resistance management instructions as stated on label. Do not apply subsequent applications of a Group 28 insecticide (e.g., Coragen or Voliam Xpress) following Fortenza seed treatment. This product contains no colourant. An appropriate colourant must be added when this product is applied. Toxic to birds. Any spilled or exposed seed must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to aquatic organisms. Do not apply directly to freshwater habitats, estuaries or marine habitats. Avoid application to areas with a moderate to steep slope, compacted soil or clay.
	imidacloprid **(See NOTE.)**	Gaucho 600 FL Sombrero 600 FS	21.3 mL/ 80,000 kernels 21.3 mL/ 80,000 kernels	**For use in commercial seed treatment facilities only.** Seed-applied insecticides can affect seed drop and final plant stands. Use approved lubricant as required to minimize dust and ensure planting accuracy. This product contains no colourant. An appropriate colourant must be added when this product is applied. Toxic to birds and small wild mammals. Any spilled or exposed seed must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to aquatic organisms. Do not apply where contamination of groundwater or run-off into aquatic sites is possible.

CORN INSECTS

Table 1–2. Control Options for Insects in Field and Seed Corn — Wireworms, Millipedes

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
WIREWORMS (*Limonius* spp. and others) (continued)				
Seed Treatment (continued)				
	thiamethoxam **(See NOTE.)**	Cruiser 5 FS	16.7 mL/ 80,000 kernels	**For use in commercial seed treatment facilities only.** Seed-applied insecticides can affect seed drop and final plant stands. Use approved lubricant as required to minimize dust and ensure planting accuracy. Do not graze or feed livestock on treated areas for 45 days after planting. This product contains no colourant. An appropriate colourant must be added when this product is applied. Toxic to birds and small wild mammals. Any spilled or exposed seed must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to fish and aquatic organisms. Do not apply directly to water or to areas where surface water is present.
Soil Applied at Planting Only				
In-furrow application is safer to the applicator and non-target animals than T-band application.	tefluthrin	Force 3.0G	37.5 g/ 100-m (328-ft) row	**In-furrow application only.** Place directly in the seed furrow behind the planter disc openers. Toxic to birds and small wild mammals. Any spilled or exposed granules must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to aquatic organisms. Do not apply when weather conditions favour runoff from treated areas into adjacent aquatic sites.
MILLIPEDES (Various species)				
Millipedes can be a pest in cool, wet springs in fields with heavy residue or high organic matter. They can be misidentified as wireworms. Ensure that proper identification has been made.				
No registered products available at this time.				

CORN INSECTS

Table 1–3. Control Options for Insects in Field and Seed Corn — Black Cutworm

LEGEND: PHI = Pre-Harvest Interval (days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
BLACK CUTWORM (*Agrotis ipsilon*)					
Seed Treatment					
In Ontario, the use of neonicotinoid seed treatments on corn and soybean seed is restricted. See the Ontario website on Neonicotinoid Regulations at www.ontario.ca/page/neonicotinoid-regulations for more information on the requirements to use these products. Clothianidin may not be used as a corn seed treatment solely for protection from black cutworm. However, seed treatments used for the control of other soil insect pests may provide early-season protection from young black cutworm larvae. Black cutworm is a sporadic pest. Using seed treatments specifically for black cutworm control is not needed unless the field has had a continuous history of cutworm injury. **NOTE:** The planting of neonicotinoid-treated corn and soybean seed can pose a risk to pollinators. This includes all clothianidin, imidacloprid and thiamethoxam products. The contaminated insecticide dust emitted from pneumatic planters can drift onto flower and water sources and expose bees to these insecticides. Only a dust-reducing fluency agent is permitted to be used as a seed flow lubricant for corn or soybean seed treated with neonicotinoid insecticides clothianidin, thiamethoxam or imidacloprid. Talc and graphite are not permitted for use in this way. Growers are encouraged to follow best management practices (BMPs) to protect pollinators at planting. To help minimize the dust generated during planting, refer to *Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices* on the Health Canada website at www.canada.ca/pollinators. If treated seeds are spilled outdoors or in areas accessible to birds, promptly clean up or bury to prevent ingestion.	chlorantraniliprole	Lumivia	0.25 mg a.i./seed	N/A	**For use in commercial seed treatment facilities only.** It is not for use in on-farm treating systems such as hopper-box or slurry-box applications just prior to planting. This product contains no colourant. An appropriate colourant must be added when this product is applied. Do not make a subsequent foliar application of any Group 28 insecticide (e.g., Coragen or Voliam Xpress) for a minimum of 60 days after planting seed treated with Lumivia. Toxic to birds and small wild mammals. Any spilled or exposed seed must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to aquatic organisms. Do not apply where contamination of groundwater or run-off into aquatic sites is possible.
	clothianidin **(See NOTE.)**	NipsIt INSIDE 600 Poncho 250	33.3 mL/ 80,000 kernels	N/A	**For seed corn only.** The use of neonicotinoid seed treatments for black cutworm control is not permitted on field corn. **For use in commercial seed treatment facilities only.** Seed-applied insecticides can affect seed drop and final plant stands. Use approved lubricant as required to minimize dust and ensure planting accuracy. A 30-day plant-back interval for cereal grains, grasses, soybeans and dry beans is required. This product contains no colourant. An appropriate colourant must be added when this product is applied. Toxic to birds and small wild mammals. Any spilled or exposed seed must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to aquatic organisms. Do not apply where contamination of groundwater or run-off into aquatic sites is possible.
	cyantraniliprole	Fortenza	0.25 mg a.i./seed or 167 mL/100 kg seed	N/A	**For use in commercial seed treatment facilities only.** Apply Fortenza as a water-based slurry utilizing standard slurry seed treatment equipment that provides uniform seed coverage. Follow resistance management instructions as stated on label. Do not apply subsequent applications of a Group 28 insecticide (e.g., Coragen or Voliam Xpress) following Fortenza seed treatment. This product contains no colourant. An appropriate colourant must be added when this product is applied. Toxic to birds. Any spilled or exposed seed must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to aquatic organisms. Do not apply directly to freshwater habitats, estuaries or marine habitats. Avoid application to areas with a moderate to steep slope, compacted soil or clay.

CORN INSECTS

Table 1–3. Control Options for Insects in Field and Seed Corn — Black Cutworm

LEGEND: PHI = Pre-Harvest Interval (days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
BLACK CUTWORM (*Agrotis ipsilon*) (continued)					
Soil-Applied at Planting Only					
Risk factors for black cutworm infestations include fields with winter annual weeds and volunteer wheat before planting, no-till fields or heavy soybean residue. Control annual weeds at least 3 weeks prior to planting to reduce attraction by adult moths flying in from the south.	tefluthrin	Force 3.0G	37.5 g/ 100-m (328-ft) row	N/A	Soil-applied control is not as good as a well-timed rescue treatment. May be applied as a banded or in-furrow application. For banded applications, place directly in a 15-cm band ahead of the press wheel. For in-furrow application, place all material directly in the open seed furrow, behind the planter disc openers. Toxic to birds and small wild mammals. Any spilled or exposed granules must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to aquatic organisms. Do not apply when weather conditions favour runoff from treated areas into adjacent aquatic sites.
Transgenic Corn					
Use transgenic corn specifically for black cutworm control only in those fields with a history of cutworm infestations, as this pest is sporadic and may only require foliar control when thresholds are reached.	Bt corn	Agrisure 3120 E-Z Refuge Agrisure 3122 E-Z Refuge Agrisure 3110 Viptera Agrisure 3111 Viptera Agrisure Viptera 3220 E-Z Refuge Agrisure Viptera 3330 E-Z Refuge Agrisure Duracade 5122 E-Z Refuge Agrisure Duracade 5222 E-Z Refuge Optimum AcreMax Optimum AcreMax Leptra Optimum AcreMax XTreme Optimum Intrasect PowerCore PowerCore Enlist Qrome SmartStax SmartStax Enlist SmartStax Refuge Advanced Tricepta	See Table 9–7. *Bt Corn Products/Traits Currently Available in Canada — as of October 2020* for Bt corn options.	N/A	**Only Bt hybrids containing Cry1F or Vip3A provide protection from black cutworm larvae.** May only control young larvae. Keep careful and accurate records and report any unexpected injury to your corn agronomist or OMAFRA field crop entomologist for Bt hybrids that should be providing protection.

CORN INSECTS

Table 1–3. Control Options for Insects in Field and Seed Corn — Black Cutworm

LEGEND: PHI = Pre-Harvest Interval (days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
BLACK CUTWORM (*Agrotis ipsilon*) (continued)					
Rescue Treatments					
Scout early. Black cutworms are easier to control when larvae are small. Look for leaf-feeding (pinholes) by young climbing larvae as the first sign of damage. If more than 10% of plants show leaf feeding, or 3% of the plants are cut at the base and larvae are smaller than 2.5 cm, treating at this time will provide nearly 100% control. Visit the Great Lakes and Maritimes Pest Monitoring Network for real-time trapping maps and results on black cutworm and other corn pests found on Field Crop News: fieldcropnews.com/ for more information.	chlorantraniliprole	Coragen	250 mL/ha (101 mL/acre)	field corn: 14 seed corn: 1	Use a minimum of 100 L/ha of water. Maximum 4 applications/yr. 12-hr restricted entry interval. Do not make a foliar application of Coragen insecticide for a minimum of 60 days after planting of seed treated with any Group 28 insecticide (i.e., Fortenza or Lumivia). Toxic to aquatic organisms. Do not apply this product directly to freshwater, estuarine and marine habitats. Observe buffer zones specified. Toxic to certain beneficial insects. Minimize spray drift to reduce harmful effects to beneficial insect in habitats adjacent to application site.
	chlorpyrifos	Citadel 480 EC Lorsban 4E Pyrinex 480 EC Sharphos Insecticide	1.2–2.4 L/ha (480–960 mL/acre)	70	**Apply at seedling stage only.** For best results, apply in the evening. Maximum 1 application/yr. 24-hr restricted entry interval. Toxic to bees exposed to direct treatment, drift or residues on blooming plants. DO NOT use on flowering crops or weeds. DO NOT apply this product or allow it to drift to flowering crops or weeds if bees are visiting the treatment area. Applicators should inform local beekeepers prior to application if hives are in adjacent fields. This product contains a petroleum distillate which is moderately to highly toxic to aquatic organisms. Avoid contamination of aquatic systems during application. Drift and runoff from treated areas may be hazardous to aquatic organisms in adjacent aquatic sites.
	cypermethrin	Mako	175 mL/ha (70 mL/acre)	21	**Apply at seedling stage only.** Apply under warm, moist conditions in evening or night when cutworms are most active. Do not disturb soil for 5 days after application. Toxic to bees and other beneficial insects. Avoid spraying when bees are foraging. Avoid application during the crop blooming period. If application must be made during flowering, restrict application to evening when most bees are not foraging.

CORN INSECTS

Table 1–3. Control Options for Insects in Field and Seed Corn — Black Cutworm

LEGEND: PHI = Pre-Harvest Interval (days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
BLACK CUTWORM (*Agrotis ipsilon*) (continued)					
Rescue Treatments (continued)					
(continued)	lambda-cyhalothrin	Labamba Matador 120 EC Silencer 120 EC	83 mL/ha (34 mL/acre)	silage: 14 field and seed: 21	**Apply at seedling stage only.** Apply under warm, moist conditions in evening or night when cutworms are most active. Do not disturb soil for 5 days after application. 24-hr restricted entry interval. 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. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.
	permethrin	Ambush 500 EC	140 mL/ha (60 mL/acre)	30	**Apply at seedling stage only.** Apply under warm, moist conditions in evening or night when cutworms are most active. Do not disturb the soil for 5 days after application. Toxic to bees. Avoid spraying when bees are foraging. Spray deposit should be dry before bees commence foraging in treated crop. This product contains a petroleum distillate which is moderately to highly toxic to aquatic organisms. Avoid contamination of aquatic systems during application. Observe buffer zones specified on the label.
		Perm-UP Pounce 384 EC	180–390 mL/ha (73–158 mL/acre)		

CORN INSECTS

Table 1–4. Control Options for Insects in Field and Seed Corn — Seedcorn Maggot, Seedcorn Beetle

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
SEEDCORN MAGGOT (*Delia platura*)				
Seed Treatment For all seed treatments, use full rate and ensure good coverage of seed.				
In Ontario, the use of neonicotinoid seed treatments on corn and soybean seed is restricted. See the Ontario website on Neonicotinoid Regulations at www.ontario.ca/page/neonicotinoid-regulations for more information on the requirements to use these products. Seedcorn maggot problems in corn are rare in Ontario. Use seed treatments in high-risk fields where large amounts of recently incorporated manure, green manure or residue, in fields that are freshly tilled or when cool, unfavourable emergence conditions exist. **NOTE:** The planting of neonicotinoid-treated corn and soybean seed can pose a risk to pollinators. This includes all clothianidin, imidacloprid and thiamethoxam products. The contaminated insecticide dust emitted from pneumatic planters can drift onto flower and water sources and expose bees to these insecticides. Only a dust-reducing fluency agent is permitted to be used as a seed flow lubricant for corn or soybean seed treated with neonicotinoid insecticides clothianidin, thiamethoxam or imidacloprid. Talc and graphite are not permitted for use in this way. Growers are encouraged to follow best management practices (BMPs) to protect pollinators at planting. To help minimize the dust generated during planting, refer to *Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices* on the Health Canada website at www.canada.ca/pollinators.	chlorantraniliprole	Lumivia	0.25 mg a.i./seed	**Provides suppression only. For use in commercial seed treatment facilities only.** It is not for use in on-farm treating systems such as hopper-box or slurry-box applications just prior to planting. Do not make a subsequent foliar application of any Group 28 insecticide (e.g., Coragen or Voliam Xpress) for a minimum of 60 days after planting seed treated with Lumivia. This product contains no colourant. An appropriate colourant must be added when this product is applied. Toxic to birds and small wild mammals. Any spilled or exposed seed must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to aquatic organisms. Do not apply where contamination of groundwater or run-off into aquatic sites is possible.
	clothianidin **(See NOTE.)**	NipsIt INSIDE 600 Poncho 250	33.3 mL/ 80,000 kernels	**For use in commercial seed treatment facilities only.** Seed-applied insecticides can affect seed drop and final plant stands. Use approved lubricant as required to minimize dust and ensure planting accuracy. A 30-day plant-back interval for cereal grains, grasses, soybeans and dry beans is required. This product contains no colourant. An appropriate colourant must be added when this product is applied. Toxic to birds and small wild mammals. Any spilled or exposed seed must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to aquatic organisms. Do not apply where contamination of groundwater or run-off into aquatic sites is possible.

CORN INSECTS

Table 1–4. Control Options for Insects in Field and Seed Corn — Seedcorn Maggot, Seedcorn Beetle

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
SEEDCORN MAGGOT (*Delia platura*)(continued)				
Seed Treatment (continued)				
(continued)	cyantraniliprole	Fortenza	0.25 mg a.i./seed or 167 mL/100 kg seed	**Provides suppression only. For use in commercial seed treatment facilities only.** Apply Fortenza as a water-based slurry utilizing standard slurry seed treatment equipment that provides uniform seed coverage. This product contains no colourant. An appropriate colourant must be added when this product is applied. Follow resistance management instructions as stated on label. Do not apply subsequent applications of a Group 28 insecticide (e.g., Coragen or Voliam Xpress) following Fortenza seed treatment. Toxic to birds. Any spilled or exposed seed must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to aquatic organisms. Do not apply directly to freshwater habitats, estuaries or marine habitats. Avoid application to areas with a moderate to steep slope, compacted soil or clay.
	thiamethoxam **(See NOTE.)**	Cruiser 5 FS	16.7–33.3 mL/ 80,000 kernels	**For use in commercial seed treatment facilities only.** Seed-applied insecticides can affect seed drop and final plant stands. Use approved lubricant as required to minimize dust and ensure planting accuracy. Do not graze or feed livestock on treated areas for 45 days after planting. This product contains no colourant. An appropriate colourant must be added when this product is applied. Toxic to birds and small wild mammals. Any spilled or exposed seed must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to fish and aquatic organisms. Do not apply directly to water or to areas where surface water is present.
Soil-Applied at Planting Only				
In-furrow application is safer to the applicator and non-target animals than T-band application.	tefluthrin	Force 3.0G	37.5 g/100-m (328-ft) row	**In-furrow application only.** Place directly in the seed furrow behind the planter disc openers. Toxic to birds and small wild mammals. Any spilled or exposed granules must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to aquatic organisms. Do not apply when weather conditions favour runoff from treated areas into adjacent aquatic sites.
SEEDCORN BEETLE (*Agonoderus lecontei* and *Clivina impressifrons*)				
Risk factors for seedcorn beetle infestations include no-till, cool, wet spring and slow crop emergence conditions.				
No registered products available at this time.				

CORN INSECTS

Table 1–5. Control Options for Insects in Field and Seed Corn — European Chafer, June Beetle, Japanese Beetle, Corn Flea Beetle

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
GRUBS — EUROPEAN CHAFER (*Amphimallon majalis*), JUNE BEETLE (*Phyllophaga* spp.) or JAPANESE BEETLE (*Popillia japonica*) Some products are also able to protect against other grub species. Refer to product labels for other grub species.				
Seed Treatment				
In Ontario, the use of neonicotinoid seed treatments on corn and soybean seed is restricted. See the Ontario website on Neonicotinoid Regulations at www.ontario.ca/page/neonicotinoid-regulations for more information on the requirements to use these products. See OMAFRA Publication 811, *Agronomy Guide for Field Crops*, for further information on insect biology and management options. **NOTE:** The planting of neonicotinoid-treated corn and soybean seed can pose a risk to pollinators. This includes all clothianidin, imidacloprid and thiamethoxam products. The contaminated insecticide dust emitted from pneumatic planters can drift onto flower and water sources and expose bees to these insecticides. Only a dust-reducing fluency agent is permitted to be used as a seed flow lubricant for corn or soybean seed treated with neonicotinoid insecticides clothianidin, thiamethoxam or imidacloprid. Talc and graphite are not permitted for use in this way. Growers are encouraged to follow best management practices (BMPs) to protect pollinators at planting. To help minimize the dust generated during planting, refer to *Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices* on the Health Canada website at www.canada.ca/pollinators.	chlorantraniliprole	Lumivia	0.25–0.75 mg a.i./seed	**For use in commercial seed treatment facilities only.** It is not for use in on-farm treating systems such as hopper-box or slurry-box applications just prior to planting. Toxic to aquatic organisms. Use higher rates in areas with high pressure. Do not make a subsequent foliar application of any Group 28 insecticide (e.g., Coragen or Voliam Xpress) for a minimum of 60 days after planting seed treated with Lumivia. This product contains no colourant. An appropriate colourant must be added when this product is applied. Toxic to birds and small wild mammals. Any spilled or exposed seed must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to aquatic organisms. Do not apply where contamination of groundwater or run-off into aquatic sites is possible.
	clothianidin **(See NOTE.)**	NipsIt INSIDE 600 Poncho 250	33.3 mL/ 80,000 kernels	**For use in commercial seed treatment facilities only.** Seed-applied insecticides can affect seed drop and final plant stands. Use approved lubricant as required to minimize dust and ensure planting accuracy. A 30-day plantback interval for cereal grains, grasses, soybeans and dry beans is required. This product contains no colourant. An appropriate colourant must be added when this product is applied. Toxic to birds and small wild mammals. Any spilled or exposed seed must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to aquatic organisms. Do not apply where contamination of groundwater or run-off into aquatic sites is possible.

CORN INSECTS

Table 1–5. Control Options for Insects in Field and Seed Corn — European Chafer, June Beetle, Japanese Beetle, Corn Flea Beetle

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
GRUBS — EUROPEAN CHAFER (*Amphimallon majalis*), JUNE BEETLE (*Phyllophaga* spp.) or JAPANESE BEETLE (*Popillia japanica*) (continued)				
Seed Treatment (continued)				
(continued)	cyantraniliprole	Fortenza	167 mL/ 100 kg seed	**For European chafer grubs only. For use in commercial seed treatment facilities only.** Apply Fortenza as a water-based slurry utilizing standard slurry seed treatment equipment that provides uniform seed coverage. Do not apply subsequent applications of a Group 28 insecticide (e.g., Coragen or Voliam Xpress) following Fortenza seed treatment. This product contains no colourant. An appropriate colourant must be added when this product is applied. Follow resistance management instructions as stated on label. Toxic to birds. Any spilled or exposed seed must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to aquatic organisms. Do not apply directly to freshwater habitats, estuaries or marine habitats. Avoid application to areas with a moderate to steep slope, compacted soil or clay.
	thiamethoxam **(See NOTE.)**	Cruiser 5 FS	16.7 mL/ 80,000 kernels	**For European chafer grubs only. For use in commercial seed treatment facilities only.** Seed-applied insecticides can affect seed drop and final plant stands. Use approved lubricant as required to minimize dust and ensure planting accuracy. Do not graze or feed livestock on treated areas for 45 days after planting. This product contains no colourant. An appropriate colourant must be added when this product is applied. Toxic to birds and small wild mammals. Any spilled or exposed seed must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to fish and aquatic organisms. Do not apply directly to water or to areas where surface water is present.

CORN INSECTS

Table 1–5. Control Options for Insects in Field and Seed Corn — European Chafer, June Beetle, Japanese Beetle, Corn Flea Beetle

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
CORN FLEA BEETLE (*Chaetocnema pulicaria*)				
Seed Treatment				
In Ontario, the use of neonicotinoid seed treatments on corn and soybean seed is restricted. See the Ontario website on Neonicotinoid Regulations at www.ontario.ca/page/neonicotinoid-regulations for more information on the requirements to use these products. Flea beetles are a vector of Stewart's bacterial wilt. It is uneconomical to spray corn with insecticides to protect against Stewart's wilt except in seed corn with highly susceptible inbreds. **NOTE:** The planting of neonicotinoid-treated corn and soybean seed can pose a risk to pollinators. This includes all clothianidin, imidacloprid and thiamethoxam products. The contaminated insecticide dust emitted from pneumatic planters can drift onto flower and water sources and expose bees to these insecticides. Only a dust-reducing fluency agent is permitted to be used as a seed flow lubricant for corn or soybean seed treated with neonicotinoid insecticides clothianidin, thiamethoxam or imidacloprid. Talc and graphite are not permitted for use in this way. Growers are encouraged to follow best management practices (BMPs) to protect pollinators at planting. To help minimize the dust generated during planting, refer to *Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices* on the Health Canada website at www.canada.ca/pollinators.	clothianidin **(See NOTE.)**	NipsIt INSIDE 600 Poncho 250	33.3 mL/ 80,000 kernels	**For seed corn only.** The use of neonicotinoid seed treatments solely for protection against flea beetles is not permitted on field corn. **For use in commercial seed treatment facilities only.** Seed-applied insecticides can affect seed drop and final plant stands. Use approved lubricant as required to minimize dust and ensure planting accuracy. A 30-day plant-back interval for cereal grains, grasses, soybeans and dry beans is required. This product contains no colourant. An appropriate colourant must be added when this product is applied. Toxic to birds and small wild mammals. Any spilled or exposed seed must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to aquatic organisms. Do not apply where contamination of groundwater or run-off into aquatic sites is possible.
	imidacloprid **(See NOTE.)**	Gaucho 600 FL	80 mL/ 80,000 kernels	**For seed corn only.** The use of neonicotinoid seed treatments solely for protection against flea beetles is not permitted on field corn. **For use in commercial seed treatment facilities only.** Ensure good coverage. Seed-applied insecticides can affect seed drop and final plant stands. Use approved lubricant as required to minimize dust and ensure planting accuracy. This product contains no colourant. An appropriate colourant must be added when this product is applied. Toxic to birds and small wild mammals. Any spilled or exposed seed must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to aquatic organisms. Do not apply where contamination of groundwater or run-off into aquatic sites is possible.
		Sombrero 600 FS	21.3 mL/ 80,000 kernels	
	thiamethoxam **(See NOTE.)**	Cruiser 5 FS	16.7–33.3 mL/ 80,000 kernels	**For seed corn only.** The use of neonicotinoid seed treatments solely for protection against flea beetles is not permitted on field corn. **For use in commercial seed treatment facilities only**. Seed-applied insecticides can affect seed drop and final plant stands. Use approved lubricant as required to minimize dust and ensure planting accuracy. Do not graze or feed livestock on treated areas for 45 days after planting. This product contains no colourant. An appropriate colourant must be added when this product is applied. Toxic to birds and small wild mammals. Any spilled or exposed seed must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to fish and aquatic organisms. Do not apply directly to water or to areas where surface water is present.

CORN INSECTS

Table 1–6. Control Options for Insects in Field and Seed Corn — European Corn Borer

LEGEND: PHI = Pre-Harvest Interval (days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
EUROPEAN CORN BORER (ECB) (*Ostrinia nubilalis*)					
Transgenic Corn					
To manage potential corn borer resistance, follow all insect resistance management strategies mandated by the Canadian Food Inspection Agency and recommended by the Canadian Corn Pest Coalition at: www.cornpest.ca.	Bt corn	Agrisure CB/LL Agrisure GT/CB/LL Agrisure 3010 Agrisure 3000GT Agrisure 3120 E-Z Refuge Agrisure 3122 E-Z Refuge Agrisure 3110 Viptera Agrisure 3111 Viptera Agrisure Viptera 3220 E-Z Refuge Agrisure Viptera 3330 E-Z Refuge Agrisure Duracade 5122 E-Z Refuge Agrisure Duracade 5222 E-Z Refuge Genuity VT Triple Pro Optimum AcreMax Optimum AcreMax Leptra Optimum AcreMax XTreme Optimum Intrasect PowerCore PowerCore Enlist Qrome SmartStax SmartStax Enlist SmartStax Refuge Advanced Trecepta VT Double PRO	See Table 9–7. *Bt Corn Products/Traits Currently Available in Canada — as of October 2020* for Bt corn options.	N/A	Insecticides have generally not provided economic control of ECB in field corn. Bt corn provides more consistent control. Use corn hybrids that express multiple Bt proteins against ECB. Avoid using single trait hybrids containing only one Bt protein against ECB as this increases the risk of resistance developing. ECB has developed resistance to Bt hybrids containing Cry1F in the Maritimes. Scout any ECB Bt hybrids and report suspected damage to your corn agronomist and OMAFRA field crop entomologist for further actions to be taken to mitigate the situation.

CORN INSECTS

Table 1–6. Control Options for Insects in Field and Seed Corn — European Corn Borer

LEGEND: PHI = Pre-Harvest Interval (days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
EUROPEAN CORN BORER (ECB) (*Ostrinia nubilalis*) (continued)					
Foliar Treatment					
See OMAFRA Publication 811, *Agronomy Guide for Field Crops*, to calculate economic thresholds.	acephate	Orthene	563–825 g/ha (228–334 g/acre)	21	**Ground application only.** Apply in 220–1,000 L of spray mix. Use the high rate only when heavy pest infestations are present. Do not feed corn fodder or forage from treated crop to livestock. Maximum 4 applications/season. 5-day restricted entry interval. 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. Minimize the spray drift to reduce harmful effects on bees in habitats close to the application site. Toxic to birds and wild mammals. Applications may adversely affect birds and wildlife visiting the treatment area. Toxic to aquatic organisms. Observe buffer zones as specified under directions of use.
	Bacillus thuringiensis	Bioprotec CAF	2.8–4.0 L/ha (1.1–1.6 L/acre)	1	**Ground application only.** This product is a good option for organically grown corn. Apply at first signs of infestation when larvae are small. Repeat applications, according to economic threshold, as necessary to maintain control. Use a minimum of 300 L/ha of water. This product is more effective when no rain occurs within 24–48 hr after application. Maximum 6 applications/yr.
		Dipel 2X DF	0.56–1.12 kg/ha (0.22–0.45 kg/acre)	1	This product is a good option for organically grown corn. Apply when pinhole feeding is observed in at least 5% of the plants. Repeat at 7-day intervals. Only effective against small larvae and must be applied before larvae begin stalk boring.
	chlorantraniliprole	Coragen	250–375 mL/ha (101–151 mL/acre)	field corn: 14 seed corn: 1	Time ground and/or aerial application to coincide with peak egg hatch. Use a minimum of 100 L/ha of water. Maximum 4 applications/yr. 12-hr restricted entry interval. Do not make a foliar application of Coragen insecticide for a minimum of 60 days after planting of seed treated with any Group 28 insecticide (i.e., Fortenza or Lumivia). Toxic to aquatic organisms. Do not apply this product directly to freshwater, estuarine and marine habitats. Observe buffer zones specified. Toxic to certain beneficial insects. Minimize spray drift to reduce harmful effects to beneficial insects in habitats adjacent to application site.

CORN INSECTS

Table 1–6. Control Options for Insects in Field and Seed Corn — European Corn Borer

LEGEND: PHI = Pre-Harvest Interval (days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
EUROPEAN CORN BORER (ECB) (*Ostrinia nubilalis*) (continued)					
Foliar Treatment (continued)					
See OMAFRA Publication 811, *Agronomy Guide for Field Crops*, to calculate economic thresholds.	cypermethrin	Mako	175 mL/ha (70 mL/acre)	5	Ground and aerial application. Apply when egg masses begin to hatch but no later than when 1st feeding occurs on foliage. For 2nd brood in late planting, apply before tassels show. Use a minimum 300–500 L water/ha for ground application and 11–22 L/ha for aerial application. Maximum 3 applications/yr. Do not apply more than 2 applications by air. Restricted entry interval when foliage dries. Toxic to bees and other beneficial insects. Avoid spraying when bees are foraging. Avoid application during the crop blooming period. If application must be made during flowering, restrict application to evening when most bees are not foraging.
		Ship 250	280 mL/ha (110 mL/acre)	5	Spray no later than when the first feeding is seen on foliage. This product is very toxic to fish and aquatic organisms. This product is toxic to predacious mites and other beneficial predacious arthropods. Do not apply when weather conditions favour drift from target area. This product is very toxic to bees; avoid spraying when bees are foraging. Spray deposit should be dry before bees commence foraging in treated crop.
	deltamethrin	Decis 5 EC	250–300 mL/ha (100–120 mL/acre)	1	Time ground and aerial application when egg masses begin to hatch but no later than when 1st pinhole feeding occurs on foliage. For 2nd brood in late planting, apply before tassels show. Repeat in 5–8-day intervals. Use at least 240 L water/ha. Maximum 3 applications/yr. Do not feed silage or stubble to dairy cattle. 12-hr restricted entry interval. Toxic to bees for 1 day after application. DO NOT apply when crop or weeds are in bloom. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.
		Decis 100 EC	125–150 mL/ha (50–60 mL/acre)	1	Ground application only. Apply when egg masses begin to hatch, but no later than when the first pinhole feeding is seen on the leaves. Direct spray into the whorl of the plant. Repeat at 5–8-day intervals. For control of second generation, direct spray at ear zone. Use at least 240 L water/ha for ground. Maximum 3 applications/yr. 12-hr restricted entry interval. Toxic to bees for 1 day after application. DO NOT apply when crop or weeds are in bloom. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild animals.

CORN INSECTS

Table 1–6. Control Options for Insects in Field and Seed Corn — European Corn Borer

LEGEND: PHI = Pre-Harvest Interval (days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
EUROPEAN CORN BORER (ECB) (*Ostrinia nubilalis*) (continued)					
Foliar Treatment (continued)					
See OMAFRA Publication 811, *Agronomy Guide for Field Crops*, to calculate economic thresholds.	lambda-cyhalothrin	Labamba Matador 120 E Silencer 120 EC	83–187 mL/ha (34–76 mL/acre)	silage: 14 field and seed: 21	Ground and aerial application. For best results, apply in the early morning, before temperatures rise, or during the evening, past the heat of the day. Use 100–200 L water/ha for ground application, 10–40 L water/ha for aerial application. Spray no later than 10 days after egg hatch. Maximum 3 applications/yr. Do not apply more than 2 applications of 83 mL/ha by air. 24-hr restricted entry interval. 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. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.
	lambda-cyhalothrin + chlorantraniliprole	Voliam Xpress	500 mL/ha (200 mL/acre)	silage: 14 field and seed: 21	Apply no later than when the first feeding is seen on foliage. Re-apply after 7 days, depending on the presence of significant populations as determined by local monitoring. This treatment will not prevent internal cob damage if the insect has penetrated the ear. Allow a 7-day interval between treatments. For ground application, apply in a minimum of 150 L of water/ha. For aerial application, apply in a minimum of 40 L of water/ha. 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. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.

CORN INSECTS

Table 1–6. Control Options for Insects in Field and Seed Corn — European Corn Borer

LEGEND: PHI = Pre-Harvest Interval (days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
EUROPEAN CORN BORER (ECB) (*Ostrinia nubilalis*) (continued)					
Foliar Treatment (continued)					
See OMAFRA Publication 811, *Agronomy Guide for Field Crops*, to calculate economic thresholds. Visit the Great Lakes and Maritimes Pest Monitoring Network for real-time trapping maps and results on ECB and other corn pests found on Field Crop News: fieldcropnews.com/	methoxyfenozide	Intrepid	300–600 mL/ha (120–240 mL/acre)	21	Apply at the first signs of feeding damage before the insect enters the ear. Monitoring of insect populations is key to controlling this pest. Direct application at the whorl for early-season (first-generation) infestations. Repeat applications after 5–10 days if required, based on population monitoring. Use the higher rate for heavy infestations or larger crop canopies. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.
	spinetoram	Delegate	120–210 g/ha (50–85 g/acre)	grain: 28 days silage: 7 days	Ground and aerial application. Use the higher rate for heavy infestations and for large larvae. Repeat applications based on monitoring of insect populations. Apply a maximum of 3 applications/yr with a minimum of 5 days between applications. 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. Toxic to small wild mammals. May be toxic to certain beneficial insects. Minimize spray drift to reduce harmful effects on beneficial insects in habitats next to the application site.

CORN INSECTS

Table 1–7. Control Options for Insects in Field and Seed Corn — Western Bean Cutworm

LEGEND: PHI = Pre-Harvest Interval (days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
WESTERN BEAN CUTWORM (*Striacosta albicosta*)					
Transgenic Corn					
Follow all insect resistance management strategies mandated by the Canadian Food Inspection Agency and recommended by the Canadian Corn Pest Coalition at www.cornpest.ca. Do not solely rely on Bt hybrids for WBC control. Repeated use of Bt hybrids will lead to resistance. Rotate this technology with foliar insecticides to delay resistance.	Bt corn	Agrisure 3110 Viptera Agrisure 3111 Viptera Agrisure Viptera 3220 E-Z Refuge Agrisure Viptera 3330 E-Z Refuge Agrisure Duracade 5222 E-Z Refuge Optimum AcreMax Leptra Tricepta	See Table 9–7. *Bt Corn Products/Traits Currently Available in Canada — as of October 2020*, for Bt corn options.	N/A	Only Bt corn hybrids containing Vip3A provide full control. This means that these are only single trait and should not be used every year due to the risk of resistance. Bt corn hybrids containing Cry1F no longer provide protection against WBC. Keep careful and accurate records. Scout for unexpected damage on hybrids containing Vip3A and report any injury to your corn agronomist and OMAFRA field crop entomologist.
Foliar Treatment					
Use pheromone traps to monitor for pest presence and peak flight. Focus scouting efforts on the top 3–4 leaves of the plant during pre-tassel to fresh silk stage. Look for egg masses and young larvae. Eggs hatch 1 or 2 days after turning purple. Spray is warranted if during three scouting trips, 5% of the plants have eggs or small larvae, accumulative. Spray is only effective on small larvae, prior to them entering the ear. Additional impact on quality can be expected from ear rots and secondary pests that may enter and feed on the damaged ears. Visit the Great Lakes and Maritimes Pest Monitoring Network for real-time trapping maps and results on WBC and other corn pests on Field Crop News at: fieldcropnews.com/. Additional information on pest status and management recommendations is also available on Field Crop News.	chlorantraniliprole	Coragen	250–375 mL/ha (101–151 mL/acre)	field corn: 14 seed corn: 1	For ground application, use a minimum water volume of 100 L/ha and 50 L/ha for aerial. Thorough coverage is required to obtain optimum control. Use high rate of Coragen under heavy pest pressure. Minimum of 3 days between applications. Maximum 4 applications/yr. 12-hr restricted entry interval. Do not exceed a total of 1.125 L of Coragen/ha per season. Do not make a foliar application of Coragen insecticide for a minimum of 60 days after planting of seed treated with any Group 28 insecticide (i.e., Fortenza or Lumivia). Toxic to aquatic organisms. Do not apply this product directly to freshwater, estuarine and marine habitats. Observe buffer zones specified. Toxic to certain beneficial insects. Minimize spray drift to reduce harmful effects to beneficial insects in habitats adjacent to application site.

CORN INSECTS

Table 1–7. Control Options for Insects in Field and Seed Corn — Western Bean Cutworm

LEGEND: PHI = Pre-Harvest Interval (days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
WESTERN BEAN CUTWORM (*Striacosta albicosta*) (continued)					
Foliar Treatment (continued)					
(continued)	deltamethrin	Decis 5 EC	250–300 mL/ha (100–120 mL/acre)	1	Ground and aerial application. Apply when egg masses begin to hatch. Use at least 240 L water/ha. Maximum 3 applications/yr. Do not feed silage or stubble to dairy cattle. 12-hr restricted entry interval. Toxic to bees for 1 day after application. DO NOT apply when crop or weeds are in bloom. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.
		Decis 100 EC	125–150 mL/ha (50–60 mL/acre)	1	Application should be based on the presence of vulnerable pest developmental stages and significant populations as determined by local monitoring. Use at least 240 L water/ha for ground and 11–22 L water/ha for aerial. Maximum 3 applications/yr. 12-hr restricted entry interval. Toxic to bees for 1 day after application. DO NOT apply when crop or weeds are in bloom. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.
		Poleci 2.5 EC	500–600 mL/ha	5	Ground application only. Apply when egg masses begin to hatch. Use at least 240 L water/ha. Maximum 3 applications/yr. To minimize residues in high organic (muck) soils, apply before August 1. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.
	lambda-cyhalothrin	Labamba Matador 120 E	83–187 mL/ha (34–76 mL/acre)	silage: 14 field and seed: 21	Ground and aerial application. For best results, apply in the early morning, before temperatures rise, or during the evening. Use 100–200 L water/ha for ground application, 10–40 L water/ha for aerial application. Spray no later than 10 days after egg hatch. Maximum 3 applications/yr. Do not apply more than 2 applications of 83 mL/ha by air. 24-hr restricted entry interval. 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. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.

CORN INSECTS

Table 1–7. Control Options for Insects in Field and Seed Corn — Western Bean Cutworm

LEGEND: PHI = Pre-Harvest Interval (days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
WESTERN BEAN CUTWORM (*Striacosta albicosta*) (continued)					
Foliar Treatment (continued)					
(continued)	lambda-cyhalothrin + chlorantraniliprole	Voliam Xpress	500 mL/ha (200 mL/acre)	silage: 14 field and seed: 21	Apply no later than when the first feeding is seen. Re-apply after 7 days, depending on the presence of significant populations as determined by local monitoring. This treatment will not prevent internal cob damage if the insect has penetrated the ear. Allow a 7-day interval between treatments. For ground application — apply in a minimum of 150 L of water/ha. For aerial application — apply in a minimum of 40 L of water/ha. 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. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.
	methoxyfenozide	Intrepid	600 mL/ha (240 mL/acre)	21	Applications should be timed at egg hatch or to small larvae. Repeat applications based on monitoring of insect populations. Apply a maximum of 3 applications/yr. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.
	spinetoram	Delegate	120–210 g/ha (50–85 g/acre)	field corn: 28 silage: 7	For the control of western bean cutworm, apply Delegate at the rate of 120–210 g/ha in sufficient water volume for complete coverage of the plant foliage. Applications should be timed at egg hatch or to small larvae. Use the higher rate for heavy infestations and for large larvae. Repeat applications based on monitoring of insect populations. Apply a maximum of 3 applications/yr with a minimum of 5 days between applications. Toxic to small wild mammals. May be toxic to certain beneficial insects. Minimize spray drift to reduce harmful effects on beneficial insects in habitats next to the application site.

CORN INSECTS

Table 1–8. Control Options for Insects in Field and Seed Corn — Armyworm, Corn Leaf Aphid, Brown Marmorated Stink Bug, Potato Stem Borer, Slugs, Sap Beetles

LEGEND: PHI = Pre-Harvest Interval (days)

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
ARMYWORM (TRUE – *Pseudaletia unipuncta*, FALL – *Spodoptera frugiperda*)					
Foliar Treatment					
Late-planted corn is most susceptible to leaf and whorl feeding by armyworm. **True armyworm (TAW):** Insecticide may be warranted in seedling corn if there are two or more unparasitized larvae per seedling, and feeding damage exceeds 10%. In corn past the 6-leaf stage, if 50% of the plants are showing damage and are infested with larvae smaller than 2.5 cm, insecticide treatment may be warranted. **Fall armyworm (FAW):** Insecticide may be warranted if 50% of the plants are infested with unparasitized larvae smaller than 2.5 cm. However, damage is usually not economically significant unless infestations are high, and feeding is concentrated on the undeveloped tassels. If larvae have white eggs attached to them, they are parasitized and may not need treatment. If larvae are 2.0 cm or larger, chemical control will not work well. Once the larvae are in the corn ear, insecticides cannot provide control. Visit the Great Lakes and Maritimes Pest Monitoring Network for real-time trapping maps and results on TAW, FAW and other corn pests on Field Crop News at: fieldcropnews.com/.	chlorantraniliprole	Coragen	250–375 mL/ha (101–151 mL/acre)	field corn: 14 seed corn: 1	Ground and aerial application. Use a minimum of 100 L/ha of water. Maximum 4 applications/yr. 12-hr restricted entry interval. Do not make a foliar application of Coragen insecticide for a minimum of 60 days after planting of seed treated with any Group 28 insecticide (i.e., Fortenza or Lumivia). Toxic to aquatic organisms. Do not apply this product directly to freshwater, estuarine and marine habitats. Observe buffer zones specified. Toxic to certain beneficial insects. Minimize spray drift to reduce harmful effects to beneficial insects in habitats adjacent to application site.
	lambda-cyhalothrin	Labamba Matador 120 E	True armyworm: 83–208 mL/ha (34–84 mL/acre) Fall armyworm: 83 mL/ha (34 mL/acre)	silage: 14 field and seed: 21	Ground and aerial application. For best results, apply in the early morning, before temperatures rise, or during the evening. Use 100–200 L water/ha for ground application, 10–40 L water/ha for aerial application. Spray no later than 10 days after egg hatch. Maximum 3 applications/yr. Do not apply more than 2 applications of 83 mL/ha by air. 24-hr restricted entry interval. 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. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.
		Silencer 120 EC	83 mL/ha (34 mL/acre)	silage: 14 field and seed: 21	
	lambda-cyhalothrin + chlorantraniliprole	Voliam Xpress	500 mL/ha (200 mL/acre)	silage: 14 field and seed: 21	Apply no later than when the first feeding is seen. Re-apply after 7 days, depending on the presence of significant populations as determined by local monitoring. This treatment will not prevent internal cob damage if the insect has penetrated the ear. Allow a 7-day interval between treatments. For ground application — apply in a minimum of 150 L of water/ha. For aerial application — apply in a minimum of 40 L of water/ha. Do not apply more than 2 applications per year. 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. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.

CORN INSECTS

Table 1–8. Control Options for Insects in Field and Seed Corn — Armyworm, Corn Leaf Aphid, Brown Marmorated Stink Bug, Potato Stem Borer, Slugs, Sap Beetles

LEGEND: PHI = Pre-Harvest Interval (days)

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
CORN LEAF APHID (*Rhopalosiphum maidis*)					
If 50% of all plants during the late-whorl-to-early-tassel stage have 400 aphids per plant, or if honeydew accumulation is impeding pollination and plants are under moisture stress, control is required. Control is not warranted once pollination has occurred.	flupyradifurone	Sivanto Prime	500–750 mL/ha (202–303 mL/acre)	21	The maximum amount of Sivanto Prime allowed per crop season is 2,000 mL/ha. Apply as a foliar application ensuring thorough coverage. Do not make any application of Sivanto Prime following soil, in-furrow or seed treatment applications of a Group 4D insecticide. Toxic to adult bees in laboratory studies via oral exposure, however, not toxic to bees through contact exposure, and field studies conducted with this product have shown no effects on honeybee colony development. Minimize spray drift to reduce exposure to bees in habitats close to the application site. Application during the crop blooming period, and when flowering weeds are present, may only be made in the early morning and the evening when most bees are not foraging. Toxic to aquatic organisms. Observe buffer zones specified on the label. Toxic to certain beneficial insects. Minimize spray drift to reduce harmful effects on beneficial insects in habitats next to the application sites.
	sulfoxaflor	Closer	75–150 mL/ha (30—60 mL/acre)	grain: 14 days forage: 7 days	Ground and aerial application. Maximum 2 applications/yr with a minimum of 7 days between applications. For aerial application, use a minimum spray volume of 30 L/ha. Do not apply Closer during crop flowering period or when flowering weeds are present in the treatment area. Toxic to certain beneficial insects. Minimize spray drift to reduce harmful effects on beneficial insects in habitats next to the application site such as hedgerows and woodland. Toxic to bees. Bees can be 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 site. Bees can be exposed to product residues in flowers, leaves, pollen and/or nectar resulting from foliar applications.
BROWN MARMORATED STINK BUG (*Halyomorpha halys*)					
This is a new invasive species in Ontario and is established in many urban areas of Ontario, though infestations have not been detected in field crops in Ontario as of 2020. Brown marmorated stink bugs (BMSBs) are most likely to enter corn and soybean fields once the crop has an ear developing or a pod forming. Scout fields once a week, inspecting 5 areas within the first 12 m of the field's edge. No thresholds have been established for corn or soybeans in Ontario yet. If this pest is found in corn or soybeans, please contact the OMAFRA Agricultural Information Contact Centre at: 1-877-424-1300 or ag.info.omafra@ontario.ca. Management strategies are under development. Up-to-date information is available at ontario.ca/stinkbug.					
POTATO STEM BORER (*Hydraecia micacea*)					
No insecticides are registered.					
SLUGS (Various species)					
Usually not an economic pest because growing point is not affected.					
SAP BEETLES (*Glischrochilus quadrisignatus*)					
Not an economic pest but can carry *Fusarium*.					

CORN INSECTS

Table 1–9. Control Options for Insects in Field and Seed Corn — Corn Earworm, Two-Spotted Spidermites

LEGEND: PHI = Pre-Harvest Interval (days)

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
CORN EARWORM (CEW) (*Helicoverpa zea*)					
Insecticides have generally not provided economic control of CEW in field corn. There may be some value in treating seed corn to maintain kernel quality. For best results, apply at or shortly after egg hatch. Target insecticides to cover the corn ear and silks. Visit the Great Lakes and Maritimes Pest Monitoring Network for real-time trapping maps and results on CEW and other corn pests on Field Crop News at: fieldcropnews.com.	chlorantraniliprole	Coragen	250–375 mL/ha (101–151 mL/acre)	field corn: 14 seed corn: 1	Ground and aerial application. Use a minimum of 100 L/ha of water. Maximum 4 applications/yr. 12-hr restricted entry interval. Do not make a foliar application of Coragen insecticide for a minimum of 60 days after planting of seed treated with any Group 28 insecticide (i.e., Fortenza or Lumivia). Toxic to aquatic organisms. Do not apply this product directly to freshwater, estuarine and marine habitats. Observe buffer zones specified. Toxic to certain beneficial insects. Minimize spray drift to reduce harmful effects to beneficial insects in habitats adjacent to application site.
	cypermethrin	Mako	175 mL/ha (70 mL/acre)	5	Ground and aerial application. Ensure good coverage of ears and silks. Use minimum 300–500 L/ha of water for ground application and 11–22 L/ha for aerial application. Maximum 3 applications/yr. Do not apply more than 2 applications by air. Restricted entry interval when foliage dries. Toxic to bees and other beneficial insects. Avoid spraying when bees are foraging. Avoid application during the crop blooming period. If application must be made during flowering, restrict application to evening when most bees are not foraging.
	deltamethrin	Decis 100 EC	125–150 mL/ha (50–60 mL/acre)	1	Application should be based on the presence of vulnerable pest developmental stages and significant populations as determined by local monitoring. Use at least 240 L water/ha for ground and 11–22 L water/ha for aerial. Maximum 3 applications/yr. 12-hr restricted entry interval. Toxic to bees for 1 day after application. DO NOT apply when crop or weeds are in bloom. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Tox to small wild mammals.
	lambda-cyhalothrin	Labamba Matador 120 E	83–187 mL/ha (34–76 mL/acre)	silage: 14 field and seed: 21	Ground and aerial application. For best results, apply in the early morning, before temperatures rise, or during the evening. Use 100–200 L water/ha for ground application, 10–40 L water/ha for aerial application. Spray no later than 10 days after egg hatch. Maximum 3 applications/yr. Do not apply more than 2 applications of 83 mL/ha by air. 24-hr restricted entry interval. 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. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.
		Silencer 120 EC	83 mL/ha (34 mL/acre)		

CORN INSECTS

Table 1–9. Control Options for Insects in Field and Seed Corn — Corn Earworm, Two-Spotted Spidermites

LEGEND: PHI = Pre-Harvest Interval (days)

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
CORN EARWORM (CEW) (*Helicoverpa zea*) (continued)					
(continued)	lambda-cyhalothrin + chlorantraniliprole	Voliam Xpress	500 mL/ha (200 mL/acre)	silage: 14 field and seed: 21	Apply no later than when the first feeding is seen. Re-apply after 7 days, depending on the presence of significant populations as determined by local monitoring. This treatment will not prevent internal cob damage if the insect has penetrated the ear. Allow a 7-day interval between treatments. For ground application — apply in a minimum of 150 L of water/ha. For aerial application — apply in a minimum of 40 L of water/ha. 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. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.
TWO-SPOTTED SPIDER MITES (*Tetranychus uricae*)					
Spider mites can be an economic pest in seed corn, particularly in hot, dry years. Populations can flare up shortly after applications of pyrethroid insecticides, as these insecticides control the natural enemies but have no activity on the pest.	spiromesifen	Oberon	400–600 mL/ha (160–240 mL/acre)	silage: 5 field and seed: 30	For use in field, seed and silage corn. Ground and aerial application. An adjuvant may be used to improve coverage and control. For best results, treat when mite populations begin to build and before a damaging population becomes established. This product is effective against the egg and nymph stages of whiteflies and mites. Use a minimum of 100 L/ha of water for ground application, 50 L/ha of water for aerial application. Maximum 2 applications/yr. 12-hr restricted entry interval. May be toxic to bee brood. Bee brood may be exposed to residues on pollen and nectar brought back to the hive by bees foraging on flowering crops and weeds. Toxic to aquatic organisms and non-target terrestrial plants. Observe buffer zones specified on the label. Toxic to certain beneficial insects. Minimize spray drift to reduce harmful effects on beneficial insects in habitats next to the application site. Consider site characteristics and conditions before application to reduce risk of runoff into aquatic habitats.

Field and Seed Corn

All field and seed corn should be treated with a fungicide seed treatment to prevent early-season preemergence and post-emergent damping-off disease. This will help reduce seed decay and seedling blights. Corn seedling diseases are prevalent under cool wet conditions that keep the soil temperatures below 13°C. Low-lying or poorly drained areas of the field are often the first to show disease problems. Seed rots and seedling blights are more severe in no-till or reduced-tillage fields since heavy residue will keep soil cooler and wetter longer than in conventional tilled fields. Damping-off will occur in conventional fields when the crop is planted early in conditions that favour disease development or when environmental conditions cause slow germination. Other factors that delay germination and emergence, such as compaction, crusting, deep planting, etc., can also result in a poor stand. Plant vigour is often reduced in those plants that do survive. Consult with your seed company and the Ontario Corn Committee Hybrid Performance Trials at www.gocorn.net for hybrid selection. See OMAFRA Publication 811, *Agronomy Guide for Field Crops*, for further information on the specific disease symptoms, life cycle and management options.

CORN DISEASES

Table 1–10. Control Options for Diseases in Field and Seed Corn — Pythium Damping-Off

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
PYTHIUM DAMPING-OFF (*Pythium* 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 increased drainage. Plant when soil temperatures are above 13°C. There is no known resistance, but some degree of tolerance is available in some hybrids. Crop rotation has limited effect. Consult with your seed company for hybrid selection.	azoxystrobin	Dynasty 100 FS	10 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. Must be used in combination with Maxim XL for control of other corn diseases.
	ethaboxam	INTEGO Solo	13–19.6 mL/100 kg (5–7.5 g a.i./100 kg)	For commercial and on-farm treating. Regulations under the *Seeds Act* 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. 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 *Rhizoctonia solani* and other fungal pathogens responsible for seed and seedling diseases.
	metalaxyl	Allegiance FL Apron FL	46–110 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or feed livestock on seeded area for 4 weeks after planting.
	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. Do not graze or cut for forage within 4 weeks after planting. Read label for information regarding resistant strains of fungus.
	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.
	thiabendazole + fludioxonil + metalaxyl-M + azoxystrobin	Maxim Quattro	67 mL/ 100 kg seed	**For use in commercial seed-treating facilities only.** Do not use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment applications at, or immediately before, planting. Do not graze corn or cut for forage within 30 days of planting. This product contains no colourant. An appropriate colourant must be added when this product is applied to seed.

CORN DISEASES

Table 1–11. Control Options for Diseases in Field and Seed Corn — Rhizoctonia

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
RHIZOCTONIA (*Rhizoctonia solani*)				
Seed Treatment				
This disease can occur on all soil types. There are no known resistant or tolerant hybrids available. Remove excess soil moisture through improved drainage. Plant seed when soil temperatures are above 13°C.	azoxystrobin	Dynasty 100 FS	10 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. Must be used in combination with Maxim XL for control of other corn diseases.
	carbathiin + thiram	Vitaflo 280	280 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	fludioxonil	Maxim 480 FS	5.2–10.4 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. Do not graze or cut for forage within 4 weeks after planting.
	ipconazole	Vortex FL	5.6 mL/ 100 kg seed	**For use in commercial seed treatment facilities only.** Use only in treating equipment that can accurately control application rates and provide good distribution of chemical onto seed in the mixing chamber. Not for use in hopper-box, planter-box, slurry-box or similar seed treatment applications. This product contains no dye. An appropriate seed colourant must be applied.
	mandestrobin	S-2200 3.2FS	15.6 mL/ 100 kg seed	For commercial and on-farm treating. Regulations under the *Seeds Act* require that an appropriate colourant be added when this product is applied to seed. Ensure uniform seed coverage and do not apply this product in a hopper-box or planter-box at planting time. For resistance management, please note that S-2200 3.2 FS fungicide is a Group 11 fungicide. Any fungal population may contain individuals naturally resistant to S-2200 3.2 FS fungicide and other Group 11 fungicides.
	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.
	pyraclostrobin	Stamina Corn	25 mL/ 100 kg seed	**For use in commercial seed-treating facilities only.** Thorough seed coverage offers the best protection from soil-borne seedling diseases. Do not use treated seed for food, feed or oil producing. The purchaser is responsible for ensuring that all seed treated is adequately dyed with a suitable colour to prevent accidental use.
	thiabendazole + fludioxonil + metalaxyl-M + azoxystrobin	Maxim Quattro	67 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. Do not graze corn or cut for forage within 30 days of planting. This product contains no colourant. An appropriate colourant must be added when this product is applied to seed.

CORN DISEASES

Table 1–12. Control Options for Diseases in Field and Seed Corn — Fusarium Seedling Blight

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
FUSARIUM SEEDLING BLIGHT (*F. culmorum, F. graminearum* and *F. avenaceum*)				
Seed Treatment				
Some level of resistance or tolerance to this disease is available in some hybrids. Rotate with other crops. Tillage has little effect. Treat seed with fungicide and reduce early-season stresses. Plant when soil temperatures are above 13°C.	carbathiin + thiram	Vitaflo 280	280 mL/ 100 kg seed	For use in commercial and on-farm seed treatment facilities. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	fludioxonil	Maxim 480 FS	5.2–10.4 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. Do not graze or cut for forage within 4 weeks after planting.
	ipconazole	Vortex FL	5.6 mL/ 100 kg seed	**For use in commercial seed treatment facilities only.** Use only in treating equipment that can accurately control application rates and provide good distribution of chemical onto seed in the mixing chamber. Not for use in hopper-box, planter-box, slurry-box or similar seed treatment applications. This product contains no dye. An appropriate seed colourant must be applied.
	mandestrobin	S-2200 3.2FS	15.6 mL/ 100 kg seed	For commercial and on-farm treating. Regulations under the *Seeds Act* require that an appropriate colourant be added when this product is applied to seed. Ensure uniform seed coverage and do not apply this product in a hopper-box or planter-box at planting time. For resistance management, please note that S-2200 3.2 FS fungicide is a Group 11 fungicide. Any fungal population may contain individuals naturally resistant to S-2200 3.2 FS fungicide and other Group 11 fungicides.
	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.
	thiabendazole + fludioxonil + metalaxyl-M + azoxystrobin	Maxim Quattro	67 mL/ 100 kg seed	**For use in commercial seed-treating facilities only.** Do not use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment applications at, or immediately before, planting. Do not graze corn or cut for forage within 30 days of planting. This product contains no colourant. An appropriate colourant must be added when this product is applied to seed.
	trifloxystrobin	Trilex FS	21 mL/ 100 kg seed	**For use in commercial seed treatment facilities only.** Apply using standard commercial seed treatment equipment. Not for use in hopper-box, planter-box, slurry-box or similar seed treatment applications. Uniform application on seed is necessary to ensure seed safety and best disease protection.

CORN DISEASES

Table 1–13. Control Options for Diseases in Field and Seed Corn — Aspergillus Seed Rot, Penicillium Seed Rot

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
ASPERGILLUS (*Aspergillus* spp.) SEED ROT				
Seed Treatment				
Aspergillus seed rot is occasionally a problem in Ontario.	carbathiin + thiram	Vitaflo 280	280 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 28 days after planting. Read label for information regarding resistant strains of fungus.
	fludioxonil	Maxim 480 FS	5.2–10.4 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. Do not graze or cut for forage within 4 weeks after planting.
	ipconazole	Vortex FL	5.6 mL/ 100 kg seed	**For use in commercial seed treatment facilities only.** Use only in treating equipment that can accurately control application rates and provide good distribution of chemical onto seed in the mixing chamber. Not for use in hopper-box, planter-box, slurry-box or similar seed treatment applications. This product contains no dye. An appropriate seed colourant must be applied.
	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.
	thiabendazole + fludioxonil + metalaxyl-M + azoxystrobin	Maxim Quattro	67 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. Do not graze corn or cut for forage within 30 days of planting. This product contains no colourant. An appropriate colourant must be added when this product is applied to seed.
PENICILLIUM (*Penicillium oxalicum*) SEED ROT				
Seed Treatment				
This disease prefers high temperatures and is found only until the nodal roots develop. Infected roots may appear blue-green.	carbathiin + thiram	Vitaflo 280	280 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 28 days after planting. Read label for information regarding resistant strains of fungus.
	fludioxonil	Maxim 480 FS	5.2–10.4 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. Do not graze or cut for forage within 4 weeks after planting.
	ipconazole	Vortex FL	5.6 mL/ 100 kg seed	**Provides suppression only. For use in commercial seed treatment facilities only.** Use only in treating equipment that can accurately control application rates and provide good distribution of chemical onto seed in the mixing chamber. Not for use in hopper-box, planter-box, slurry-box or similar seed treatment applications. This product contains no dye. An appropriate seed colourant must be applied.
	penflufen + prothioconazole + metalaxyl	EverGol Energy	65 mL/ 100 kg seed	**Provides suppression only.** 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.
	thiabendazole + fludioxonil + metalaxyl-M + azoxystrobin	Maxim Quattro	67 mL/ 100 kg seed	**For use in commercial seed-treating facilities only.** Do not use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment applications at, or immediately before, planting. Do not graze corn or cut for forage within 30 days of planting. This product contains no colourant. An appropriate colourant must be added when this product is applied to seed.

CORN DISEASES

Table 1–14. Control Options for Diseases in Field and Seed Corn — Common Rust

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
COMMON RUST (*Puccinia sorghi* and *Puccinia polysora*)					
Rust is generally not a problem in Ontario except when infection begins early in the season. Field corn has good resistance compared to seed corn, sweet corn and specialty corn hybrids. As a result, foliar fungicides in field corn are not needed unless significant disease appears before corn tassels. Humid, cool conditions favour this disease.	azoxystrobin	Azoshy 250 SC Quadris	453 mL/ha (183 mL/acre)	7	Ground and aerial application. Apply prior to disease development. Second application may be made 7–14 days later. Maximum 2 applications/yr. Do not re-enter treated area until residues have dried.
	azoxystrobin + propiconazole	Quilt	0.75–1.0 L/ha (303–404 mL/acre)	30	Ground and aerial application. Apply when disease first appears, followed by a second application 14 days after, if environmental conditions are favourable for disease development. Do not apply to field corn or field corn grown for seed after brown silk. Maximum 2 applications/yr. 12-hr restricted entry interval.
	azoxystrobin + propiconazole + benzovindiflupyr	Trivapro A + Trivapro B (sold as co-pack: Trivapro)	1 L/ha (404 mL/acre) + 300 mL/ha (120 mL/acre)	14	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. Maximum 2 applications/yr. 12-hr restricted entry interval.
	fluoxastrobin	Evito	146–296 mL/ha (59–120 mL/acre)	30	Ground and aerial application. For optimum results, begin applications preventively and repeat If needed after a 7–10-day interval. Use the higher rates and shorter interval when disease pressure Is high. 12-hr restricted entry interval.
	fluoxastrobin + tetraconazole	Zolera FX	500 mL/ha (202 mL/acre)	30	Ground and aerial application. For optimum results, apply preventively. Apply between the V4 (4 leaf collar) and dough stage (R4). 12-hr restricted entry interval.
	penthiopyrad	Vertisan	1–1.75 L/ha (0.4–0.7 L/acre)	7	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. 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 restricted entry interval, 3 days if detasseling.
	propiconazole	Bumper 432 EC Nufarm Propiconazole Princeton	300 mL/ha (121 mL/acre)	14	Ground and aerial application. Apply when rust pustules first appear. Under severe disease pressure, a second application 14 days later may be necessary.
		Propi Super 25 EC Tilt 250E	500 mL/ha (200 mL/acre)		

CORN DISEASES

Table 1–14. Control Options for Diseases in Field and Seed Corn — Common Rust

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
COMMON RUST (*Puccinia sorghi* and *Puccinia polysora*) (continued)					
(continued)	prothioconazole	Proline 480 SC	315–420 mL/ha (127–170 mL/acre)	24 hr OR 20 days for hand-detasseling seed corn	Ground and aerial application. Maximum 1 application/yr. 24-hr restricted entry interval. **EXCEPTION:** 20 days for hand-harvesting sweet corn and hand-detasseling seed corn. Apply Proline 480 SC foliar fungicide as a preventive foliar spray when the earliest disease symptoms appear on the leaves and stems. Observe fields closely for early disease symptoms, particularly under prolonged conditions favourable for disease development. Under high disease pressure, use a non-ionic surfactant with Proline 480 SC foliar fungicide (do not apply a non-ionic surfactant prior to tassel emergence, as crop injury may occur).
	prothioconazole + trifloxystrobin	Stratego PRO	572 mL/ha (232 mL/acre)	30	Ground and aerial application. Apply Stratego PRO fungicide when disease first appears and continue on a 7–14-day interval if favourable conditions for disease development persist. A restricted entry interval (REI) of 12 days after an application is required before detasseling corn grown for seed. For field corn, popcorn and teosinte, do not apply within 30 days of harvest for forage, grain and stover. DO NOT apply Stratego PRO fungicide with an adjuvant in corn.
	pydiflumetofen + azoxystrobin + propiconazole	Miravis Neo	0.75–1.0 L/ha (304–405 mL/acre)	30	Ground and aerial application. Make the first application at the first sign of disease. A second application can be made in grain corn 14 days after the first application, when disease pressure is high or when agronomic or weather conditions are conducive to disease development or movement. Use the 1 L/ha application rate when disease pressure is high or if susceptible hybrids are used. Maximum 2 applications/yr for grain corn. Maximum 1 application/yr for corn forage. 12-hr restricted entry interval.
	pyraclostrobin	Headline EC	400–600 mL/ha (160–240 mL/acre)	7	Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha. Do not graze treated crop within 6 days of last application. Maximum 2 applications/yr. 12-hr restricted entry interval.
	pyraclostrobin + fluxapyroxad	Priaxor	300 mL/ha (120 mL/acre)	21	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. Maximum 2 applications/yr. 12-hr restricted entry interval.
	pyraclostrobin + metconazole	Headline AMP	0.75–1.0 L/ha (303–404 mL/acre)	20	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. Use higher water volumes to ensure adequate coverage and better activity on leaf disease. Maximum 2 applications/yr. 12-hr restricted entry interval.

CORN DISEASES

Table 1–15. Control Options for Diseases in Field and Seed Corn — Southern Leaf Rust

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
SOUTHERN LEAF RUST (*Puccinia polysora*)					
Foliar Treatment					
Has not been economically important in Ontario (occurs in extreme Southwest) but the disease is increasing in the southern U.S. and Midwest where overwintering spores originate and potentially blow into Ontario. Southern rust pustules primarily occur on upper leaf surface and are orange to light brown, round, whereas common rust occurs on both upper and lower leaf surfaces with brown to brownish-red spores. Southern rust prefers warmer temperatures (25°C–30°C+) compared to common rust (15°C–25°C). Both rust diseases may be found on the leaf.	prothioconazole + trifloxystrobin	Stratego PRO	572 mL/ha (232 mL/acre)	30	Ground and aerial application. Apply Stratego PRO fungicide when disease first appears and continue on a 7–14-day interval if favourable conditions for disease development persist. A restricted entry interval (REI) of 12 days after an application is required before detasseling corn grown for seed. For field corn, popcorn and teosinte, do not apply within 30 days of harvest for forage, grain and stover. DO NOT apply Stratego PRO fungicide with an adjuvant in corn.

CORN DISEASES

Table 1–16. Control Options for Diseases in Field and Seed Corn — Northern Corn Leaf Blight, Helminthosporium Leaf Spot

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
NORTHERN CORN LEAF BLIGHT (*Setospaeria turcica*)					
Risk of this disease is on the rise in Ontario. Consult with your seed company for hybrid selection. Seed corn may need protection. Crop rotation and tillage will reduce inoculum levels in surface residues. In reduced tillage systems, rotation and resistance are necessary.	azoxystrobin + propiconazole	Fungtion SC Quilt	0.75–1.0 L/ha (303–404 mL/acre)	30	Ground and aerial application. Apply when disease first appears, followed by a second application 14 days after, if environmental conditions are favourable for disease development. Do not apply to field corn or field corn grown for seed after brown silk. Maximum 2 applications/yr.
	azoxystrobin + propiconazole + benzovindiflupyr	Trivapro A + Trivapro B (sold as co-pack: Trivapro)	1 L/ha (404 mL/acre) + 300 mL/ha (120 mL/acre)	14	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. Maximum 2 applications/yr. 12-hr restricted entry interval.
	fluoxastrobin	Evito	146–296 mL/ha (59–120 mL/acre)	30	**Provides suppression only.** Ground and aerial application. For optimum results, begin applications preventively and repeat if needed after a 7–10-day Interval. Use the higher rates and shorter interval when disease pressure Is high. 12-hr restricted entry interval.
	fluoxastrobin + tetraconazole	Zolera FX	500 mL/ha (202 mL/acre)	30	Ground and aerial application. For optimum results, apply preventively. Apply between the V4 (4 leaf collar) and dough stage (R4). 12-hr restricted entry interval.
	picoxystrobin	Acapela	0.53–0.8 L/ha (0.21–0.32 L/acre)	7	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. Apply no more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 2.64 L/ha per season. 12-hr restricted entry interval.
	propiconazole	Bumper 432 EC Nufarm Propiconazole Princeton	150–300 mL/ha (60–121 mL/acre)	14	Ground and aerial application. Apply when disease first appears. Under severe disease pressure, a second application 14 days later may be necessary.
		Propi Super 25 EC	500 mL/ha (200 mL/acre)		
		Tilt 250E	250–500 mL/ha (100–200 mL/acre)		
	prothioconazole	Proline 480 SC	315–420 mL/ha (127–170 mL/acre)	24 hr OR 20 days for hand-detasseling seed corn	Ground and aerial application. Maximum 1 application/yr. 24-hr restricted entry interval. **EXCEPTION:** 20 days for hand-harvesting sweet corn and hand-detasseling seed corn. Apply Proline 480 SC foliar fungicide as a preventive foliar spray when the earliest disease symptoms appear on the leaves and stems. Fields should be observed closely for early disease symptoms, particularly under prolonged conditions favourable for disease development.

CORN DISEASES

Table 1–16. Control Options for Diseases in Field and Seed Corn — Northern Corn Leaf Blight, Helminthosporium Leaf Spot

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
NORTHERN CORN LEAF BLIGHT (*Setospaeria turcica*) (continued)					
(continued)	prothioconazole + trifloxystrobin	Stratego PRO	572 mL/ha (232 mL/acre)	30	Ground and aerial application. Apply Stratego PRO fungicide when disease first appears and continue on a 7–14-day interval if favourable conditions for disease development persist. A restricted entry interval (REI) of 12 days after an application is required before detasseling corn grown for seed. For field corn, popcorn and teosinte, do not apply within 30 days of harvest for forage, grain and stover. DO NOT apply Stratego PRO fungicide with an adjuvant in corn.
	pydiflumetofen + azoxystrobin + propiconazole	Miravis Neo	0.75 L/ha (304 mL/acre)	30	Ground and aerial application. Make the first application at the first sign of disease. A second application can be made in grain corn 14 days after the first application, when disease pressure is high or when agronomic or weather conditions are conducive to disease development or movement. Maximum 2 applications/yr for grain corn. Maximum 1 application/yr for corn forage. 12-hr restricted entry interval.
	pyraclostrobin + fluxapyroxad	Priaxor	300 mL/ha (120 mL/acre)	21	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. Maximum 2 applications/yr. 12-hr restricted entry interval.
	pyraclostrobin + metconazole	Headline AMP	0.75–1.0 L/ha (303–404 mL/acre)	20	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. Use higher water volumes to ensure adequate coverage and better activity on leaf disease. Maximum 2 applications/yr. 12-hr restricted entry interval.
HELMINTHOSPORIUM LEAF SPOT (*Cochliobolus carbonum*)					
This disease is not generally a problem in Ontario, since hybrids with resistance are available. Consult with your seed company for hybrid selection. Crop rotation and tillage will reduce inoculum levels in surface residues. In reduced tillage systems, rotation and resistance are necessary. Chemical control is usually not economical in field corn but may be necessary if a very susceptible seed corn inbred is used.	propiconazole	Bumper 432 EC	150–300 mL/ha (60–121 mL/acre)	14	Ground and aerial application. Apply when disease first appears. Under severe disease pressure, a second application 14 days later may be necessary.
		Nufarm Propiconazole			
		Princeton			
		Tilt 250E	250–500 mL/ha (100–200 mL/acre)		

CORN DISEASES

Table 1–17. Control Options for Diseases in Field and Seed Corn — Eye Spot

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
EYE SPOT (*Aureobasidium zeae* or *Kabatiella zeae*)					
Many resistant or tolerant commercial hybrids are available. Consult with your seed company for hybrid selection. Crop rotation and tillage will reduce inoculum levels in surface residues. In reduced tillage systems, rotation and resistance are necessary. Chemical control is usually not economical in field corn but may be necessary if a very susceptible seed corn inbred is used.	azoxystrobin + propiconazole	Quilt	0.75–1.0 L/ha (303–404 mL/acre)	30	Ground and aerial application. Apply when disease first appears, followed by a second application 14 days after, if environmental conditions are favourable for disease development. Do not apply to field corn or field corn grown for seed after brown silk. Maximum 2 applications/yr.
	azoxystrobin + propiconazole + benzovindiflupyr	Trivapro A + Trivapro B (sold as co-pack: Trivapro)	1 L/ha (404 mL/acre) + 300 mL/ha (120 mL/acre)	14	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. Maximum 2 applications/yr. 12-hr restricted entry interval.
	propiconazole	Bumper 432 EC	300 mL/ha (121 mL/acre)	14	Ground and aerial application. Apply when disease first appears. Under severe disease pressure, a second application 14 days later may be necessary.
		Nufarm Propiconazole			
		Princeton			
		Tilt 250E	500 mL/ha (200 mL/acre)		
	prothioconazole	Proline 480 SC	315–420 mL/ha (127–170 mL/acre)	24 hr OR 20 days for hand-detasseling seed corn	Ground and aerial application. Maximum 1 application/yr. 24-hr restricted entry interval. **EXCEPTION:** 20 days for hand-harvesting sweet corn and hand-detasseling seed corn. Apply Proline 480 SC foliar fungicide as a preventive foliar spray when the earliest disease symptoms appear on the leaves and stems. Observe fields closely for early disease symptoms, particularly under prolonged conditions favourable for disease development. Under high disease pressure, use a non-ionic surfactant with Proline 480 SC foliar fungicide (do not apply a non-ionic surfactant prior to tassel emergence, as crop injury may occur).
	prothioconazole + trifloxystrobin	Stratego PRO	572 mL/ha (232 mL/acre)	30	Ground and aerial application. Apply Stratego PRO fungicide when disease first appears and continue on a 7–14-day interval if favourable conditions for disease development persist. A restricted entry interval (REI) of 12 days after an application is required before detasseling corn grown for seed. For field corn, popcorn and teosinte, do not apply within 30 days of harvest for forage, grain and stover. DO NOT apply Stratego PRO fungicide with an adjuvant in corn.
	pydiflumetofen + azoxystrobin + propiconazole	Miravis Neo	0.75 L/ha (304 mL/acre)	30	Ground and aerial application. Make the first application at the first sign of disease. A second application can be made in grain corn 14 days after the first application, when disease pressure is high or when agronomic or weather conditions are conducive to disease development or movement. Maximum 2 applications/yr for grain corn. Maximum 1 application/yr for corn forage. 12-hr restricted entry interval.
	pyraclostrobin	Headline EC	400–600 mL/ha (160–240 mL/acre)	7	Ground and aerial application. Use a minimum water volume of 100 L/ha. For optimal disease control, begin applications prior to disease development. Do not graze treated crop within 6 days of last application. Maximum 2 applications/yr. 12-hr restricted entry interval.

CORN DISEASES

Table 1–17. Control Options for Diseases in Field and Seed Corn — Eye Spot

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
EYE SPOT (*Aureobasidium zeae* or *Kabatiella zeae*) (continued)					
(continued)	pyraclostrobin + fluxapyroxad	Priaxor	300 mL/ha (120 mL/acre)	21	**Provides suppression only.** 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. Maximum 2 applications/yr. 12-hr restricted entry interval.
	pyraclostrobin + metconazole	Headline AMP	0.75–1.0 L/ha (303–404 mL/acre)	20	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. Use higher water volumes to ensure adequate coverage and better activity on leaf disease. Maximum 2 applications/yr. 12-hr restricted entry interval.

CORN DISEASES

Table 1–18. Control Options for Diseases in Field and Seed Corn — Southern Corn Leaf Blight

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
SOUTHERN CORN LEAF BLIGHT (*Cochliobolus heterostrophus*)					
Was a major concern in the 1970s, but with the switch from cytoplasm male sterile T to normal cytoplasm corn, the disease is not considered to be a threat.	azoxystrobin + propiconazole	Fungtion SC	0.75–1.0 L/ha (303–404 mL/acre)	30	Ground and aerial application. Apply when disease first appears, followed by a second application 14 days after, if environmental conditions are favourable for disease development. Do not apply to field corn or field corn grown for seed after brown silk. Maximum 2 applications/yr.
		Quilt			
	azoxystrobin + propiconazole + benzovindiflupyr	Trivapro A + Trivapro B (sold as co-pack: Trivapro)	1 L/ha (404 mL/acre) + 300 mL/ha (120 mL/acre)	14	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. Maximum 2 applications/yr. 12-hr restricted entry interval.
	fluoxastrobin	Evito	146–296 mL/ha (59–120 mL/acre)	30	Ground and aerial application. For optimum results, begin applications preventively and repeat if needed after a 7–10-day interval. Use the higher rates and shorter interval when disease pressure is high. 12-hr restricted entry interval.
	fluoxastrobin + tetraconazole	Zolera FX	500 mL/ha (202 mL/acre)	30	Ground and aerial application. For optimum results, apply preventively. Apply between the V4 (4-leaf collar) and dough stage (R4). 12-hr restricted entry interval.
	propiconazole	Bumper 432 EC	150–300 mL/ha (60–121 mL/acre)	14	Ground and aerial application. Apply when disease first appears. Under severe disease pressure, a second application 14 days later may be necessary.
		Nufarm Propiconazole			
		Princeton			
		Propi Super 25 EC	500 mL/ha (200 mL/acre)		
		Tilt 250E	250–500 mL/ha (100–200 mL/acre)		
	pydiflumetofen + azoxystrobin + propiconazole	Miravis Neo	0.75 L/ha (304 mL/acre)	30	Ground and aerial application. Make the first application at the first sign of disease. A second application can be made in grain corn 14 days after the first application, when disease pressure is high or when agronomic or weather conditions are conducive to disease development or movement. Maximum 2 applications/yr for grain corn; Maximum 1 application/yr for corn forage. 12-hr restricted entry interval.

CORN DISEASES

Table 1–19. Control Options for Diseases in Field and Seed Corn — Grey Leaf Spot

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
GREY LEAF SPOT (*Cercospora zeae-maydis*)					
This disease is becoming more common across Ontario. Some hybrids are tolerant/resistant to the disease. Consult with your seed company for hybrid selection. Crop rotation and tillage will reduce inoculum levels in surface residues. In reduced tillage systems, rotation and resistance are necessary. Chemical control is usually not economical in field corn.	azoxystrobin + propiconazole	Fungtion SC Quilt	0.75–1.0 L/ha (303–404 mL/acre)	30	Ground and aerial application. Apply when disease first appears, followed by a second application 14 days after, if environmental conditions are favourable for disease development. Do not apply to field corn or field corn grown for seed after brown silk. Maximum 2 applications/yr.
	azoxystrobin + propiconazole + benzovindiflupyr	Trivapro A + Trivapro B (sold as co-pack: Trivapro)	1 L/ha (404 mL/acre) + 300 mL/ha (120 mL/acre)	14	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. Maximum 2 applications/yr. 12-hr restricted entry interval.
	fluoxastrobin	Evito	146–296 mL/ha (59–120 mL/acre)	30	Ground and aerial application. For optimum results, begin applications preventively and repeat If needed after a 7–10-day interval. Use the higher rates and shorter interval when disease pressure Is high. 12-hr restricted entry interval.
	fluoxastrobin + tetraconazole	Zolera FX	500 mL/ha (202 mL/acre)	30	Ground and aerial application. For optimum results, apply preventively. Apply between the V4 (4-leaf collar) and dough stage (R4). 12-hr restricted entry interval.
	penthiopyrad	Vertisan	1–1.75 L/ha (0.4–0.7 L/acre)	7	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. 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 restricted entry interval, 3 days if detasseling.
	propiconazole	Bumper 432 EC Nufarm Propiconazole Princeton	300 mL/ha (121 mL/acre)	14	Ground and aerial application. Apply when disease first appears. Under severe disease pressure, a second application 14 days later may be necessary.
		Propi Super 25 EC Tilt 250E	500 mL/ha (200 mL/acre)		
	prothioconazole	Proline 480 SC	315–420 mL/ha (127–170 mL/acre)	24 hr OR 20 days for hand-detasseling seed corn	Ground and aerial application. Maximum 1 application/yr. 24-hr restricted entry interval. **EXCEPTION:** 20 days for hand-harvesting sweet corn and hand-detasseling seed corn. Apply Proline 480 SC foliar fungicide as a preventive foliar spray when the earliest disease symptoms appear on the leaves and stems. Observe fields closely for early disease symptoms, particularly under prolonged conditions favourable for disease development. Under high disease pressure, use a non-ionic surfactant with Proline 480 SC foliar fungicide (do not apply a non-ionic surfactant prior to tassel emergence, as crop injury may occur).

CORN DISEASES

Table 1–19. Control Options for Diseases in Field and Seed Corn — Grey Leaf Spot

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
GREY LEAF SPOT (*Cercospora zeae-maydis*) (continued)					
(continued)	prothioconazole + trifloxystrobin	Stratego PRO	572 mL/ha (232 mL/acre)	30	Ground and aerial application. Apply Stratego PRO fungicide when disease first appears and continue on a 7–14-day interval if favourable conditions for disease development persist. A restricted entry interval (REI) of 12 days after an application is required before detasseling corn grown for seed. For field corn, popcorn and teosinte, do not apply within 30 days of harvest for forage, grain and stover. DO NOT apply Stratego PRO fungicide with an adjuvant in corn.
	pydiflumetofen + azoxystrobin + propiconazole	Miravis Neo	0.75 L/ha (304 mL/acre)	30	Ground and aerial application. Make the first application at the first sign of disease. A second application can be made in grain corn 14 days after the first application, when disease pressure is high or when agronomic or weather conditions are conducive to disease development or movement. Maximum 2 applications/yr for grain corn. Maximum 1 application/yr for corn forage. 12-hr restricted entry interval.
	pyraclostrobin	Headline EC	400–600 mL/ha (160–240 mL/acre)	7	Ground and aerial application. Use a minimum water volume of 100 L/ha. For optimal disease control, begin applications prior to disease development. Do not graze treated crop within 6 days of last application. Maximum 2 applications/yr. 12-hr restricted entry interval.
	pyraclostrobin + fluxapyroxad	Priaxor	300 mL/ha (120 mL/acre)	21	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. Maximum 2 applications/yr. 12-hr restricted entry interval.
	pyraclostrobin + metconazole	Headline AMP	0.75–1.0 L/ha (303–404 mL/acre)	20	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. Use higher water volumes to ensure adequate coverage and better activity on leaf disease. Maximum 2 applications/yr. 12-hr restricted entry interval.

CORN DISEASES

Table 1–20. Control Options for Diseases in Field and Seed Corn — Nematodes

LEGEND: PHI = Pre-Harvest Interval (in days) N/A = Not Applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
NEMATODES: NEEDLE (*Longidorus* spp.), ROOT LESION (*Pratylenchus* spp.), ROOT KNOT (*Meloidogyne* spp.)					
Corn nematodes are difficult to diagnose in the field without a lab test. Unfortunately symptoms are misdiagnosed for other problems. Above-ground symptoms typically include stunting, yellowing and uneven stands while root symptoms may include lesions, discolouration, lack of root hairs and/or stunted root growth.	*Bacillus firmus* strain I-1582	Votivo 240 FS	0.042–0.42 mL/ 1,000 seeds	N/A	Check with your seed corn dealer for availability and co-pack formulations.

CORN DISEASES

Table 1–21. Control Options for Diseases in Field and Seed Corn — Stalk Rot, Fusarium and Gibberella Ear Rots

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
STALK ROT — suppression only (*Fusarium, Gibberella* and *Colletotrichum*)					
Foliar Treatment					
The distribution and prevalence of stalk and ear rot diseases vary from year to year. However, the diseases are present in most years even though at low levels. The majority of stalk rot damage in Ontario is caused by three fungi, namely *Colletotrichum, Gibberella* and *Fusarium*. However, *Diplodia* and *Pythium* have also been observed in Ontario. Management begins by reducing crop stresses through planting hybrids that have good resistance or tolerance to leaf diseases and stalk rots, managing insects, good weed control, appropriate plant populations, a balanced N and K fertility program, crop rotation and tillage.	prothioconazole	Proline 480 SC	420 mL/ha (170 mL/acre)	14	Ground and aerial application. Maximum 1 application/yr. 24-hr restricted entry interval.
FUSARIUM (*Fusarium* spp.) and GIBBERELLA (*Gibberella* spp.) EAR ROTS					
Any of the *Fusarium* or *Gibberella* rots can establish after pollination through silk infection or in wounds created by insects or birds. Warm rainy weather or long dews any time after pollination may lead to increased ear rots. The most common and important ear mould in Ontario is *Gibberella zeae*, which is the sexual reproductive stage of *Fusarium graminearum*. Many plant pathologists believe that in years with a high occurrence of fusarium head blight in wheat, the potential exists for increased gibberella ear rot in corn. These ear rots are especially important to swine and other livestock producers since they produce mycotoxins that can have a detrimental effect on the animals. Preventing ear rots is difficult since weather conditions are critical to disease development. Although some tolerant hybrids are available, none have complete resistance. Consult with your seed company as well as www.gocorn.net/ for hybrid selection. Harvest fields as soon as possible if 10% of the ears have some ear rot to limit further disease development and potential mycotoxins production. See OMAFRA Publication 811, *Agronomy Guide for Field Crops* and www.fieldcropnews.ca for more information.	metconazole	Caramba	1.0 L/ha (404 mL/acre)	20	**Provides suppression only.** Ground and aerial application. Apply to corn when the crop is between silking (GS 63) and silk browning (GS 67). It is important to have good spray coverage on the silks to ensure optimum efficacy. Maximum 1 application/yr. 12-hr restricted entry interval. **EXCEPTION:** 18 days for hand harvesting. Pre-harvest interval is 20 days for field corn grain and popcorn grain. Pre-harvest interval for sweet corn cobs is 7 days for mechanical harvesting and 18 days for hand harvesting.
	prothioconazole	Proline 480 SC	420 mL/ha (170 mL/acre)	24 hr OR 20 days for hand-detasseling seed corn	**Provides suppression only.** Ground and aerial application. Timing of application is critical. Apply from development stage of corn between the tip of stigmata visible (silking BBCH 63) to the stigmata drying (silk browning BBCH 67). This product will reduce both disease symptoms and levels of mycotoxin in the grain. Maximum 1 application/yr. 24-hr restricted entry interval. **EXCEPTION:** 20 days for hand-harvesting sweet corn and hand-detasseling seed corn. Under high disease pressure, use a non-ionic surfactant with Proline 480 SC foliar fungicide (do not apply a non-ionic surfactant prior to tassel emergence, as crop injury may occur).
	pydiflumetofen + azoxystrobin + propiconazole	Miravis Neo	1.0–1.25 L/ha (405–506 mL/acre)	30	Ground and aerial application. For optimum suppression, apply Miravis Neo once from the developmental stage of corn between the tip of stigmata visible (silking, BBCH 63) to the stigmata drying (silk browning, BBCH 67). Miravis Neo will reduce both disease symptoms and levels of mycotoxins in the grain. Use the 1.25 L/ha application rate when disease pressure is high or if susceptible hybrids are used. Maximum 2 applications or 2 L/ha/yr for grain corn. Maximum 1 application/yr for corn forage. 12-hr restricted entry interval.

CORN DISEASES

Table 1–22. Control Options for Diseases in Field and Seed Corn — Anthracnose Leaf Blight

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
ANTHRACNOSE LEAF BLIGHT (*Colletotrichum graminicola*)					
Foliar Treatment					
The fungus that causes anthracnose leaf blight is also responsible for anthracnose stalk rot. Producers should record where anthracnose leaf blight symptoms developed early in the season and return to those areas to scout for stalk rots a few weeks before harvest. Tillage systems that leave considerable amounts of anthracnose-infected debris on the soil surface may lead to greater severity and an increased presence of the disease. Planting anthracnose leaf blight–resistant hybrids can help to manage anthracnose leaf blight. However, resistance to anthracnose stalk rot is separate from resistance to anthracnose leaf blight. In no-till or reduced tillage fields, management of anthracnose leaf blight is best achieved with rotations (avoiding second-year corn) and planting of resistant corn hybrids.	azoxystrobin + propiconazole + benzovindiflupyr	Trivapro A + Trivapro B (sold as co-pack: Trivapro)	1 L/ha (404 mL/acre) + 300 mL/ha (120 mL/acre)	14	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. Maximum 2 applications/yr. 12-hr restricted entry interval.
	pyraclostrobin + metconazole	Headline AMP	0.75–1.0 L/ha (303–404 mL/acre)	20	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. Use higher water volumes to ensure adequate coverage and better activity on leaf disease. Maximum 2 applications/yr. 12-hr restricted entry interval.
	pydiflumetofen + azoxystrobin + propiconazole	Miravis Neo	0.75 L/ha (304 mL/acre)	30	Ground and aerial application. Make the first application at the first sign of disease. A second application can be made 14 days after the first application, when disease pressure is high or when agronomic or weather conditions are conducive to disease development or movement. Apply in sufficient water volume to obtain thorough coverage; a minimum spray volume of 200 L/ha and 50 L/ha is recommended for ground and aerial application, respectively.

CORN DISEASES

Table 1–23. Control Options for Diseases in Field and Seed Corn — Tar Spot

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
TAR SPOT (*Phyllachora maydis*)					

Tar spot is a relatively new corn disease in the U.S. Midwest. Since its initial confirmation in northern Indiana (2015), it has moved into new areas including up to the Michigan-Ontario border in 2019. Due to wind patterns and proximity to infected areas in Michigan, it was not unexpected that tar spot was confirmed in Chatham-Kent late in the 2020 season. This was also the first confirmation for Canada. Tar spot has also been confirmed in Essex, Lambton, Elgin and Middlesex counties as well. OMAFRA has been working closely with U.S. pathologists, and a real-time tar spot tracking system that includes Ontario has been developed, so please visit the Corn ipmPIPE website at http://corn.ipmpipe.org/tarspot-2 for updates.

Tar spot appears as small, raised black tar-like spots (stroma) scattered across the upper and lower leaf surface and husks, often during the mid- to late grain fill stage (R3–R6). It can be confused with other diseases, such as rust or insect frass (droppings). Tar spot can be confirmed by rubbing the lesion; if the raised black spots do not rub off, it is likely tar spot. A tan halo may (or may not) appear around the black spots. The air-dispersed pathogen is carried by storm fronts and wind currents, and thrives under cool, wet conditions. It usually develops later in the season, during the mid- to late grain stages (R3–R6) but is of major concern when symptoms occur early under favourable cool, wet conditions.

Although certain fungicides are effective against tar spot in the U.S., none are registered in Canada as of October 2020. Residue management, scouting and tracking of tar spot movement is critical in 2021. For more information go to Crop Protection Network (www.cropprotectionnetwork.org/) and OMAFRA field crop news (www.fieldcropnews.com).

2. Soybeans

Bee kill incidences in Ontario have been found to be associated with the planting of corn and soybean seed treated with neonicotinoid. Growers are encouraged to follow best management practices to protect pollinators at planting. See Health Canada's pollinator protection web page: www.canada.ca/pollinators, follow label precautions and statements to reduce pollinator risk, as well as Integrated Pest Management (IPM) Course for Corn and Soybeans at www.ipmcertified.ca/ for the latest information. Consult your seed company and the Ontario Soybean and Canola Committee (OSACC) at www.gosoy.ca for variety information.

SOYBEAN INSECTS

Table 2–1. Control Options for Insects in Soybeans — Seedcorn Maggot

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
SEEDCORN MAGGOT (*Delia platura*)				
Seed Treatment — For all seed treatments, use full rate and ensure good coverage of seed.				
In Ontario, the use of neonicotinoid seed treatments on corn and soybean seed is restricted. A pest assessment report is required to purchase and use a neonicotinoid seed treatment for this pest. See the Ontario website on Neonicotinoid Regulations at www.ontario.ca/page/neonicotinoid-regulations for more information on the requirements to use these products. Factors that increase the risk of seedcorn maggot are early-planted fields where large amounts of manure, green manure or residue have been recently incorporated or when cool conditions unfavourable for emergence are expected. **NOTE:** The planting of neonicotinoid-treated corn and soybean seed can pose a risk to pollinators. This includes all clothianidin, imidacloprid and thiamethoxam products. The contaminated insecticide dust emitted from pneumatic planters can drift onto flower and water sources and expose bees to these insecticides. Only a dust-reducing fluency agent is permitted to be used as a seed flow lubricant for corn or soybean seed treated with neonicotinoid insecticides clothianidin, thiamethoxam or imidacloprid. Talc and graphite are not permitted for use in this way. Growers are encouraged to follow best management practices (BMPs) to protect pollinators at planting. To help minimize the dust generated during planting, refer to *Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices* on the Health Canada website at www.canada.ca/pollinators.	cyantraniliprole	Fortenza	41.5–83 mL/ 100 kg seed (25–50 g/ 100 kg seed)	This product contains no colourant. An appropriate colourant must be added when this product is applied. Do not apply any subsequent application of a Group 28 insecticide (e.g., in-furrow, soil or foliar application) following Fortenza seed treatment. Toxic to bees. This product is systemic and bees can be exposed to product residues in flower, leaves, pollen and/or nectar. However, when product is applied and used according to label directions, risk is expected to be negligible. Toxic to aquatic organisms. Do not apply this product directly to freshwater habitats, estuaries or marine habitats. Avoid application to areas with a moderate slope, compacted soil or clay. If treated seeds are spilled outdoors or in areas accessible to birds, promptly clean up or bury to prevent ingestion.
	thiamethoxam **(See NOTE.)**	Cruiser 5 FS	50–83 mL/ 100 kg seed	**For use in commercial seed treatment facilities only.** Use higher rate when insect populations are expected to be high. Do not graze or feed livestock on treated areas for 45 days after planting. This product contains no colourant. An appropriate colourant must be added when this product is applied. Toxic to fish and aquatic invertebrates. Do not apply directly to water or to areas where surface water is present. Treated seed is toxic to birds and small wild mammals. Spilled or exposed seeds and dust must be incorporated into the soil or cleaned-up from the soil surface.

SOYBEAN INSECTS

Table 2–1. Control Options for Insects in Soybeans — Seedcorn Maggot

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
SEEDCORN MAGGOT (*Delia platura*) (continued)				
Seed Treatment — For all seed treatments, use full rate and ensure good coverage of seed. (continued)				
(continued)	imidacloprid **(See NOTE.)**	Alias 240 SC	260–520 mL/ 100 kg seed	Do not use in commercial seed treatment facilities. Apply through slurry applicator seed treaters, which provide uniform seed coverage. Maintain constant agitation of the slurry during application. Do not apply any subsequent application of a Group 4 insecticide (e.g., Concept or Endigo) following a soil, in-furrow or seed treatment with Alias 240 SC. This product contains no colourant. An appropriate colourant must be added when using this product as a seed treatment. Toxic to aquatic invertebrates. Keep out of lakes, streams, ponds and other aquatic systems. Toxic to birds. Any spilled or exposed seeds must be incorporated into the soil or otherwise cleaned-up from the soil surface.
		Sombrero 600 FS	104–208 mL/ 100 kg seed	For commercial and on-farm treating. Apply through slurry applicator seed treaters, which provide uniform seed coverage. Maintain constant agitation of the slurry during application. Do not apply any subsequent application of a Group 4 insecticide (e.g., Concept or Endigo) following a soil, in-furrow or seed treatment with Sombrero. Keep out of lakes, streams, ponds or other aquatic systems. Dispose of all excess and any spilled treated seeds by covering or incorporating into the soil.
		Stress Shield 600	104–208 mL/ 100 kg seed (62.5–125 g a.i./ 100 kg seed)	**For use in commercial seed treatment facilities only**. Stress Shield 600 may only be mixed with certain fungicide seed treatment partners that are listed on the product label. Do not apply any subsequent application of a Group 4 insecticide (neonicotinoids) (e.g., Concept or Endigo) with Stress Shield 600. 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. Toxic to birds and aquatic organisms. Spilled or exposed seeds and dust must be incorporated into the soil or cleaned-up from the soil surface.
	thiamethoxam + metalaxyl-M + fludioxonil + sedaxane **(See NOTE.)**	Cruiser Maxx Beans + Vibrance 500 FS (sold as a co-pack: Cruiser Maxx Vibrance Beans)	195 mL + 5–10 mL/ 100 kg seed (2.5–5 g a.i./ 100 kg seed)	**For use in commercial seed treatment facilities only.** Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting. This product contains no colourant. An appropriate colourant must be added when this product is applied. Toxic to fish and aquatic invertebrates. Do not apply directly to water or to areas where surface water is present. Treated seed is toxic to birds and small wild mammals. Spilled or exposed seeds and dust must be incorporated into the soil or cleaned-up from the soil surface.

SOYBEAN INSECTS

Table 2–2. Control Options for Insects in Soybeans — Soybean Aphid

LEGEND: PHI = Pre-Harvest Interval (in days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
SOYBEAN APHID (*Aphis glycines*)					
Seed Treatment					
Foliar treatment at threshold is the recommended method of control. In Ontario, the use of neonicotinoid seed treatments on corn and soybean seed is restricted. See the Ontario website on Neonicotinoid Regulations at www.ontario.ca/page/neonicotinoid-regulations for more information on the requirements to use these products. Clothianidin, thiamethoxam and imidacloprid may not be used as soybean seed treatment solely for protection from soybean aphid. However, seed treatments for the control of other soil insect pests may provide early-season protection (approximately 2 weeks after planting) from early infestations of soybean aphids. These early-season infestations are more likely to occur in Eastern Ontario. **NOTE:** The planting of neonicotinoid-treated corn and soybean seed can pose a risk to pollinators. This includes all clothianidin, imidacloprid and thiamethoxam products. The contaminated insecticide dust emitted from pneumatic planters can drift onto flower and water sources and expose bees to these insecticides. Only a dust-reducing fluency agent is permitted to be used as a seed flow lubricant for corn or soybean seed treated with neonicotinoid insecticides clothianidin, thiamethoxam or imidacloprid. Talc and graphite are not permitted for use in this way. Growers are encouraged to follow best management practices (BMPs) to protect pollinators at planting. To help minimize the dust generated during planting, refer to *Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices* on the Health Canada website at www.canada.ca/pollinators.	cyantraniliprole	Lumiderm	0.075–0.200 mg a.i./seed	N/A	This product contains no colourant. An appropriate colourant must be added when this product is applied. For use in commercial seed treatment facilities using a closed transfer system only. DO NOT use open transfer systems. On-farm seed treatment is permitted for soybean only. Open transfer is permitted for the on-farm treatment of soybeans only. Do not apply any subsequent application of a Group 28 Insecticide (e.g., in-furrow, soil or foliar application) following Lumiderm seed treatment.
	thiamethoxam **(See NOTE.)**	Cruiser 5 FS	83 mL/ 100 kg seed	N/A	**For soybeans grown under contract for seed production only.** The use of neonicotinoid seed treatments solely for protection against soybean aphids is not permitted on commercial soybeans**. For use in commercial seed treatment facilities only.** This product contains no colourant. An appropriate colourant must be added when this product is applied. Provides only early-season protection against soybean aphids and will not protect crop against typical mid-to-late-season aphid infestations. Toxic to fish and aquatic invertebrates. Do not apply directly to water or to areas where surface water is present. Treated seed is toxic to birds and small wild mammals. Spilled or exposed seeds and dust must be incorporated into the soil or cleaned-up from the soil surface.
	thiamethoxam + metalaxyl-M + fludioxonil + sedaxane **(See NOTE.)**	Cruiser Maxx Beans + Vibrance 500 FS (sold as a co-pack: Cruiser Maxx Vibrance Beans)	195 mL + 5–10 mL/ 100 kg seed (2.5–5 g a.i./ 100 kg seed)	N/A	**For soybeans grown under contract for seed production only.** The use of neonicotinoid seed treatments solely for protection against soybean aphids is not permitted on commercial soybeans. **For use in commercial seed treatment facilities only.** Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting. This product contains no colourant. An appropriate colourant must be added when this product is applied. Provides only early-season protection against soybean aphids and will not protect crop against typical mid-to-late-season aphid infestations. Toxic to fish and aquatic invertebrates. Do not apply directly to water or to areas where surface water is present. Treated seed is toxic to birds and small wild mammals. Spilled or exposed seeds and dust must be incorporated into the soil or cleaned-up from the soil surface.

SOYBEAN INSECTS

Table 2–2. Control Options for Insects in Soybeans — Soybean Aphid

LEGEND: PHI = Pre-Harvest Interval (in days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
SOYBEAN APHID (*Aphis glycines*) (continued)					
Seed Treatment (continued)					
(continued)	imidacloprid **(See NOTE.)**	Alias 240 SC	260–520 mL/ 100 kg seed	N/A	**For soybeans grown under contract for seed production only.** The use of neonicotinoid seed treatments solely for protection against soybean aphids is not permitted on commercial soybeans. Do not use in commercial seed treatment facilities. Apply through slurry applicator seed treaters that provide uniform seed coverage. Maintain constant agitation of the slurry during application. Do not apply any subsequent application of a Group 4 insecticide (e.g., Concept or Endigo) following a soil, in-furrow or seed treatment with Alias 240 SC. Provides only early-season protection against soybean aphids and will not protect crop against typical mid-to-late-season aphid infestations. Toxic to aquatic invertebrates. Keep out of lakes, streams, ponds and other aquatic systems. Toxic to birds. Any spilled or exposed seeds must be incorporated into the soil or otherwise cleaned-up from the soil surface.
		Sombrero 600 FS	104–208 mL/ 100 kg seed	N/A	**For soybeans grown under contract for seed production only.** For use in commercial and on-farm seed treatment equipment. The use of neonicotinoid seed treatments solely for protection against soybean aphids is not permitted on commercial soybeans. Apply through slurry applicator seed treaters that provide uniform seed coverage. Maintain constant agitation of the slurry during application. Do not apply any subsequent application of a Group 4 insecticide (e.g., Concept or Endigo) following a soil, in-furrow or seed treatment with Sombrero. Provides only early-season protection against soybean aphids and will not protect crop against typical mid-to-late-season aphid infestations. Toxic to birds, aquatic invertebrates and wildlife. Keep out of lakes, streams, ponds or other aquatic systems. Dispose of all excess and any spilled treated seeds by covering or incorporating into the soil.
		Stress Shield 600	104–208 mL/ 100 kg seed (62.5–125 g a.i./ 100 kg seed)	N/A	**For soybeans grown under contract for seed production only.** The use of neonicotinoid seed treatments solely for protection against soybean aphids is not permitted on commercial soybeans. **For use in commercial seed treatment facilities only.** Stress Shield 600 may only be mixed with certain fungicide seed treatment partners that are listed on the product label. Do not apply any subsequent application of a Group 4 insecticide (neonicotinoids) (e.g., Concept or Endigo) with Stress Shield 600. 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. Provides only early-season protection against soybean aphids and will not protect crop against typical mid-to-late-season aphid infestations. Toxic to birds and aquatic organisms. Spilled or exposed seeds and dust must be incorporated into the soil or cleaned-up from the soil surface.

SOYBEAN INSECTS

Table 2–2. Control Options for Insects in Soybeans — Soybean Aphid

LEGEND: PHI = Pre-Harvest Interval (in days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
SOYBEAN APHID (*Aphis glycines*) (continued)					
Foliar Treatment					
Foliar treatment is the recommended method of control for soybean aphids. Aphid infestations are more likely to cause yield reduction if the plants are already suffering from drought conditions or another stress factor. Scout fields frequently. Apply foliar insecticide when threshold of "250 aphids per plant with increasing populations" has been reached in the R1–R5 stage of soybeans. If aphid populations do not appear to be on the increase above 250 per plant, do not apply insecticide, as it will kill off the beneficial insects that are keeping the aphid population in check. Aphids are more likely to increase quickly in the absence of their predators and could easily reach threshold. The free Aphid Advisor app (aphidapp.com) developed by the University of Guelph and OMAFRA can help you with your soybean aphid spray decisions. It will determine if the natural enemy population in your field is enough to manage the aphid population or whether a spray is needed before economic injury occurs. For further information on scouting techniques, thresholds and management options, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	afidopyropen	Sefina	200 mL/ha (81 mL/acre)	7	Thorough and uniform coverage of all plant parts is required for effective control. For ground application apply a minimum spray volume 100–200 L/ha (for aerial 50 L/ha). Applications during crop blooming period may be made only in the evening when most bees are not foraging.
	dimethoate	Cygon 480 EC Lagon 480 EC	0.7–1 L/ha (280–404 mL/acre)	30	Ground and aerial application. Use high volume, high pressure and ensure good coverage. Maximum 2 applications/yr. Toxic to bees. Restrict application to the period after dark when bees are inside their hives, or in the early morning before the bees are foraging in the fields. Toxic to birds, mammals and aquatic organisms. Observe buffer zones specified on the label. Avoid contamination of aquatic systems and consider the characteristics and conditions of the site before treatment to reduce runoff into aquatic habitats.
	flupyradifurone	Sivanto Prime	500–750 mL/ha (202–303 mL/acre)	7	Ground or aerial application. The maximum amount of Sivanto Prime allowed per crop season is 2,000 mL/ha. Apply as a foliar application ensuring thorough coverage. Toxic to adult bees in laboratory studies via oral exposure, however, not toxic to bees through contact exposure, and field studies conducted with this product have shown no effects on honeybee colony development. Minimize spray drift to reduce exposure to bees in habitats close to the application site. Application during the crop blooming period and when flowering weeds are present may only be made in the early morning and the evening when most bees are not foraging. Toxic to aquatic organisms. Observe buffer zones specified on the label. Toxic to certain beneficial insects. Minimize spray drift to reduce harmful effects on beneficial insects in habitats next to the application sites.
	imidacloprid + deltamethrin	Concept	325–650 mL/ha (131–263 mL/acre)	20	Ground or aerial application. Do not apply this product if following a seed treatment or soil application of a Group 4 insecticide (e.g., Alias, Cruiser, Sombrero, Stressor Shield) that season. Use high rate for fastest knockdown and best residual control. Minimum of 5 days between applications. Maximum 3 applications/yr. 24-hr restricted entry interval. Highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. DO NOT apply this product to flowering crops or weeds if bees are visiting the treatment area. Highly toxic to fish and other aquatic organisms. Observe buffer zones specified on the label. Do not allow drift to come in contact with lakes, streams, rivers, ponds and other aquatic areas.

SOYBEAN INSECTS

Table 2–2. Control Options for Insects in Soybeans — Soybean Aphid

LEGEND: PHI = Pre-Harvest Interval (in days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
SOYBEAN APHID (*Aphis glycines*) (continued)					
Foliar Treatment (continued)					
(continued)	lambda-cyhalothrin	Labamba Matador 120 E Silencer 120 EC	83–233 mL/ha (34–94 mL/acre)	21	Ground and aerial application. For best results, apply during the early morning, before temperatures rise, or during the evening. Use higher rate when conditions favour rapidly increasing populations or when crop canopies are dense, resulting in poor spray coverage. Select nozzle size, type and pressure to produce a medium spray. Use 100–200 L water/ha for ground application, 10–40 L water/ha for aerial application. Maximum 3 applications/yr. 24-hr restricted entry interval. 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. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.
	lambda-cyhalothrin + chlorantraniliprole	Voliam Xpress	225–500 mL/ha (91–202 mL/acre)	21	Ground and aerial application. Do not use more than 3 applications by ground application or more than 1 application by aerial application. Re-apply after 7 days, depending on the presence of significant populations as determined by local monitoring. Apply in a minimum of 100–200 L of water/ha for ground application. Apply in a minimum of 40 L of water/ha for aerial application. 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. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.

SOYBEAN INSECTS

Table 2–2. Control Options for Insects in Soybeans — Soybean Aphid

LEGEND: PHI = Pre-Harvest Interval (in days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
SOYBEAN APHID (*Aphis glycines*) (continued)					
Foliar Treatment (continued)					
(continued)	spirotetramat	Movento 240 SC	185–275 mL/ha (75–111 mL/acre)	21	Ground and aerial application. The minimum interval between applications is 7 days. A maximum of 730 mL/ha of Movento is allowed per crop season. Movento must be tank-mixed with a spray adjuvant/additive having spreading and penetrating properties to maximize leaf uptake and systemicity of the active ingredient within treated plants. Please see label for suggested adjuvants. The efficacy of Movento may not be apparent for 10–21 days. Toxic to bee brood. Bee brood may be exposed to residues in/on pollen and nectar brought back to the hive by bees foraging on flowering crops and weeds. DO NOT apply during crop flowering period or when flowering weeds are present in the treatment area. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided.
	thiamethoxam + lambda-cyhalothrin	Endigo	180 mL/ha (73 mL/acre)	30	Ground and aerial application. Allow at least 7 days between treatments. Do not graze or harvest treated forage, straw or hay for livestock feed. Do not apply this product within 45 days of planting if seeds were treated with a neonicotinoid product (e.g., Alias, Cruiser, Sombrero, Stressor Shield). Do not exceed a total of 540 mL/ha of Endigo per season. Maximum of 3 applications/yr. Use a minimum of 100–200 L of water/ha for ground applications and 20 L of water/ha for aerial application. Do not apply pre-bloom or during bloom (Do not apply until after stage R3.5 (petal fall)). Do not apply when bees are present. Toxic to bees. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site. Toxic to aquatic organisms. Observe buffer zones specified on the label.

SOYBEAN INSECTS

Table 2–3. Control Options for Insects in Soybeans — Bean Leaf Beetle

LEGEND: PHI = Pre-Harvest Interval (in days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
BEAN LEAF BEETLE (*Certoma trifurcata*)					
Seed Treatment					
In Ontario, the use of neonicotinoid seed treatments on corn and soybean seed is restricted. See the Ontario website on Neonicotinoid Regulations at www.ontario.ca/page/neonicotinoid-regulations for more information on the requirements to use these products. Seed treatments may provide early-season protection from early infestations of bean leaf beetle. Fields with a history of early-season infestation from overwintering adults are at a higher risk and should be scouted regularly. Fields in southwestern counties of Ontario, in particular, tend to experience injury to the seedling crop from early infestations of beetles. **NOTE:** The planting of neonicotinoid-treated corn and soybean seed can pose a risk to pollinators. This includes all clothianidin, imidacloprid and thiamethoxam products. The contaminated insecticide dust emitted from pneumatic planters can drift onto flower and water sources and expose bees to these insecticides. Only a dust-reducing fluency agent is permitted to be used as a seed flow lubricant for corn or soybean seed treated with neonicotinoid insecticides clothianidin, thiamethoxam or imidacloprid. Talc and graphite are not permitted for use in this way. Growers are encouraged to follow best management practices (BMPs) to protect pollinators at planting. To help minimize the dust generated during planting, refer to *Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices* on the Health Canada website at www.canada.ca/pollinators.	cyantraniliprole	Fortenza	83 mL/100 kg seed (50 g/100 kg seed)	N/A	This product contains no colourant. An appropriate colourant must be added when this product is applied. Do not apply any subsequent application of a Group 28 insecticide (e.g., in-furrow, soil or foliar application) following Fortenza seed treatment. Toxic to bees. This product is systemic and bees can be exposed to product residues in flower, leaves, pollen and/or nectar. However, when product is applied and used according to label directions, risk is expected to be negligible. Toxic to aquatic organisms. Do not apply this product directly to freshwater habitats, estuaries or marine habitats. Avoid application to areas with a moderate slope, compacted soil or clay. If treated seeds are spilled outdoors or in areas accessible to birds, promptly clean up or bury to prevent ingestion.
		Lumiderm	0.075–0.200 mg a.i./seed	N/A	This product contains no colourant. An appropriate colourant must be added when this product is applied. For use in commercial seed treatment facilities using a closed transfer system only. DO NOT use open transfer systems. On-farm seed treatment is permitted for soybean only. Open transfer is permitted for the on-farm treatment of soybeans only. Do not apply any subsequent application of a Group 28 Insecticide (e.g., in-furrow, soil or foliar application) following Lumiderm seed treatment. Toxic to bees. This product is systemic and bees can be exposed to product residues in flower, leaves, pollen and/or nectar. However, when product is applied and used according to label directions, risk is expected to be negligible. Toxic to aquatic organisms. Do not contaminate aquatic habitats.

SOYBEAN INSECTS

Table 2–3. Control Options for Insects in Soybeans — Bean Leaf Beetle

LEGEND: PHI = Pre-Harvest Interval (in days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
BEAN LEAF BEETLE (*Certoma trifurcata*) (continued)					
Seed Treatment (continued)					
(continued)	imidacloprid **(See NOTE.)**	Alias 240 SC	260–520 mL/ 100 kg seed	N/A	**Do not use in commercial seed treatment facilities.** Apply through slurry applicator seed treaters, which provide uniform seed coverage. Maintain constant agitation of the slurry during application. Do not apply any subsequent application of a Group 4 insecticide (e.g., Concept or Endigo) following a soil, in-furrow or seed treatment with Alias 240 SC. This product contains no colourant. An appropriate colourant must be added when this product is applied. Toxic to aquatic invertebrates. Keep out of lakes, streams, ponds and other aquatic systems. Toxic to birds. Any spilled or exposed seeds must be incorporated into the soil or otherwise cleaned-up from the soil surface.
		Sombrero 600 FS	104–208 mL/ 100 kg seed	N/A	For commercial and on-farm treating. Apply through slurry applicator seed treaters, which provide uniform seed coverage. Maintain constant agitation of the slurry during application. Do not apply any subsequent application of a Group 4 insecticide (e.g., Concept or Endigo) following a soil, in-furrow or seed treatment with Sombrero. This product contains no colourant. An appropriate colourant must be added when this product is applied. Toxic to birds, aquatic invertebrates and wildlife. Keep out of lakes, streams, ponds or other aquatic systems. Dispose of all excess and any spilled treated seeds by covering or incorporating into the soil.
		Stress Shield 600	104–208 mL/ 100 kg seed (62.5–125 g a.i./ 100 kg seed)	N/A	**For use in commercial seed treatment facilities only.** Stress Shield 600 may only be mixed with certain fungicide seed treatment partners that are listed on the product label. Do not apply any subsequent application of a Group 4 insecticide (neonicotinoids) (e.g., Concept or Endigo) with Stress Shield 600. 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. Toxic to birds and aquatic organisms. Spilled or exposed seeds and dust must be incorporated into the soil or cleaned-up from the soil surface.

SOYBEAN INSECTS

Table 2–3. Control Options for Insects in Soybeans — Bean Leaf Beetle

LEGEND: PHI = Pre-Harvest Interval (in days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
BEAN LEAF BEETLE (*Certoma trifurcata*) (continued)					
Seed Treatment (continued)					
(continued)	thiamethoxam **(See NOTE.)**	Cruiser 5 FS	83 mL/ 100 kg seed	N/A	**For use in commercial seed treatment facilities only.** To reduce early-season defoliation. Do not graze or feed livestock on treated areas for 45 days after planting. This product contains no colourant. An appropriate colourant must be added when this product is applied. Toxic to fish and aquatic invertebrates. Do not apply directly to water or to areas where surface water is present. Treated seed is toxic to birds and small wild mammals. Spilled or exposed seeds and dust must be incorporated into the soil or cleaned-up from the soil surface.
	thiamethoxam + metalaxyl-M + fludioxonil + sedaxane **(See NOTE.)**	Cruiser Maxx Beans + Vibrance 500 FS (sold as a co-pack: Cruiser Maxx Vibrance Beans)	195 mL + 5–10 mL/ 100 kg seed (2.5–5 g a.i./ 100 kg seed)	N/A	**For use in commercial seed treatment facilities only.** Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting. This product contains no colourant. An appropriate colourant must be added when this product is applied. Toxic to fish and aquatic invertebrates. Do not apply directly to water or to areas where surface water is present. Treated seed is toxic to birds and small wild mammals. Spilled or exposed seeds and dust must be incorporated into the soil or cleaned-up from the soil surface.

SOYBEAN INSECTS

Table 2–3. Control Options for Insects in Soybeans — Bean Leaf Beetle

LEGEND: PHI = Pre-Harvest Interval (in days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
BEAN LEAF BEETLE (*Certoma trifurcata*) (continued)					
Foliar Treatment					
For protection from overwintering adults, in areas with a history of injury, consider using insecticide seed treatment for the earliest planted soybeans. Bean leaf beetle populations rarely cause enough defoliation after the seedling stages to require a foliar insecticide application in Ontario. Defoliation thresholds are listed in the OMAFRA Publication 811, *Agronomy Guide for Field Crops*. Food-grade and seed soybeans may require protection, especially during the later R5 and R6 pod stages to reduce pod disease development caused by beetle feeding. If 10% of pods have feeding damage, insecticide may be necessary. Pay attention to pre-harvest intervals when spraying during the R6 stage of soybeans.	dimethoate	Cygon 480 EC Lagon 480 EC	0.7–1 L/ha (280–404 mL/acre)	30	Ground and aerial application. Use sufficient water volume to ensure good coverage. Maximum 2 applications/yr. Toxic to bees. Restrict application to the period after dark when bees are inside their hives, or in the early morning before the bees are foraging in the fields. Toxic to birds, mammals and aquatic organisms. Observe buffer zones specified on the label. Avoid contamination of aquatic systems and consider the characteristics and conditions of the site before treatment to reduce runoff into aquatic habitats.
	imidacloprid + deltamethrin	Concept	325–650 mL/ha (131–263 mL/acre)	20	**Provides suppression only.** Ground or aerial application. Do not apply this product if following a seed treatment of a Group 4 insecticide (e.g., Alias, Cruiser, Sombrero, Stressor Shield) within that season. Use high rate for fastest knockdown and best residual control. Minimum of 5 days between applications. Maximum 3 applications/yr. 24-hr restricted entry interval. Highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. DO NOT apply this product to flowering crops or weeds if bees are visiting the treatment area. Highly toxic to fish and other aquatic organisms. Observe buffer zones specified on the label. Do not allow drift to come in contact with lakes, streams, rivers, ponds and other aquatic areas.
	lambda-cyhalothrin	Labamba Matador 120 E Silencer 120 EC	83–233 mL/ha (34–94 mL/acre)	21	Ground and aerial application. For best results, apply during the early morning, before temperatures rise, or during the evening. Use 100–200 L water/ha for ground application, 10–40 L water/ha for aerial application. Maximum 3 applications/yr. 24-hr restricted entry interval. 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. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.

SOYBEAN INSECTS

Table 2–3. Control Options for Insects in Soybeans — Bean Leaf Beetle

LEGEND: PHI = Pre-Harvest Interval (in days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
BEAN LEAF BEETLE (*Certoma trifurcata*) (continued)					
Foliar Treatment (continued)					
(continued)	lambda-cyhalothrin + chlorantraniliprole	Voliam Xpress	225–500 mL/ha (91–202 mL/acre)	21	Ground and aerial application. Do not use more than 3 applications by ground application or more than 1 application by aerial application. Re-apply after 7 days, depending on the presence of significant populations as determined by local monitoring. Apply in a minimum of 100–200 L of water/ha for ground application. Apply in a minimum of 40 L of water/ha for aerial application. 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. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.
	spirotetramat	Movento	185–275 mL/ha (75–111 mL/acre)	21	Ground and aerial application. The minimum interval between applications is 7 days. A maximum of 730 mL/ha of Movento is allowed per crop season. Movento must be tank-mixed with a spray adjuvant/additive having spreading and penetrating properties to maximize leaf uptake and systemicity of the active ingredient within treated plants. Please see label for suggested adjuvants. The efficacy of Movento may not be apparent for 10–21 days. Toxic to bee brood. Bee brood may be exposed to residues in/on pollen and nectar brought back to the hive by bees foraging on flowering crops and weeds. DO NOT apply during crop flowering period or when flowering weeds are present in the treatment area. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided.
	thiamethoxam + lambda-cyhalothrin	Endigo	180 mL/ha (73 mL/acre)	30	Ground and aerial application. Allow at least 7 days between treatments. Do not graze or harvest treated forage, straw or hay for livestock feed. Do not apply this product within 45 days of planting if seeds were treated with a neonicotinoid product (e.g., Alias, Cruiser, Sombrero, Stressor Shield). Do not exceed a total of 540 mL/ha of Endigo per season. Maximum of 3 applications/yr. Use a minimum of 100–200 L of water/ha for ground applications and 20 L of water/ha for aerial application. Do not apply pre-bloom or during bloom (do not apply until after stage R3.5 (petal fall)). Do not apply when bees are present. Toxic to bees. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site. Toxic to aquatic organisms. Observe buffer zones specified on the label.

SOYBEAN INSECTS

Table 2–4. Control Options for Insects in Soybeans — Wireworm

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
WIREWORM (*Limonius* spp.)				
Seed Treatment				
In Ontario, the use of neonicotinoid seed treatments on corn and soybean seed is restricted. See the Ontario website on Neonicotinoid Regulations at www.ontario.ca/page/neonicotinoid-regulations for more information on the requirements to use these products. The risk factors for wireworm infestations include fields with a history of cereal/corn/grassy weeds, sandy soils, history of wireworm problems and fields that are coming out of sod. **NOTE:** The planting of neonicotinoid-treated corn and soybean seed can pose a risk to pollinators. This includes all clothianidin, imidacloprid and thiamethoxam products. The contaminated insecticide dust emitted from pneumatic planters can drift onto flower and water sources and expose bees to these insecticides. Only a dust-reducing fluency agent is permitted to be used as a seed flow lubricant for corn or soybean seed treated with neonicotinoid insecticides clothianidin, thiamethoxam or imidacloprid. Talc and graphite are not permitted for use in this way. Growers are encouraged to follow best management practices (BMPs) to protect pollinators at planting. To help minimize the dust generated during planting, refer to *Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices* on the Health Canada website at www.canada.ca/pollinators.	cyantraniliprole	Fortenza	83 mL/100 kg seed (50 g/100 kg seed)	This product contains no colourant. An appropriate colourant must be added when this product is applied. Do not apply any subsequent application of a Group 28 insecticide (e.g., in furrow, soil or foliar application) following Fortenza seed treatment. Toxic to bees. This product is systemic and bees can be exposed to product residues in flower, leaves, pollen and/or nectar. However, when product is applied and used according to label directions, risk is expected to be negligible. Toxic to aquatic organisms. Do not apply this product directly to freshwater habitats, estuaries or marine habitats. Avoid application to areas with a moderate slope, compacted soil or clay. If treated seeds are spilled outdoors or in areas accessible to birds, promptly clean up or bury to prevent ingestion.
	imidacloprid **(See NOTE.)**	Alias 240 SC	260–520 mL/ 100 kg seed	**Do not use in commercial seed treatment facilities.** Apply through slurry applicator seed treaters, which provide uniform seed coverage. Maintain constant agitation of the slurry during application. Do not apply any subsequent application of a Group 4 insecticide (e.g., Concept or Endigo) following a soil, in-furrow or seed treatment with Alias 240 SC. This product contains no colourant. An appropriate colourant must be added when this product is applied.
		Sombrero 600 FS	104–208 mL/ 100 kg seed	For use in commercial and on-farm seed treatment equipment. Apply through slurry applicator seed treaters, which provide uniform seed coverage. Maintain constant agitation of the slurry during application. Do not apply any subsequent application of a Group 4 insecticide (e.g., Concept or Endigo) following a soil, in-furrow or seed treatment with Sombrero. This product contains no colourant. An appropriate colourant must be added when this product is applied. Toxic to aquatic invertebrates. Keep out of lakes, streams, ponds and other aquatic systems. Toxic to birds. Any spilled or exposed seeds must be incorporated into the soil or otherwise cleaned-up from the soil surface.
		Stress Shield 600	104–208 mL/ 100 kg seed (62.5–125 g a.i./ 100 kg seed)	**For use in commercial seed treatment facilities only.** Stress Shield 600 may only be mixed with certain fungicide seed treatment partners that are listed on the product label. Do not apply any subsequent application of a Group 4 insecticide (neonicotinoids) (e.g., Concept or Endigo) with Stress Shield 600. 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. Toxic to birds and aquatic organisms. Spilled or exposed seeds and dust must be incorporated into the soil or cleaned-up from the soil surface.

SOYBEAN INSECTS

Table 2–4. Control Options for Insects in Soybeans — Wireworm

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
WIREWORM (*Limonius* spp.) (continued)				
Seed Treatment (continued)				
(continued)	thiamethoxam **(See NOTE.)**	Cruiser 5 FS	50–83 mL/ 100 kg seed	**For use in commercial seed treatment facilities only.** Use higher rate when insect populations are expected to be high. Do not graze or feed livestock on treated areas for 45 days after planting. This product contains no colourant. An appropriate colourant must be added when this product is applied. Toxic to fish and aquatic invertebrates. Do not apply directly to water or to areas where surface water is present. Treated seed is toxic to birds and small wild mammals. Spilled or exposed seeds and dust must be incorporated into the soil or cleaned-up from the soil surface.
	thiamethoxam + metalaxyl-M + fludioxonil + sedaxane **(See NOTE.)**	Cruiser Maxx Beans + Vibrance 500 FS (sold as a co-pack: Cruiser Maxx Vibrance Beans)	195 mL + 5–10 mL/ 100 kg seed (2.5–5 g a.i./ 100 kg seed)	**For use in commercial seed treatment facilities only.** Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting. Toxic to fish and aquatic invertebrates. Do not apply directly to water or to areas where surface water is present. Treated seed is toxic to birds and small wild mammals. Spilled or exposed seeds and dust must be incorporated into the soil or cleaned-up from the soil surface.

SOYBEAN INSECTS

Table 2–5. Control Options for Insects in Soybeans — Grubs, Brown Marmorated Stink Bug

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
GRUBS — EUROPEAN CHAFER (*Amphimallon majalis*), JUNE BEETLE (*Phyllophaga* spp.) or JAPANESE BEETLE (*Popillia japonica*)				
Seed Treatment				
In Ontario, the use of neonicotinoid seed treatments on corn and soybean seed is restricted. See the Ontario website on Neonicotinoid Regulations at www.ontario.ca/page/neonicotinoid-regulations for more information on the requirements to use these products. **NOTE:** The planting of neonicotinoid-treated corn and soybean seed can pose a risk to pollinators. This includes all clothianidin, imidacloprid and thiamethoxam products. The contaminated insecticide dust emitted from pneumatic planters can drift onto flower and water sources and expose bees to these insecticides. Only a dust-reducing fluency agent is permitted to be used as a seed flow lubricant for corn or soybean seed treated with neonicotinoid insecticides clothianidin, thiamethoxam or imidacloprid. Talc and graphite are not permitted for use in this way. Growers are encouraged to follow best management practices (BMPs) to protect pollinators at planting. To help minimize the dust generated during planting, refer to *Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices* on the Health Canada website at www.canada.ca/pollinators.	cyantraniliprole	Fortenza	41.5–83 mL/ 100 kg seed	**For European chafer and June beetle grubs.** This product contains no colourant. An appropriate colourant must be added when this product is applied. Do not apply any subsequent application of a Group 28 insecticide (e.g., in-furrow, soil or foliar application) following Fortenza seed treatment. Toxic to bees. This product is systemic and bees can be exposed to product residues in flower, leaves, pollen and/or nectar. However, when product is applied and used according to label directions, risk is expected to be negligible. Toxic to aquatic organisms. Do not apply this product directly to freshwater habitats, estuaries or marine habitats. Avoid application to areas with a moderate slope, compacted soil or clay. If treated seeds are spilled outdoors or in areas accessible to birds, promptly clean up or bury to prevent ingestion.
	imidacloprid **(See NOTE.)**	Stress Shield 600	104–208 mL/ 100 kg seed (62.5–125 g a.i./ 100 kg seed)	**For European chafer and Japanese beetle grubs. For use in commercial seed treatment facilities only.** Stress Shield 600 may only be mixed with certain fungicide seed treatment partners that are listed on the product label. Do not apply any subsequent application of a Group 4 insecticide (neonicotinoids) (e.g., Concept or Endigo) with Stress Shield 600. 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. Toxic to birds and aquatic organisms. Spilled or exposed seeds and dust must be incorporated into the soil or cleaned-up from the soil surface.
	thiamethoxam **(See NOTE.)**	Cruiser 5 FS	83 mL/ 100 kg seed	**For European chafer only. For use in commercial seed treatment facilities only.** Use higher rate when insect populations are expected to be high. Do not graze or feed livestock on treated areas for 45 days after planting. This product contains no colourant. An appropriate colourant must be added when this product is applied. Toxic to fish and aquatic invertebrates. Do not apply directly to water or to areas where surface water is present. Treated seed is toxic to birds and small wild mammals. Spilled or exposed seeds and dust must be incorporated into the soil or cleaned-up from the soil surface.
BROWN MARMORATED STINK BUG (*Halyomorpha halys*)				
This is a new invasive species in Ontario and is established in many urban areas of Ontario, though infestations have not been detected in field crops in Ontario as of 2020. BMSBs are most likely to enter corn and soybean fields once the crop has an ear developing or a pod forming. Scout fields once a week, inspecting five areas within the first 12 m of the field's edge. No thresholds have been established for corn or soybeans in Ontario yet. If this pest is found in corn or soybeans, contact the OMAFRA Agricultural Information Contact Centre at 1-877-424-1300 or ag.info.omafra@ontario.ca. Management strategies are under development. Up-to-date information is available at ontario.ca/stinkbug.				No products currently registered for BMSB on soybeans.

SOYBEAN INSECTS

Table 2–6. Control Options for Insects in Soybeans — Two-Spotted Spidermites, Japanese Beetle, Potato Leafhopper, Slugs

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
TWO-SPOTTED SPIDERMITES (*Tetranychus uricae*)					
Foliar application					
Scout fields in the first week of July. Infestations usually move in from edge of field as hot spots. Spot spray when populations average 4 mites per leaflet. Do not use a pyrethroid insecticide (e.g., Matador) for the control of spidermites, as it will kill the beneficial mites and cause the spidermite populations to increase.	dimethoate	Cygon 480 EC Lagon 480 EC	1 L/ha (404 mL/acre)	30	Ground and aerial application. Use sufficient water volume to ensure good coverage. Maximum 2 applications/yr. Toxic to adult bees in laboratory studies via oral exposure, however, not toxic to bees through contact exposure, and field studies conducted with this product have shown no effects on honeybee colony development. Minimize spray drift to reduce exposure to bees in habitats close to the application site. Toxic to bees. Application during the crop blooming period, and when flowering weeds are present, may only be made in the early morning and the evening when most bees are not foraging. 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. Toxic to birds, mammals and aquatic organisms. Observe buffer zones specified on the label. Avoid contamination of aquatic systems and consider the characteristics and conditions of the site before treatment to reduce runoff into aquatic habitats.
JAPANESE BEETLE ADULTS (*Popillia japonica*)					
Foliar application					
If the defoliation by adults exceeds the defoliation thresholds, insecticide applications may be necessary. Defoliation thresholds for soybeans are available in OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	imidacloprid + deltamethrin	Concept	325–650 mL/ha (131–263 mL/acre)	20	Ground or aerial application. Use high rate for fastest knockdown and best residual control. Do not apply this product if following a seed treatment or soil application of a Group 4 insecticide (e.g., Alias, Cruiser, Sombrero, Stress or Shield) within that season. Minimum of 5 days between applications. Maximum 3 applications/yr. 24-hr restricted entry interval. Highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. DO NOT apply this product to flowering crops or weeds if bees are visiting the treatment area. Toxic to aquatic organisms. Observe buffer zones specified on the label.

SOYBEAN INSECTS

Table 2–6. Control Options for Insects in Soybeans — Two-Spotted Spidermites, Japanese Beetle, Potato Leafhopper, Slugs

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
POTATO LEAFHOPPER (*Empoasca fabae*)					
Foliar application					
Potato leafhoppers are controlled in soybeans by plant resistance through leaf pubescence. Problems are rare in soybeans in Ontario and only occur on young seedling plants in extremely high potato leafhopper infestation years or on varieties with low to no leaf pubescence (hairy leaves). Food grade soybeans may need protection.	dimethoate	Cygon 480 EC Lagon 480 EC	0.7–1 L/ha (280–404 mL/acre)	30	Ground and aerial application. Use sufficient water volume to ensure good coverage. Maximum 2 applications/yr. 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. Toxic to birds, mammals and aquatic organisms. Observe buffer zones specified on the label. Avoid contamination of aquatic systems and consider the characteristics and conditions of the site before treatment to reduce runoff into aquatic habitats.
	flupyradifurone	Sivanto Prime	500–700 mL/ha (202–303 mL/acre)	21	Ground and aerial application. Use a minimum of 100 L/ha of water for ground and 20 L/ha of water for aerial applications. Minimum of 10 days between applications. Toxic to adult bees in laboratory studies via oral exposure, however not toxic to bees through contact exposure and field studies conducted with this product have shown no effects on honeybee colony development. Application during crop blooming period and when flowering weeds are present may only be made in the early morning and evening when most bees are not foraging. Toxic to aquatic organisms. Observe buffer zones specified on the label. Toxic to certain beneficial insects. Minimize spray drift to reduce harmful effects on beneficial insects in habitats next to the application sites.
SLUGS (Various species)					
Slugs often avoid contact by feeding below ground, and dew and rainfall easily wash any product used away from the slugs and leaves. Ensure seed slots are closed during planting. Growers with fields with a history of significant slug damage should consider using some form of tillage to eliminate significant residue, exposing the slugs to dehydration and predation. Zone tillage or row sweepers can help speed up the drying of the row area, thus deterring slug feeding. Moving trash away from seedlings may also help reduce damage. See OMAFRA Publication 811, *Agronomy Guide for Field Crops*, for rotation and tillage recommendations.	iron (present as ferric phosphate)	Sluggo Professional	12–50 kg/ha (4.9–20.2 kg/acre)	N/A	Use broadcast or granular spreader to apply evenly around or over the plants to be protected. At the seedling and later stages, apply the bait between the rows and around the perimeter of the field.

SOYBEAN DISEASES

Table 2–7. Control Options for Diseases in Soybeans — Soybean Cyst Nematode, Root Lesion Nematode

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
SOYBEAN CYST NEMATODE (*Heterodera glycines*)				
Seed Treatment				
Soybean cyst nematode (SCN) is often confused with other common problems such as nutrient deficiencies, herbicide injury, soil compaction, drought, flooding or root rots. By the time above-ground symptoms from SCN feeding become noticeable, most fields have lost 25%–30% yield potential to the nematode. Early detection through scouting and soil testing is critical. If you suspect SCN, plants should be carefully dug (not pulled) and soil gently removed from the roots. Cysts are white to yellow and about the size of a pinhead. Rotating non-host crops such as corn, wheat, alfalfa or vegetable crops such as tomatoes, with resistant varieties, will lower SCN populations and improve yields on SCN-infested fields. In addition, rotation of SCN-resistant varieties is recommended to reduce shifts in the nematode population. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	fluopyram	ILeVO	0.075–0.15 mg a.i./seed or 17.5–35 mL/ 140,000 soybean seeds	**For use in commercial seed treatment (facilities and mobile treaters) with closed transfer including closed mixing, loading, calibrating and closed treatment equipment.** No open transfer of ILeVO is permitted. Not for use in hopper box, planter box, slurry box or other on-farm seed treatment applications. The higher rate should be used on soybean seed planted in fields with high nematode pressure or in fields with nematodes as well as sudden death syndrome. Fields with a history of soybean cyst nematodes should be planted with SCN-tolerant soybean cultivars in addition to the ILeVO seed treatment to achieve the best yield potential of soybean. Apply using commercial slurry or mist-type seed treatment equipment. Uniform application of seed is necessary to ensure seed safety and best disease protection. Dilute product with sufficient water to ensure complete seed coverage. Apply to high quality, properly cleaned seeds. This product contains no colourant. An appropriate colourant must be added when this product is applied to seed.
	Pasteuria nishizawae	CLARIVA pn	8–10 million spores per seed (100 kg seed)	**For commercial seed treatment facilities only.** To determine the amount (mL) of CLARIVA pn required to treat 100 kg of seed, use the following formula: Rate per 100 kg seed (mL/100 kg seed) = spores per seed (8,000,000–10,000,000) ÷ product guarantee (spores/mL) x seed size (seeds/kg) x 100 kg seed This product does not contain a colourant. A suitable colourant must be added to the slurry prior to application to the seed. Dilute in sufficient water to achieve thorough and even coverage to the seed.
ROOT LESION NEMATODE (*Pratylenchus* sp.)				
Seed Treatment				
Root lesion nematodes have a wide host range including many field, horticultural crops and many weed species. The nematode can be found in most fields and causes small streak (scratch-like) lesions on roots providing an entry point for other root rot pathogens to infect. No known resistant varieties. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	fluopyram	ILeVO	0.075–0.15 mg a.i./seed or 17.5–35 mL/ 140,000 soybean seeds	**For use in commercial seed treatment (facilities and mobile treaters) with closed transfer, including closed mixing, loading, calibrating and closed treatment equipment.** No open transfer of ILeVO is permitted. Not for use in hopper box, planter box, slurry box or other on-farm seed treatment applications. The higher rate should be used on soybean seed planted in fields with high nematode pressure or in fields with nematodes as well as sudden death syndrome. Fields with a history of soybean cyst nematodes should be planted with SCN-tolerant soybean cultivars in addition to the ILeVO seed treatment to achieve the best yield potential of soybean. Apply using commercial slurry or mist-type seed treatment equipment. Uniform application of seed is necessary to ensure seed safety and best disease protection. Dilute product with sufficient water to ensure complete seed coverage. Apply to high-quality, properly cleaned seeds. This product contains no colourant. An appropriate colourant must be added when this product is applied to seed.

SOYBEAN DISEASES

Table 2–8. Control Options for Diseases in Soybeans — Sudden Death Syndrome

LEGEND: PHI = Pre-Harvest Interval (in days) N/A = Not Applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
SUDDEN DEATH SYNDROME (*Fusarium virguliforme*)					
Seed Treatment					
Wet soils and warm temperatures are conducive to disease development. A slight brownish discolouration occurs in crowns of affected plants. Infected plants wilt and may die very quickly in July and August. Yellowing and browning of leaf tissue between the veins on the upper leaves and defoliation may occur. Petioles are generally retained. The disease is frequently, but not always, associated with soybean cyst nematode. Select varieties with resistance to SCN and SDS. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	fluopyram	ILeVO	0.15–0.25 mg a.i./seed or 35–58 mL/ 140,000 soybean seeds	N/A	**For use in commercial seed treatment (facilities and mobile treaters) with closed transfer including closed mixing, loading, calibrating and closed treatment equipment.** No open transfer of ILeVO is permitted. Not for use in hopper-box, planter-box, slurry-box or other on-farm seed treatment applications. The higher rate is recommended for fields with moderate-to-high disease pressure and/or known history of SDS outbreaks and/or for use on soybean varieties that are known to be susceptible for this disease. The lower rate should be used under low disease pressure. Apply using commercial slurry or mist-type seed treatment equipment. Uniform application of seed is necessary to ensure seed safety and best disease protection. Dilute product with sufficient water to ensure complete seed coverage. Apply to high-quality, properly cleaned seeds. This product contains no colourant. An appropriate colourant must be added when this product is applied to seed.
	ipconazole + carbathiin + metalaxyl	Rancona Trio	500 mL/100 kg seed	N/A	**Provides suppression only.** For commercial and on-farm treating. Do not graze or cut for forage within 4 weeks after planting. Read label for information regarding resistant strains of fungus.
	pydiflumetofen	Saltro	0.0756 mg a.i./seed or 100 mL/100 kg seed	N/A	For commercial and on-farm treating. Apply a total slurry volume of SALTRO plus water (or Rhizobia inoculant at rates recommended by the manufacturer to achieve proper total slurry volumes) to a total volume of 325 mL per 100 kg of seed. This product contains no colourant. An appropriate colourant must be added when this product is applied.
	thiabendazole	MERTECT SC	10–40 mL/100 kg seed	N/A	**Provides suppression only. For commercial and mobile seed treaters only.** May be tank-mixed for control of a broad spectrum of diseases and insect pests; see the label and labels of the tank-mix partner for application rates, precautions and directions. Use the high rate under higher disease pressure.

SOYBEAN DISEASES

Table 2–9. Control Options for Diseases in Soybeans — Phytophthora Root Rot

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
PHYTOPHTHORA SEEDLING BLIGHT AND ROOT ROT (*Phytophthora sojae*) — Suppression only				
Seed Treatment				
Select soybean varieties that have both specific resistance (Rps genes such as 1K and 1C) and good partial resistance (tolerance) to all races of *Phytophthora*. Consult with your seed company and the Ontario Soybean and Canola Committee (OSACC) Variety Trial Results at www.gosoy.ca for variety profiles. This disease is primarily controlled through resistant varieties. Crop losses are greatest in cold, wet clay soils. Try to minimize soil compaction and remove excess moisture through improved drainage. A small amount of tillage will help warm the soil and improve surface drainage. Rotate soybeans with corn and wheat. Plant seed when soil temperatures are above 13°C. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	ethaboxam	INTEGO Solo	19.6 mL/ 100 kg seed	For commercial and on-farm treating. Regulations under the *Seeds Act* require that an appropriate colourant be added when this product is applied to seed. 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 *Rhizoctonia solani* and other fungal pathogens inciting seed and seedling disease.
	fludioxonil + metalaxyl-M	Apron Maxx RFC	100 mL + 230 mL of water/ 100 kg seed	For commercial and on-farm treating. Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting. Provides early-season protection against phytophthora root rot for tolerant varieties of soybeans. If target fields have a history of high pressure or if susceptible varieties are to be treated, tank-mix with 31 mL of Apron XL LS/100 kg seed.
		Apron Maxx RTA	325 mL/ 100 kg seed	For commercial and on-farm treating. Provides early-season protection for tolerant varieties. If target fields have a history of high *Phytophthora* pressure, or if susceptible varieties are to be treated, tank-mix with 31 mL/100 kg seed of Apron XL LS. Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers prior to use. Ensure uniform coverage.
	metalaxyl	Allegiance FL	46–93 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or feed livestock on seeded area for 4 weeks after planting.
		Apron FL		
	metalaxyl-M	Apron XL-LS	40 mL/ 100 kg seed	**For use in commercial seed treating only.** Do not graze or feed livestock on seeded area for 4 weeks after planting.
	metalaxyl-M + sedaxane + fludioxonil	Vibrance Maxx RFC	100 mL/ 100 kg seed	For commercial and on-farm treating. Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting. Provides early-season protection against phytophthora root rot for tolerant varieties of soybeans. If target fields have a history of high pressure or if susceptible varieties are to be treated, tank-mix with 31 mL of Apron XL LS/100 kg of seed.
	metalaxyl-M + sedaxane + fludioxonil	Vibrance Trio	100 mL/ 100 kg seed	For commercial and on-farm treating. Apply 100 mL of VIBRANCE TRIO Fungicide plus 225 mL of water (or Rhizobia inoculant at rates recommended by the manufacturer to achieve proper total slurry volumes) per 100 kg of seed.
	oxathiapiprolin	Lumisena	0.012–0.024 mg a.i./seed (8.4–16.8 mL product/ 140,000 seeds)	**For use in commercial seed treatment facilities only. For use by commercial treaters (facilities) with closed transfer systems only.** Closed transfer includes closed mixing, loading, calibrating and closed treatment equipment. No open transfer of Lumisena fungicide seed treatment is permitted.

SOYBEAN DISEASES

Table 2–9. Control Options for Diseases in Soybeans — Phytophthora Root Rot

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
PHYTOPHTHORA SEEDLING BLIGHT AND ROOT ROT (*Phytophthora sojae*) — Suppression only (continued)				
Seed Treatment (continued)				
(continued)	penflufen + prothioconazole + metalaxyl	EverGol Energy	6 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. For control of early-season phytophthora in soybean, product may be tank-mixed with metalaxyl and metalaxyl-M but see tank-mix partner label.
	thiamethoxam + metalaxyl-M + fludioxonil + sedaxane	Cruiser Maxx Beans + Vibrance 500 FS (sold as a co-pack: Cruiser Maxx Vibrance Beans)	195 mL + 5–10 mL/ 100 kg seed (2.5–5 g a.i./ 100 kg seed)	**For use in commercial seed treatment facilities only.** Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting. Provides early-season protection against phytophthora root rot for tolerant varieties of soybeans. If target fields have a history of high pressure or if susceptible varieties are to be treated, tank-mix with 31 mL of Apron XL LS/100 kg of seed.

SOYBEAN DISEASES

Table 2–10. Control Options for Diseases in Soybeans — Phomopsis Seed Mould

LEGEND: PHI = Pre-Harvest Interval (in days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
PHOMOPSIS SEED MOULD (*Phomopsis longicolla*)					
Seed Treatment					
This disease is most severe when cool, wet conditions delay harvest. Some varieties are more susceptible than others. Consult with your seed company for variety profiles. Fungicide seed treatments will improve the germination of low-to-moderately infected seed. Do not plant severely infected seed. Plant good-quality seed with a germination rate of at least 80%–90%. Rotate with non-host crops such as corn and wheat, remove excess surface residue and harvest as early as possible. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	carbathiin + thiram	Vitaflo 280	260 mL/ 100 kg seed	N/A	For commercial and on-farm treating. Do not graze or feed livestock on treated areas. Do not store treated soybean seed. May be applied through commercial seed treatment equipment or auger. Ensure uniform coverage.
	fludioxonil	Maxim 480 FS	5.2–10.4 mL/ 100 kg seed	N/A	**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 or immediately before planting. Do not graze treated crops or cut for forage within 30 days of planting.
	fludioxonil + metalaxyl-M	Apron Maxx RFC	100 mL + 230 mL of water/ 100 kg seed	N/A	For commercial and on-farm treating. Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting.
		Apron Maxx RTA	325 mL/ 100 kg seed	N/A	For commercial and on-farm treating. Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers prior to use. Ensure uniform coverage.
	ipconazole + carbathiin + metalaxyl	Rancona Trio	500 mL/ 100 kg seed	N/A	For commercial and on-farm treating. Do not graze or cut for forage within 4 weeks after planting. Read label for information regarding resistant strains of fungus.
	mandestrobin	S-2200 3.2FS	26 mL/ 100 kg seed	N/A	For commercial and on-farm treating. Regulations under the *Seeds Act* require that an appropriate colourant be added when this product is applied to seed. Ensure uniform seed coverage and do not apply this product in a hopper-box or planter-box at planting time. For resistance management, please note that S-2200 3.2 FS fungicide is a Group 11 fungicide. Any fungal population may contain individuals naturally resistant to S-2200 3.2 FS fungicide and other Group 11 fungicides.
	metalaxyl-M + sedaxane + fludioxonil	Vibrance Maxx RFC	100 mL/ 100 kg seed	N/A	For commercial and on-farm treating. Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting.
	metalaxyl-M + sedaxane + fludioxonil	Vibrance Trio	100 mL/ 100 kg seed		For commercial and on-farm treating. Apply 100 mL of VIBRANCE TRIO fungicide plus 225 mL of water (or Rhizobia inoculant at rates recommended by the manufacturer to achieve proper total slurry volumes) per 100 kg of seed. This product contains no colourant. An appropriate colourant must be added when this product is applied.
	penflufen + prothioconazole + metalaxyl	EverGol Energy	65 mL/ 100 kg seed	N/A	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. For control of early-season phytophthora in soybean, product may be tank-mixed with metalaxyl and metalaxyl-M but, again, see tank-mix partner label.

SOYBEAN DISEASES

Table 2–10. Control Options for Diseases in Soybeans — Phomopsis Seed Mould

LEGEND: PHI = Pre-Harvest Interval (in days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
PHOMOPSIS SEED MOULD (*Phomopsis longicolla*) (continued)					
Seed Treatment (continued)					
(continued)	thiabendazole	MERTECT SC	10–40 mL/ 100 kg seed	N/A	For commercial and on-farm treating. May be tank-mixed for control of a broad spectrum of diseases and insect pests; see the label and labels of the tank-mix partner for application rates, precautions and directions. Use the high rate under higher disease pressure.
	thiamethoxam + metalaxyl-M + fludioxonil + sedaxane	Cruiser Maxx Beans + Vibrance 500 FS (sold as a co-pack: Cruiser Maxx Vibrance Beans)	195 mL + 5–10 mL/ 100 kg seed (2.5–5 g a.i./ 100 kg seed)	N/A	**For use in commercial seed treatment facilities only.** Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers for details prior to use. Use the low rate of Vibrance 500 FS (2.5 g a.i./100 kg) for control of pre-emergent damping-off, seed decay or seedling blight. For extended control of post-emergent damping-off and seedling blight or high disease pressure, use the high rate (5 g a.i./100 kg). Follow resistance management instructions on the label.
	trifloxystrobin	Trilex FS	21 mL/ 100 kg seed	N/A	**For use in commercial seed treatment facilities only.** Apply using standard commercial seed treatment equipment. Not for use in hopper-box, planter-box, slurry-box or similar seed treatment applications. Uniform application on seed is necessary to ensure seed safety and best disease protection.
Foliar Treatment					
Symptoms appear mid-season as rows of small, black, raised dots or bumps on the stem and later on the pods. Management includes the use of full-season varieties, crop rotation, fungicides and removal of soybean debris.	trifloxystrobin + prothioconazole	Stratego PRO	572 mL/ha (230 mL/acre)	20	Ground and aerial application. Begin fungicide applications preventively or at the first signs of disease from early flowering (R1) to complete pod fill (R5). A non-ionic surfactant at 0.125% vol/vol may be used with Stratego PRO fungicide.

SOYBEAN DISEASES

Table 2–11. Control Options for Diseases in Soybeans — Rhizoctonia Damping-Off

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
RHIZOCTONIA DAMPING-OFF AND SEEDLING BLIGHT (*Rhizoctonia solani*)				
Seed Treatment				
This disease can occur on all soil types and environmental conditions. Losses due to this disease are greatest when a dry spring is followed by wet conditions. Few management options exist since no resistant or tolerant varieties are available. Seed treatment and crop rotation with corn and small grains can help minimize the disease. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	carbathiin + thiram	Vitaflo 280	260 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or feed livestock on treated areas. Do not store treated soybean seed. May be applied through commercial seed treatment equipment or auger. Ensure uniform coverage.
	fludioxonil	Maxim 480 FS	5.2–10.4 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. Do not graze treated crops or cut for forage within 30 days of planting.
	fludioxonil + metalaxyl-M	Apron Maxx RFC	100 mL + 230 mL of water/ 100 kg seed	For commercial and on-farm treating. Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting.
		Apron Maxx RTA	325 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treating. Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers prior to use. Ensure uniform coverage.
	ipconazole + carbathiin + metalaxyl	Rancona Trio	500 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or cut for forage within 4 weeks after planting. Read label for information regarding resistant strains of fungus.
	mandestrobin	S-2200 3.2FS	26 mL/ 100 kg seed	For commercial and on-farm treating. Regulations under the *Seeds Act* require that an appropriate colourant be added when this product is applied to seed. Ensure uniform seed coverage and do not apply this product in a hopper-box or planter-box at planting time. For resistance management, please note that S-2200 3.2 FS fungicide is a Group 11 fungicide. Any fungal population may contain individuals naturally resistant to S-2200 3.2 FS fungicide and other Group 11 fungicides.
	metalaxyl-M + sedaxane + fludioxonil	Vibrance Trio	100 mL/ 100 kg seed	For commercial and on-farm treating. Apply 100 mL of VIBRANCE TRIO Fungicide plus 225 mL of water (or Rhizobia inoculant at rates recommended by the manufacturer to achieve proper total slurry volumes) per 100 kg of seed.
	metalaxyl-M + sedaxane + fludioxonil	Vibrance Maxx RFC	100 mL/ 100 kg seed	For commercial and on-farm treating. Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 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. For control of early-season phytophthora in soybean, product may be tank-mixed with metalaxyl and metalaxyl-M but, again, see tank-mix partner label.

SOYBEAN DISEASES

Table 2–11. Control Options for Diseases in Soybeans — Rhizoctonia Damping-Off

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
RHIZOCTONIA DAMPING-OFF AND SEEDLING BLIGHT (*Rhizoctonia solani*) (continued)				
Seed Treatment (continued)				
(continued)	saponins of *Chenopodium quinoa*	Heads Up Plant Protectant	1 g/1 L of water/ 100 kg seed Apply 1 L solution for every 163 kg of soybean seed.	Treat only healthy, vigorous seed. Treat only seed needed for immediate use and planting. Thoroughly coat the surface of the seed with dissolved solution. Soybean seeds must be prepared and ready for seeding. The object is to achieve a wet shiny appearance to the seed. This will dry off or be absorbed by the seed, however, the treatment will remain in effect. Treat the seeds by dipping, spraying or dribbling the solution into a rotating auger conveyor or some other seed treatment device. Spray applications to seeds within an enclosed spray booth or other enclosed spray device are also acceptable, providing thorough coverage is achieved.
	thiamethoxam + metalaxyl-M + fludioxonil + sedaxane	Cruiser Maxx Beans + Vibrance 500 FS (sold as a co-pack: Cruiser Maxx Vibrance Beans)	195 mL + 5–10 mL/ 100 kg seed (2.5–5 g a.i./ 100 kg seed)	**For use in commercial seed treatment facilities only.** Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers for details prior to use. Use the low rate of Vibrance 500 FS (2.5 g a.i./100 kg) for control of pre-emergent damping-off, seed decay or seedling blight. For extended control of post-emergent damping-off and seedling blight or high disease pressure, use the high rate (5 g a.i./100 kg). Follow resistance management instructions as stated on the label.

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Table 2–12. Control Options for Diseases in Soybeans — Pythium Damping-Off

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
SEED ROT/DAMPING-OFF (*Pythium* spp.)				
Seed Treatment				
This disease can occur on all soil types but crop losses are greatest in cold, wet clay soils. Try to minimize soil compaction and remove excess moisture through increased drainage. Plant seed when soil temperatures are above 13°C. Treat seed with metalaxyl or metalaxyl-M. There is no known resistance but there is some degree of tolerance available in varieties. Consult with your seed company and the Ontario Soybean and Canola Committee (OSACC) Variety Trial Results at www.gosoy.ca for variety profiles. Crop rotation has limited effect. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	ethaboxam	INTEGO Solo	19.6 mL/ 100 kg seed	For commercial and on-farm treating. Regulations under the *Seeds Act* require that an appropriate colourant must be added when this product is applied to seed. 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 *Rhizoctonia solani* and other fungal pathogens inciting seed and seedling disease.
	fludioxonil + metalaxyl-M	Apron Maxx RFC	100 mL + 230 mL of water/ 100 kg seed	For commercial and on-farm treating. Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting.
		Apron Maxx RTA	325 mL/ 100 kg seed	For commercial and on-farm treating. Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers prior to use. Ensure uniform coverage.
	metalaxyl	Allegiance FL Apron FL	46–93 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or feed livestock on seeded area for 4 weeks after planting.
	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. Do not graze or feed livestock on seeded area for 4 weeks after planting. Read label for information regarding resistant strains of fungus.
	metalaxyl-M + sedaxane + fludioxonil	Vibrance Maxx RFC	100 mL/ 100 kg seed	For commercial and on-farm treating. Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting.
	metalaxyl-M + sedaxane + fludioxonil	Vibrance Trio	100 mL/ 100 kg seed	Apply 100 mL of VIBRANCE TRIO Fungicide plus 225 mL of water (or Rhizobia inoculant at rates recommended by the manufacturer to achieve proper total slurry volumes) per 100 kg of 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. For control of early-season phytophthora in soybean, product may be tank-mixed with metalaxyl and metalaxyl-M but see tank-mix partner label.
	thiamethoxam + metalaxyl-M + fludioxonil + sedaxane	Cruiser Maxx Beans + Vibrance 500 FS (sold as a co-pack: Cruiser Maxx Vibrance Beans)	195 mL + 5–10 mL/ 100 kg seed (2.5–5 g a.i./ 100 kg seed)	**For use in commercial seed treatment facilities only.** Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers for details prior to use. Use the low rate of Vibrance 500 FS (2.5 g a.i./100 kg) for control of pre-emergent damping-off, seed decay or seedling blight. For extended control of post-emergent damping-off and seedling blight or high disease pressure, use the high rate (5 g a.i./100 kg). Follow resistance management recommendations as stated on label.

SOYBEAN DISEASES

Table 2–13. Control Options for Diseases in Soybeans — Fusarium Seedling Blight

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
FUSARIUM SEEDLING BLIGHT (*Fusarium oxysporum* or *Fusarium solani*)				
Seed Treatment				
Cool, wet spring conditions favour infection. Resistant varieties are not available. Minimize soil compaction and remove excess soil moisture through improved drainage. A small amount of tillage will help warm soil and improve surface drainage. Rotate with corn and wheat. Plant high-quality seed when soil temperatures are above 13°C. Fungicide seed treatment recommended. Mounding or ridging soil at the base of the plants produces adventitious roots that can minimize losses. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	carbathiin + thiram	Vitaflo 280	260 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or feed livestock on treated areas. Do not store treated soybean seed. May be applied through commercial seed-treatment equipment or auger. Ensure uniform coverage.
	fludioxonil	Maxim 480 FS	5.2–10.4 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. Do not graze treated crops or cut for forage within 30 days of planting.
	fludioxonil + metalaxyl-M	Apron Maxx RFC	100 mL + 230 mL of water/ 100 kg seed	For commercial and on-farm treating. Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers prior to use. Do not graze or feed livestock on treated areas for 45 days after planting.
		Apron Maxx RTA	325 mL/ 100 kg seed	For commercial and on-farm treating. Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers prior to use. Ensure uniform coverage.
	ipconazole + carbathiin + metalaxyl	Rancona Trio	500 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or cut for forage within 4 weeks after planting. Read label for information regarding resistant strains of fungus.
	mandestrobin	S-2200 3.2FS	26 mL/ 100 kg seed	For commercial and on-farm treating. Regulations under the *Seeds Act* require that an appropriate colourant be added when this product is applied to seed. Ensure uniform seed coverage and do not apply this product in a hopper-box or planter-box at planting time. For resistance management, please note that S-2200 3.2 FS fungicide is a Group 11 fungicide. Any fungal population may contain individuals naturally resistant to S-2200 3.2 FS fungicide and other Group 11 fungicides.
	metalaxyl-M + sedaxane + fludioxonil	Vibrance Maxx RFC	100 mL/ 100 kg seed	For commercial and on-farm treating. Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting.
	metalaxyl-M + sedaxane + fludioxonil	Vibrance Trio	100 mL/ 100 kg seed	For commercial and on-farm treating. Apply 100 mL of VIBRANCE TRIO Fungicide plus 225 mL of water (or Rhizobia inoculant at rates recommended by the manufacturer to achieve proper total slurry volumes) per 100 kg of 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. For control of early-season phytophthora in soybean, product may be tank-mixed with metalaxyl and metalaxyl-M but see tank-mix partner label.
	thiabendazole	MERTECT SC	10–40 mL/ 100 kg seed	For commercial and on-farm treating. May be tank-mixed for control of a broad spectrum of diseases and insect pests; see the label and labels of the tank-mix partner for application rates, precautions and directions. Use the high rate under higher disease pressure.

SOYBEAN DISEASES

Table 2–13. Control Options for Diseases in Soybeans — Fusarium Seedling Blight

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
FUSARIUM SEEDLING BLIGHT (*Fusarium oxysporum* or *Fusarium solani*) (continued)				
Seed Treatment (continued)				
(continued)	thiamethoxam + metalaxyl-M + fludioxonil + sedaxane	Cruiser Maxx Beans + Vibrance 500 FS (sold as a co-pack: Cruiser Maxx Vibrance Beans)	195 mL + 5–10 mL/ 100 kg seed (2.5–5 g a.i./ 100 kg seed)	**For use in commercial seed treatment facilities only.** Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers for details prior to use. Use the low rate of Vibrance 500 FS (2.5 g a.i./100 kg seed) for control of pre-emergent damping-off, seed decay or seedling blight. For extended control of post-emergent damping-off and seedling blight or high disease pressure, use the high rate (5 g a.i./100 kg seed). Follow resistance management instructions as stated on the label.
	trifloxystrobin	Trilex FS	21 mL/ 100 kg seed	**For use in commercial seed treatment facilities only.** Apply using standard commercial seed treatment equipment. Not for use in hopper-box, planter-box, slurry-box or similar seed treatment applications. Uniform application on seed is necessary to ensure seed safety and best disease protection.

SOYBEAN DISEASES

Table 2–14. Control Options for Diseases in Soybeans — White Mould

LEGEND: PHI = Pre-Harvest Interval (in days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
WHITE MOULD (*Sclerotinia sclerotiorum*)					
Seed Treatment					
See foliar treatment section for white mould IPM information.	saponins of *Chenopodium quinoa*	Heads Up Plant Protectant	1 g/1 L of water/ha Apply 1 L solution for every 163 kg of soybean.	N/A	**Provides suppression only.** Treat only healthy vigorous seed. Treat only seed needed for immediate use and planting. Thoroughly coat the surface of the seed with dissolved solution. Soybean seeds must be prepared and ready for seeding. The object is to achieve a wet shiny appearance to the seed. This will dry off or be absorbed by the seed, however, the treatment will remain in effect. Treat the seeds by dipping, spraying or dribbling the solution into a rotating auger conveyor or some other seed treatment device. Spray applications to seeds within an enclosed spray booth or other enclosed spray device are also acceptable, providing thorough coverage is achieved.
	metalaxyl-M + sedaxane + fludioxonil	Vibrance Maxx RFC	100 mL/100 kg seed	N/A	For commercial and on-farm treating. Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting.
Foliar Treatment					
White mould is a sporadic disease that thrives under cool, wet conditions during flowering or near harvest. Fields at risk have a history of white mould, good leaf growth, high plant populations and more than 48 hours of continuous wetness and air temperatures between 15°C and 20°C (day and night average temperatures). In fields with a history of white mould, use non-host crops and avoid growing other host crops such as canola, edible beans, buckwheat and sunflowers for 2–3 years. Plant a tolerant variety, although none are resistant (immune), select a variety with good lodging resistance and keep sclerotia on the surface through conservation tillage practices. Consult with your seed company and the Ontario Soybean and Canola Committee (OSACC) Variety Trial Results at www.gosoy.ca for variety profiles. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	azoxystrobin + propiconazole	Topnotch	0.77 L/ha (311 mL/acre)	30	**Provides suppression only.** Ground and aerial application. Apply when disease first appears, followed by a second application 14 days after, if environmental conditions are favourable for disease development. Maximum 2 applications/yr. 12-hr restricted entry interval.
	azoxystrobin + propiconazole + benzovindiflupyr	Trivapro A + Trivapro B (sold as co-pack: Trivapro)	1.5 L/ha (600 mL/acre) + 450 mL/ha (180 mL/acre)	30	**Provides suppression only.** Ground and aerial application. Begin applications at the R1 (early bloom) to R2 (full bloom) stage of development and, if needed, again 10–14 days later at early pod formation (R3). Apply in sufficient water to obtain adequate coverage of foliage. Spray volumes to be used vary with amount of plant growth. For best performance, use spray volumes that range from 200–600 L/ha, depending on plant growth.
	Bacillus subtilis QST 713 strain	Serenade OPTI	0.6–2.0 kg/ha (0.24–0.81 kg/acre)	0	**Provides suppression only.** Ground and aerial application. Good option for organically grown soybeans. For maximum effectiveness, begin application soon after emergence and when conditions are conducive to disease development. Apply in sufficient water volume to ensure full coverage for effective control. Repeat as necessary on a 7–10-day interval.
	boscalid + prothioconazole	Cotegra	0.7 L/ha (280 mL/acre)	21	**Provides suppression only.** Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100–200 L/ha for ground application. Ensure thorough coverage of foliage. Apply a second time, 7–14 days later, if disease persists, or if weather conditions are favourable for disease development. Use shorter interval when disease pressure is high. Maximum 2 applications/yr.

SOYBEAN DISEASES

Table 2–14. Control Options for Diseases in Soybeans — White Mould

LEGEND: PHI = Pre-Harvest Interval (in days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
WHITE MOULD (*Sclerotinia sclerotiorum*) (continued)					
Foliar Treatment (continued)					
(continued)	*Coniothyrium minitans*	Contans WG	0.5–4 kg/ha (0.20–1.6 kg/acre)	0	**Provides suppression only. Ground application only.** Good option for organically grown soybeans. This product should be applied at least 3 months prior to anticipated outbreak (e.g., prior to planting). Product should be incorporated as thoroughly as possible to a depth of 5–20 cm. Rate should be increased to 2–4 kg/ha (0.8–1.6 kg/acre) if incorporated to a depth greater than 5 cm. A post-harvest application may be applied in the fall to treat the soil prior to spring planting of a susceptible crop. Treated soils in the fall should not be disturbed to avoid bringing untreated sclerotia from lower soil layers to the top soil layer. Maximum 2 applications/yr.
	fluazinam	Allegro 500F	Suppression: 0.44 L/ha (178 mL/acre) Control: 0.88–1.17 L/ha (356–475 mL/acre)	30	Ground and aerial application. Begin applications at the R1–R2 stage of development and repeat again 10–14 days later if conditions favour disease development. Use spray volumes of 200–600 L/ha (ground) or minimum 45 L/ha (air), depending on amount of plant growth. Maximum amount of 2.34 L/ha during the year. Maximum 2 applications/yr. Do not apply after R3 stage. 24-hr restricted entry interval. DO NOT allow livestock to graze treated areas. DO NOT feed hay from treated fields to livestock.
	picoxystrobin	Acapela	0.44–0.88 L/ha (180–350 mL/acre)	14	Ground and aerial application. Apply prior to disease development and continue on a 7–14-day interval. Optimal timing is typically R2–R3 growth stage. Use high rate and shorter interval when disease pressure is high. Apply no more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 2.64 L/ha per season. 12-hr restricted entry interval.
	pyraclostrobin + fluxapyroxad	Priaxor	0.45 L/ha (180 mL/acre)	21	**Provides suppression only.** 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. Use high rate for suppression of sclerotinia stem rot. Maximum 2 applications/yr. 12-hr restricted entry interval.
	trifloxystrobin + prothioconazole	Stratego PRO	572 mL/ha (230 mL/acre)	20	Ground and aerial application. Begin fungicide applications preventively or at the first signs of disease from early flowering (R1) to complete pod fill (R5). A non-ionic surfactant at 0.125% vol/vol may be used with Stratego PRO fungicide.

SOYBEAN DISEASES

Table 2–15. Control Options for Diseases in Soybeans — Powdery Mildew

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
POWDERY MILDEW (*Microsphaera diffusa*)					
Foliar Treatment					
This disease is most noticeable when conditions are wet or humid. Powdery mildew develops on the leaves, usually in August and September. Outbreaks arise when disease symptoms begin in early July and the environmental conditions remain cool, cloudy and humid through to pod fill. Removal of crop residue and rotation with non-host crops, such as corn and wheat, will help reduce disease risk. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	azoxystrobin	Azoshy 250 SC Quadris	500 mL/ha (200 mL/acre)	15	Ground and aerial application. See label for resistance management strategy. Maximum 2 applications/yr. Re-entry possible once residues have dried.
	azoxystrobin + propiconazole	Fungtion SC Quilt	1.0 L/ha (404 mL/acre)	30	Ground and aerial application. First application should be made at the first sign of disease, followed by a second application 14 days after the first application, if environmental conditions are favourable for disease development. Good spray coverage and canopy penetration are important for best results. See label for resistance management strategy. Maximum 2 applications/yr.
		Topnotch	0.77 L/ha (311 mL/acre)	30	Ground and aerial application. Apply when disease first appears, followed by a second application 14 days after, if environmental conditions are favourable for disease development. Maximum 2 applications/yr. 12-hr restricted entry interval.
	azoxystrobin + propiconazole + benzovindiflupyr	Trivapro A + Trivapro B (sold as co-pack: Trivapro)	1 L/ha (404 mL/acre) + 300 mL/ha (120 mL/acre)	30	Ground and aerial application. Make the first application at the first sign of disease. A second application 14 days after the first application may be needed if conditions persist. Good spray coverage and canopy penetration are important for best results. Maximum 2 applications/yr.
	propiconazole	Tilt 250 E	500 mL/ha (200 mL/acre)	30	Ground and aerial application. First application should be made at the first sign of disease, followed by a second application 14 days after the first application, if environmental conditions are favourable for disease development. Good spray coverage and canopy penetration are important for best results. See label for resistance management strategy. Maximum 2 applications/yr.
	tebuconazole	Folicur 250 EW	375–500 mL/ha (152–200 mL/acre)	20	Ground and aerial application. Apply when first symptoms of disease can be found or when risk of infection is imminent. Use the higher rate when disease pressure is severe. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. The use of a non-ionic surfactant (Agral 90 or Agsurf) is NOT required, as it is built into the formulation. Maximum 1 application/yr. 12-hr restricted entry interval.
		Tebbie	375–500 mL/ha (152–200 mL/acre)	20	Ground and aerial application. Apply to the 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 flowering stage. Consider using a higher rate when weather conditions are conducive to heavy disease development. Maximum 1 applications/yr. 12-hr restricted entry interval.

SOYBEAN DISEASES

Table 2–16. Control Options for Diseases in Soybeans — Asian Soybean Rust

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
ASIAN SOYBEAN RUST (*Phakopsora pachyrhizi*)					
Foliar Treatment					
Asian soybean rust is an invasive fungal disease. Scouting and early detection are critical to managing this disease. The early stages of the disease can be confused with other common foliar diseases such as septoria brown spot, bacterial pustule, downy mildew, frog-eye leaf spot and bacterial blight. Numerous factors such as crop stage (R1–R6), yield potential, disease risk or presence are critical components of the fungicide decision process. Strobilurin fungicides such as Headline or Quadris are protective products that stop spore germination and penetration into the soybean leaf. The strobilurins have no effect on the fungus once inside the leaf. Since the strobilurin group of fungicides have no curative activity, do not make solo applications of a strobilurin if any rust is present. The triazole fungicides such as Tilt and Folicur have varying protective abilities and are usually considered "early post-infection" fungicides. The post-infection or curative abilities are limited, and the fungicides may not perform well if 5%–10% disease is present in the lower crop canopy. Combination products containing both a strobilurin and triazole fungicide such as Quilt have preventive (pre-infection) and curative (post-infection) properties. Long periods of leaf wetness are needed for spore germination, as well as temperatures between 15°C and 30°C and a high relative humidity. Yield loss is very likely once rust can be found in the mid-crop canopy. For these reasons, scouting, fungicide selection, timing and application are critical to successful management of soybean rust. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	azoxystrobin	Azoshy 250 SC Quadris	500 mL/ha (200 mL/acre)	15	Ground and aerial application. Classified as a strobilurin fungicide; use this product in a preventive fungicide program (pre-infection). See label for resistance management strategy. Maximum 2 applications/yr. Re-entry possible once residues have dried.
	azoxystrobin + propiconazole	Fungtion SC Quilt	1.0–1.5 L/ha (404–600 mL/acre)	30	Ground and aerial application. First application should be made at the first sign of disease, followed by a second application 14 days after the first application, if environmental conditions are favourable for disease development. Good spray coverage and canopy penetration are important for best results. See label for resistance management strategy. Maximum 2 applications/yr.
	azoxystrobin + propiconazole + benzovindiflupyr	Trivapro A + Trivapro B (sold as co-pack: Trivapro)	1 L/ha (404 mL/acre) + 300 mL/ha (120 mL/acre)	30	Ground and aerial application. Make the first application at the first sign of disease. A second application 14 days after the first application may be needed if conditions persist. Good spray coverage and canopy penetration are important for best results. Maximum 2 applications/yr.
	boscalid + prothioconazole	Cotegra	0.7 L/ha (280 mL/acre)	21	Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100–200 L/ha for ground application. Ensure thorough coverage of foliage. Apply a second time 7–14 days later if disease persists, or weather conditions are favourable for disease development. Use shorter interval when disease pressure is high. Maximum 2 applications/yr.
	flutriafol	Fullback 125 SC	0.512–1.024 L/ha (207–414 mL/acre)	21	**Ground application only.** Apply as a broadcast foliar spray when conditions are favourable for development of soybean rust. Repeat 21–35 days after first application if environmental conditions are favourable for continued disease development. Do not apply more than 2,048 mL/ha per season. Do not apply more than 3 applications per growing season. No single application may exceed 1,024 mL/ha; only 1 application at 1,024 mL/ha may be made to any one field during a single growing season. 12-hr restricted entry interval. Apply only to soybeans harvested for dry seed.
	inpyrfluxam	Excalia Fungicide	146 L/ha (60 mL/acre)	**Note**	**Ground application only.** Apply in minimum 100 L/ha of water. DO NOT apply prior to V3 or after R5 stage of soybean. Retreatment interval is 14 days. **Note: DO NOT APPLY after R5**.
	penthiopyrad	Vertisan	1–1.75 L/ha (0.4–0.7 L/acre)	14	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. Do not apply more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 3 L/ha/yr. 12-hr restricted entry interval.

SOYBEAN DISEASES

Table 2–16. Control Options for Diseases in Soybeans — Asian Soybean Rust

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
ASIAN SOYBEAN RUST (*Phakopsora pachyrhizi*) (continued)					
Foliar Treatment (continued)					
(continued)	picoxystrobin	Acapela	0.44–0.88 L/ha (180–350 mL/acre)	14	Ground and aerial application. Apply prior to disease development and continue on a 7–14-day interval. Optimal timing is typically R2–R3 growth stage. Use high rate and shorter interval when disease pressure is high. 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 restricted entry interval.
	propiconazole	Propi Super 25EC	500 mL/ha (200 mL/acre)	30	Ground and aerial application. First application should be made at the first sign of disease, followed by a second application 14 days after the first application, if environmental conditions are favourable for disease development. Good spray coverage and canopy penetration are important for best results. See label for resistance management strategy. Maximum 2 applications/yr.
		Tilt 250 E	500–750 mL/ha (200–300 mL/acre)		
	prothioconazole	Proline 480 SC	210 mL/ha (85 mL/acre)	20	Ground and aerial application. Apply when first symptoms of disease can be found or the risk of infection is imminent. Maximum 1 application/yr. 24-hr restricted entry interval.
	pyraclostrobin	Headline EC	400–600 mL/ha (160–240 mL/acre)	21	Ground and aerial application. Classified as a strobilurin fungicide; use this product in a preventive fungicide program (pre-infection). See label for resistance management strategy. Maximum 2 applications/yr.
	pyraclostrobin + fluxapyroxad	Priaxor	0.3–0.45 L/ha (120–180 mL/acre)	21	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. Maximum 2 applications/yr. 12-hr restricted entry interval.
	tebuconazole	Folicur 250 EW	375–500 mL/ha (152–200 mL/acre)	20	Ground and aerial application. Apply when first symptoms of disease can be found or when risk of infection is imminent. Use the higher rate when disease pressure is severe. Use a minimum of 100 L of water for ground application, 47 L of water for aerial application. The use of a non-ionic surfactant (Agral 90 or Agsurf) is NOT required, as it is built into the formulation. Maximum 1 application/yr. 12-hr restricted entry interval.
		Tebbie	375–500 mL/ha (152–200 mL/acre)	20	Ground and aerial application. Apply to the 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 flowering stage. Consider using a higher rate when weather conditions are conducive to heavy disease development. Maximum 1 application/yr. 12-hr restricted entry interval.
	trifloxystrobin + propiconazole	Stratego PRO	572 mL/ha (230 mL/acre)	20	Ground and aerial application. Begin fungicide applications preventively or at the first signs of disease from early flowering (R1) to complete pod fill (R5). A non-ionic surfactant at 0.125% vol/vol may be used with Stratego PRO fungicide.

SOYBEAN DISEASES

Table 2–17. Control Options for Diseases in Soybeans — Frogeye Leaf Spot

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
FROGEYE LEAF SPOT (*Cercospora sojina*)					
Foliar Treatment					
The economic impact of this disease is minimal. Frogeye leaf spot occurs under hot, humid conditions particularly on very susceptible varieties. Consult with your seed company for variety profiles. This disease is most frequent in the extreme southwest counties. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	azoxystrobin + propiconazole	Fungtion SC Quilt	1.0–1.5 L/ha (404–600 mL/acre)	0	Susceptible varieties are most prone to the disease. Scout for disease and make the first application at growth stage R3 (early pod set) and 14 days later, at approximately growth stage R5, if needed.
	azoxystrobin + propiconazole + benzovindiflupyr	Trivapro A + Trivapro B (sold as co-pack: Trivapro)	1 L/ha (404 mL/acre) + 300 mL/ha (120 mL/acre)	30	Ground and aerial application. Make the first application prior to disease establishment. A second application can be made 14 days after the first application, when disease pressure is severe or when agronomic or weather conditions are conducive to disease development or movement.
	Bacillus subtilis QST 713 strain	Serenade OPTI	0.1–0.5 kg/ha (0.04–0.2 kg/acre)	0	**Provides suppression only.** Ground and aerial application. Good option for organically grown soybeans. For maximum effectiveness, begin application soon after emergence and when conditions are conducive to disease development. Apply in sufficient water volume to ensure full coverage for effective control. Repeat as necessary on a 7–10-day interval.
	boscalid + prothioconazole	Cotegra	0.7 L/ha (280 mL/acre)	21	Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100–200 L/ha for ground application. Ensure thorough coverage of foliage. Apply a second time 7–14 days later if disease persists, or if weather conditions are favourable for disease development. Use shorter interval when disease pressure is high. Maximum 2 applications/yr.
	fluoxastrobin	Evito	146–296 mL/ha (59–120 mL/acre)	30	Ground and aerial application. For optimum results, begin applications preventively and repeat If needed after a 14–21-day interval. Use the higher rates and shorter interval when disease pressure is high. Do not apply to soybean later than R6 (full seed). 12-hr restricted entry interval.
	flutriafol	Fullback 125 SC	0.512–1.024 L/ha (207–414 mL/acre)	21	**Ground application only.** Apply as a broadcast foliar spray when conditions are favourable for development of frogeye leaf spot. Repeat 14–21 days after first application if environmental conditions are favourable for continued disease development. Do not apply more than 2,048 mL/ha per season. Do not apply more than 3 applications per growing season. No single application may exceed 1,024 mL/ha; only 1 application at 1,024 mL/ha may be made to any one field during a single growing season. 12-hr restricted entry interval. Apply only to soybeans harvested for dry seed.
	penthiopyrad	Vertisan	1–1.75 L/ha (404–700 mL/acre)	14	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. Do not apply more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 3 L/ha/yr. 12-hr restricted entry interval.

SOYBEAN DISEASES

Table 2–17. Control Options for Diseases in Soybeans — Frogeye Leaf Spot

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
FROGEYE LEAF SPOT (*Cercospora sojina*) (continued)					
Foliar Treatment (continued)					
(continued)	picoxystrobin	Acapela	0.44–0.88 L/ha (0.18–0.35 L/acre)	14	Ground and aerial application. Apply prior to disease development and continue on a 7–14-day interval. Optimal timing is typically R2–R3 growth stage. Use high rate and shorter interval when disease pressure is high. Apply no more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 2.64 L/ha per season. 12-hr restricted entry interval.
	propiconazole	Bumper 432 EC Nufarm Propiconazole Princeton	300–455 mL/ha (121–184 mL/acre)	50	Ground and aerial application. **For use only on soybeans grown for seed.** Apply when disease first appears. Under severe disease pressure, make a second application 14 days after. Harvested soybean seed should not be used for human food or animal feed.
		Propi Super 25EC Tilt 250 E	500–760 mL/ha (200–308 mL/acre)	30	**Ground application only.** Apply when disease symptoms first appear. Under severe disease pressure, make a second application 14 days after. Harvested soybean seed should not be used for human food or animal feed.
	prothioconazole	Proline 480 SC	210 mL/ha (85 mL/acre)	20	Ground and aerial application. Apply when first symptoms of disease can be found, or the risk of infection is imminent. Maximum 1 application/yr. 24-hr restricted entry interval.
	pyraclostrobin	Headline EC	400–600 mL/ha (160–240 mL/acre)	21	Ground and aerial application. First application should be applied at the first sign of disease, followed by the second application 14 days after, if environmental conditions are favourable for disease development. Maximum 2 applications/yr. 12-hr restricted entry interval.
	pyraclostrobin + fluxapyroxad	Priaxor	300 mL/ha (120 mL/acre)	21	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. Use high rate for suppression of sclerotinia stem rot. Maximum 2 applications/yr. 12-hr restricted entry interval.
	tebuconazole	Folicur 250 EW	375–500 mL/ha (152–200 mL/acre)	20	Ground and aerial application. Apply when first symptoms of disease can be found or when risk of infection is imminent. Use the higher rate when disease pressure is severe. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. The use of a non-ionic surfactant (Agral 90 or Agsurf) is NOT required, as it is built into the formulation. Maximum 1 application/yr. 12-hr restricted entry interval.
		Tebbie	375–500 mL/ha (152–200 mL/acre)	20	Ground and aerial application. Apply to the 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 flowering stage. Consider using a higher rate when weather conditions are conducive to heavy disease development. Maximum 1 applications/yr. 12-hr restricted entry interval.
	trifloxystrobin + prothioconazole	Stratego PRO	572 mL/ha (230 mL/acre)	20	Ground and aerial application. Begin fungicide applications preventively or at the first signs of disease from early flowering (R1) to complete pod fill (R5). A non-ionic surfactant at 0.125% vol/vol may be used with Stratego PRO fungicide.

SOYBEAN DISEASES

Table 2–18. Control Options for Diseases in Soybeans — Septoria Brown Spot

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
SEPTORIA BROWN SPOT					
Foliar Treatment					
The disease is common but, in most cases, of minor economic importance unless disease development begins early in the season, which can lead to significant defoliation on very susceptible varieties. Varieties differ in susceptibility so if you have multiple varieties, make note of the differences in their response to the disease. Symptoms may be difficult to distinguish from those of bacterial blight, soybean rust and downy mildew. A good rotation with non-host crops such as wheat and corn will lower disease levels. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*, for more information.	*Bacillus subtilis* QST 713 strain	Serenade OPTI	0.1–0.5 kg/ha (0.04–0.2 kg/acre)	0	**Provides suppression only.** Ground and aerial application. Good option for organically grown soybeans. For maximum effectiveness, begin application soon after emergence and when conditions are conducive to disease development. Apply in sufficient water volume to ensure full coverage for effective control. Repeat as necessary on a 7–10-day interval.
	boscalid + prothioconazole	Cotegra	0.7 L/ha (280 mL/acre)	21	Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100–200 L/ha for ground application. Ensure thorough coverage of foliage. Apply a second time 7–14 days later if disease persists, or if weather conditions are favourable for disease development. Use shorter interval when disease pressure is high. Maximum 2 applications/yr.
	flutriafol	Fullback 125 SC	0.512–1.024 L/ha (207–414 mL/acre)	21	**Ground application only.** Apply Fullback fungicide as a broadcast foliar spray to soybean plants in R3 growth stage (early pod fill) or when environmental conditions are favourable for disease development. Apply second application if conditions are conducive for heavy disease development. Do not apply more than 2,048 mL/ha per season. Do not apply more than 3 applications per growing season. No single application may exceed 1,024 mL/ha; only 1 application at 1,024 mL/ha may be made to any one field during a single growing season. 12-hr restricted entry interval. Apply only to soybeans harvested for dry seed.
	penthiopyrad	Vertisan	1–1.75 L/ha (400–700 mL/acre)	14	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. Do not apply more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 3 L/ha/yr. 12-hr restricted entry interval.
	picoxystrobin	Acapela	0.44–0.88 L/ha (0.18–0.35 L/acre)	14	Ground and aerial application. Apply prior to disease development and continue on a 7–14-day interval. Optimal timing is typically R2–R3 growth stage. Use high rate and shorter interval when disease pressure is high. 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 restricted entry interval.
	pyraclostrobin + fluxapyroxad	Priaxor	0.3 L/ha (120 mL/acre)	21	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. Use high rate for suppression of sclerotinia stem rot. Maximum 2 applications/yr. 12-hr restricted entry interval.
	trifloxystrobin + prothioconazole	Stratego PRO	572 mL/ha (230 mL/acre)	20	Ground and aerial application. Begin fungicide applications preventively or at the first signs of disease from early flowering (R1) to complete pod fill (R5). A non-ionic surfactant at 0.125% vol/vol may be used with Stratego PRO fungicide.

SOYBEAN DISEASES

Table 2–19. Control Options for Diseases in Soybeans — Charcoal Rot, Cercospora Blight and Leaf Spot

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
CHARCOAL ROT (*Macrophomina phaseolina*)					
Foliar Treatment					
The disease is common but, in most cases, of minor economic importance unless disease development begins early in the season, which can lead to significant defoliation on very susceptible varieties. Varieties differ in susceptibility so if you have multiple varieties, make note of the differences in their response to the disease. Symptoms may be difficult to distinguish from those of bacterial blight, soybean rust and downy mildew. A good rotation with non-host crops such as wheat and corn will lower disease levels. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*, for more information.	trifloxystrobin + prothioconazole	Stratego PRO	572 mL/ha (230 mL/acre)	20	Ground and aerial application. Begin fungicide applications preventively or at the first signs of disease from early flowering (R1) to complete pod fill (R5). A non-ionic surfactant at 0.125% vol/vol may be used with Stratego PRO fungicide.
CERCOSPORA BLIGHT and LEAF SPOT (*Cercospora kikuchii*)					
Foliar Treatment					
This disease often appears late in the season and can cause leaf blighting and staining of the seed. Yield losses are often minimal, but a reduction in seed quality can occur due to staining. Management includes using clean seed and a fungicide seed treatment. Crop rotation and removal of crop residues can reduce infection potential. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	flutriafol	Fullback 125 SC	0.512–1.024 L/ha (207–414 mL/acre)	21	**Ground application only.** Apply as a broadcast foliar spray when conditions are favourable for development of soybean rust. Repeat 14–21 days after first application if environmental conditions are favourable for continued disease development. Do not apply more than 2,048 mL/ha per season. Do not apply more than 3 applications per growing season. No single application may exceed 1,024 mL/ha; only 1 application at 1,024 mL/ha may be made to any one field during a single growing season. 12-hr restricted entry interval. Apply only to soybeans harvested for dry seed.

3. Forages

FORAGE CROP INSECTS

Table 3–1. Control Options for Insects in Forage Crops — Alfalfa Snout Beetle, Alfalfa Weevil

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
ALFALFA SNOUT BEETLE (*Otiorhynchus ligustici*)					
Known infestations occur in fields in the counties of Leeds and Grenville, Frontenac and Dundas. Report any new infestations to OMAFRA's field crop entomologist. The use of an insecticide for the control of this insect has not been shown to be effective and is not recommended. Management is best achieved by following a strict three-year alfalfa rotation. Biological control using nematodes have been quite successful in infested fields in New York. For more information contact the OMAFRA field crop entomologist. See OMAFRA Publication 811, *Agronomy Guide for Field Crops*, for management information.					
ALFALFA WEEVIL (*Hypera postica Gyll*)					
Foliar Treatment					
First cut: If there is 40% leaf-tip feeding, with 2 or 3 active weevils per stem, and there are more than 7–10 days to preferred harvest date, consider applying an insecticide. ("Leaf-tip feeding" refers to the percent of plant tips showing obvious signs of damage, which is not to be confused with the percent defoliation.) Less than 1 active larva per stem does not require action but continue to monitor the situation. Two larvae per stem requires action if the alfalfa is less than 40 cm high. If there are more than 3 active larvae, immediate action is required. **Second Cut:** If damage was serious on first cut, feeding may continue. Check early regrowth carefully for damage and larvae. Natural enemies are generally highly effective at controlling this pest. For the safety of these natural enemies, chemical control should not be considered unless pest population exceeds the action threshold. See OMAFRA Publication 811, *Agronomy Guide for Field Crops*, for more information.	chlorantraniliprole	Coragen	375–500 mL/ha (151–202 mL/acre)	0	**Provides suppression only. For use in alfalfa only. Ground application only.** Begin applications when treatment thresholds have been reached. Thorough coverage is important. Use a minimum of 100 L/ha of water by ground. Maximum 1 application per cutting. 12-hr restricted entry interval. Toxic to aquatic organisms. Do not apply this product directly to freshwater habitats, estuarine and marine habitats. To reduce runoff from treated areas into aquatic habitats, avoid application to moderate to steep slope, compacted soil or clay. Observe buffer zones specified. Toxic to certain beneficial insects. Minimize spray drift to reduce harmful effects to beneficial insects in habitats adjacent to the application site.
	lambda-cyhalothrin	Labamba Matador 120 E Silencer 120 EC	83 mL/ha (34 mL/acre)	livestock foraging: 3	**For use in alfalfa only.** Ground and aerial application. Allow 7 days between treatments. Alfalfa seed from treated crop is not to be used for production of alfalfa sprouts for human consumption. Maximum 3 applications/yr. Do not apply more than 1 application by air. 24-hr restricted entry interval. 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. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.
	phosmet	Imidan 50 WP	2.25 kg/ha (900 g/acre)	7	**For use in alfalfa only.** Ground application only. DO NOT apply during bloom. Maximum 3 applications/yr. Do not apply more than 1 application per cutting. 5-day restricted entry interval. Toxic to bees. Do not apply to flowering crops or weeds if bees are visiting the treatment area. Toxic to birds and small wild mammals. Toxic to aquatic organisms. Observe buffer zones specified on the label.

FORAGE CROP INSECTS

Table 3–2. Control Options for Insects in Forage Crops — Potato Leafhopper, European Skipper, Grasshoppers

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
POTATO LEAFHOPPER (*Empoasca fabae*)					
Leafhopper damage is most severe in new seedings and during regrowth after cutting, particularly when the weather is hot and dry. Resistant varieties have glandular hairs on the leaves and stems. Use chemical control only if leafhoppers exceed the threshold, as insecticides will also kill beneficial insects, the natural enemies of alfalfa weevil and lygus bug. See OMAFRA Publication 811, *Agronomy Guide for Field Crops*, for thresholds.	dimethoate	Cygon 480 EC Lagon 480 EC	425 mL/ha (170 mL/acre)	2	Ground and aerial application. Maximum 2 applications/yr. Toxic to bees. Avoid application during the crop blooming period. If applications must be made during the crop blooming period, restrict applications to evening when most bees are not foraging. DO NOT apply to crops such as alfalfa when in full bloom. Toxic to birds, mammals and aquatic organisms. Observe buffer zones specified on the label. Consider site characteristics and conditions that may lead to runoff into aquatic systems.
	flupyradifurone	Sivanto Prime	500–750 mL/ha (200–300 mL/acre)	7	**Ground application only.** Minimum of 10 days between applications. Minimum of 100 L/ha of water. Toxic to adult bees in laboratory studies via oral exposure, however not toxic to bees through contact exposure, and field studies conducted with this product have shown no effects on honeybee colony development. Application during crop blooming period and when flowering weeds are present may only be made in the early morning and evening when most bees are not foraging. Toxic to aquatic organisms. Observe buffer zones specified on the label. Toxic to certain beneficial insects. Minimize spray drift to reduce harmful effects on beneficial insects in habitats next to the application sites.
	lambda-cyhalothrin	Labamba Matador 120 E Silencer 120 EC	83 mL/ha (34 mL/acre)	livestock foraging: 3	**For use in alfalfa only.** Ground and aerial application. Allow 7 days between treatments. Alfalfa seed from treated crop is not to be used for production of alfalfa sprouts for human consumption. Maximum 3 applications/yr. Do not apply more than 1 application by air. 24-hr restricted entry interval. 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. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.
EUROPEAN SKIPPER (*Thymelicus lineola*)					
If 6–8 larvae in a 30-cm-x-30-cm area are found, and larvae are still small, treat the field or the infested area. See OMAFRA Publication 811, *Agronomy Guide for Field Crops*, for scouting procedures.	*Bacillus thuringiensis* (Bt)	Dipel 2X DF	140–275 g/ha (60–115 g/acre)	0	**For use in timothy only.**
		Thuricide HPC	2.25 L/ha (900 mL/acre)	0	**For use in timothy and other forage grasses.**

FORAGE CROP INSECTS

Table 3–2. Control Options for Insects in Forage Crops — Potato Leafhopper, European Skipper, Grasshoppers

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
GRASSHOPPERS (Various species)					
Begin scouting in late June when grasshoppers are still young. Spraying insecticides on alfalfa will also kill the natural enemies of alfalfa weevil and lygus bugs.	chlorantraniliprole	Coragen	125–250 mL/ha (50–100 mL/acre)	0	**Ground application only.** Begin applications when treatment thresholds have been reached. Thorough coverage is important to obtain optimum control. Do not make more than 1 application per cutting or more than once every 7 days. Do not make more than 4 applications per season. Use the high rate under heavy pest pressure. Do not exceed a total of 1.125 L/ha per season. Do not make a foliar application for a minimum of 60 days following an in-furrow or soil application or planting of seed or seed pieces treated with any Group 28 insecticide. Toxic to aquatic organisms. Do not apply this product directly to freshwater habitats, estuarine and marine habitats. To reduce runoff from treated areas into aquatic habitats, avoid application to moderate to steep slope, compacted soil or clay. Observe buffer zones specified. Toxic to certain beneficial insects. Minimize spray drift to reduce harmful effects to beneficial insects in habitats adjacent to application site.
	lambda-cyhalothrin	Labamba Matador 120 E Silencer 120 EC	63–83 mL/ha (26–34 mL/acre)	livestock foraging: 3	**For use in alfalfa/grass mixtures and timothy.** Ground and aerial application. Allow 7 days between treatments. Alfalfa seed from treated crop is not to be used for production of alfalfa sprouts for human consumption. Maximum 3 applications/yr. Do not apply more than 1 application by air. 24-hr restricted entry interval. 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. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.
	malathion	Malathion 500 EC	2.25–2.75 L/ha (0.9–1.1 L/acre)	7	**For use in alfalfa and clover.** Ground and aerial application. Apply when 75% of foliage shows feeding damage. Product is less effective when temperatures are 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. Toxic to aquatic organisms. Observe buffer zones specified on the label. Avoid runoff from treated areas into aquatic systems. Toxic to birds.

FORAGE CROP INSECTS

Table 3–3. Control Options for Insects in Forage Crops — Alfalfa Blotch Leafminer, Armyworm

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
ALFALFA BLOTCH LEAFMINER (*Agromyza frontella*)					
Foliar Treatment					
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, *Agronomy Guide for Field Crops*, for more information.	dimethoate	Cygon 480 E Lagon 480 E	550 mL/ha (220 mL/acre)	2	Ground and aerial application. Maximum 2 applications/yr. Toxic to bees. Avoid application during the crop blooming period. If applications must be made during the crop blooming period, restrict applications to evening when most bees are not foraging. DO NOT apply to such crops as alfalfa when in full bloom. Toxic to birds, mammals and aquatic organisms. Observe buffer zones specified on the label. Consider site characteristics and conditions that may lead to runoff into aquatic systems.
	phosmet	Imidan 50 WP	2.25 kg/ha (900 g/acre)	7	**For use in alfalfa only. Ground application only.** Maximum 3 applications/yr. DO NOT apply more than 1 application per cutting. 5-day restricted entry interval. Toxic to bees. DO NOT apply to flowering crops or weeds if bees are visiting the treatment area. Toxic to birds and small wild mammals. Toxic to aquatic organisms. Observe buffer zones specified on label.
ARMYWORM (TRUE — *Pseudaletia unipuncta*, FALL — *Spodoptera frugiperda*)					
Control is warranted when 5 or more larvae (smaller than 2.5 cm) per 30 cm x 30 cm (1 ft^2) are found. Avoid treating with insecticides when large numbers of parasitized larvae are present. In seedling crops, 2–3 larvae (smaller than 2.5 cm) per 30 cm x 30 cm may warrant control. If larvae have white eggs attached to them, they are parasitized and may not need treatment. If the larvae are almost full grown (2.5 cm or larger), there is no benefit in applying insecticide since most of the feeding damage has already been done.	chlorantraniliprole	Coragen	250–375 mL/ha (101–151 mL/acre)	0	**For grass forage fodder and hay group. Ground application only.** Begin applications when treatment thresholds have been reached. Thorough coverage is important. Use a minimum of 100 L/ha of water by ground. Maximum 1 application/cutting. Maximum 4 applications/yr. 12-hr restricted entry interval. Toxic to aquatic organisms. Do not apply this product directly to freshwater habitats, estuarine and marine habitats. To reduce runoff from treated areas into aquatic habitats, avoid application to moderate to steep slope, compacted soil or clay. Observe buffer zones specified. Toxic to certain beneficial insects. Minimize spray drift to reduce harmful effects to beneficial insects in habitats adjacent to application site.

FORAGE CROP DISEASES

Table 3–4. Control Options for Seed and Root Rot Diseases in Forage Crops — Phythophthora Root Rot, Pythium Damping-Off

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
PHYTOPHTHORA ROOT ROT (*Phytophthora medicaginis*)				
Seed Treatment				
Plant resistant varieties that are treated with metalaxyl or metalaxyl-M. Consult with your seed company. Drain excess moisture from soil and avoid compaction. Avoid other stresses such as insects, weeds and untimely cuttings that may stress the plants and make them more susceptible to phytophthora. Do not cut during wet conditions. Crop rotation has little effect on the disease. Promote lateral root growth by following a good fertility program.	metalaxyl	Allegiance FL	46–110 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or feed livestock on seeded area for 4 weeks after planting.
		Apron FL		
	metalaxyl-M	Apron XL LS	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. Do not graze or feed livestock on seeded area for 4 weeks after planting. Read label for information regarding resistant strains of fungus.
PYTHIUM DAMPING-OFF (*Pythium* spp.)				
Seed Treatment				
Drain excess moisture from the soil and avoid compaction. Plant seed when soil and weather conditions favour rapid emergence and early growth of seedlings. Increase plant populations to compensate for any plant losses.	metalaxyl	Allegiance FL	46–110 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or feed livestock on seeded area for 4 weeks after planting.
		Apron FL		
	metalaxyl-M	Apron XL LS	forage grasses: 20–40 mL/ 100 kg seed alfalfa, clover, trefoil, vetch: 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. Do not graze or feed livestock on seeded area for 4 weeks after planting. Read label for information on resistant strains of fungus.

FORAGE CROP DISEASES

Table 3–5. Control Options for Foliar and Stem Diseases in Forage Crops — Verticillium Wilt, White Mould/Blossom Blight

LEGEND: PHI = Pre-Harvest Interval (in days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
VERTICILLIUM WILT (Verticillium albo-atrum)					
Seed Treatment					
Planting resistant or highly resistant varieties is the best means of control for this disease. Consult with your seed company. The fungus is spread primarily on the cutting bar of forage harvesting equipment. Before harvesting, clean the cutting bar with a 1% solution of bleach followed by a clean water rinse and oil spray. Cut the youngest fields first, working towards the oldest fields. Wait 2–3 years between alfalfa crops. Maintain a good weed control program, since some weeds can be alternate hosts. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.					No products currently registered for verticillium wilt in forages.
WHITE MOULD/BLOSSOM BLIGHT (*Sclerotinia sclerotiorum*/*Botrytis cinerea*)					
Foliar Treatment					
There are some differences in white mould susceptibility between cultivars. Check with your seed company for disease ratings. Fields established under minimum tillage may have more disease incidence. Spring planting may reduce disease incidence. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	boscalid	Lance	420 g/ha (170 g/acre)	N/A	**For use in alfalfa for seed production only.** Ground and aerial application. Apply at 20%–50% flowering. Apply every 7–14 days if disease persists or weather conditions are favourable for disease development. Do not graze or feed treated hay to livestock. Maximum 3 applications/yr. 12-hr restricted entry interval.
	penthiopyrad	Fontelis	1.25–1.75 L/ha (500–700 mL/acre)	14	Ground and aerial application. Make initial application prior to disease development and continue on a 7–14-day interval. Use higher rate and shorter interval when disease pressure is high. Make no more than 2 sequential applications of Fontelis before switching to a fungicide with a different mode of action. Maximum 3.5 L/ha/yr. 12-hr restricted entry interval.
	pyraclostrobin + fluxapyroxad	Priaxor	0.3–0.45 L/ha (120–180 mL/acre)	N/A	**Provides suppression only. For use in alfalfa for seed production only.** Ground and aerial application. For optimal results, apply PRIAXOR at the beginning of flowering (10%–30% bloom) or at the onset of disease. Make 1 application per forage cutting for feed with a maximum of 2 applications per season. 14-day PHI for crop group 18; non-grass animal feed. Do not make sequential applications. 12-hr restricted entry interval.

FORAGE CROP DISEASES

Table 3–6. Control Options for Foliar and Stem Diseases in Forage Crops — Common Leaf Spot, Lepto Leaf Spot, Spring Black Stem, Stephylium Leaf Spot

LEGEND: PHI = Pre-Harvest Interval (in days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
COMMON LEAF SPOT (*Pseudopeziza medicaginis*)					
Foliar Treatment					
Timely harvesting of forages is important to reduce leaf loss and minimize disease in the re-growth. Balance the time of harvest between the optimum stage for highest protein (bud stage in alfalfa) and the level of leaf spot disease, as leaf spot can reduce the protein level in legume leaves. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	boscalid	Lance	420 g/ha (170 g/acre)	N/A	**For use in alfalfa for seed production only.** Ground and aerial application. Apply at 20%–50% flowering. Apply every 7–14 days if disease persists or weather conditions are favourable for disease development. Do not graze or feed treated hay to livestock. Maximum 3 applications/yr. 12-hr restricted entry interval.
	mancozeb	Dithane DG	1.46 kg/ha (584 g/acre)	N/A	**For use in alfalfa for seed production only.** Ground and aerial application. Apply prior to 50% bloom. Repeat 7–10 days after 1st application and 10 days after second application. Do not graze treated crop or cut for hay. Maximum 3 applications/yr.
		Manzate Pro-Stick			
		Rainshield NT			
		Manzate Max	2.28 L/ha (923 mL/acre)		
	picoxystrobin	Acapela	0.44–0.88 L/ha (178–356 mL/acre)	14	Ground and aerial application. Begin applications in the spring at green-up and once 1–3 new leaves have grown after each cutting. Initiate applications prior to disease development and no later than 14 days prior to cutting. Use higher rate and shorter interval when disease pressure is high. Make no more than 2 sequential applications of Acapela fungicide before switching to a fungicide with a different mode of action registered for the same use. Feeding/Grazing Restriction: DO NOT harvest alfalfa seeds, forage or cut hay within 14 days of application. Maximum 3 applications/yr high rate. 12-hr restricted entry interval.
	pyraclostrobin + fluxapyroxad	Priaxor	0.3–0.45 L/ha (120–180 mL/acre)	N/A	**For use in alfalfa for seed production only.** Ground and aerial application. For optimal results, apply PRIAXOR at the beginning of flowering (10%–30% bloom) or at the onset of disease. Make 1 application per forage cutting for feed with a maximum of 2 applications per season. 14-day PHI for crop group 18; non-grass animal feed. Do not make sequential applications. 12-hr restricted entry interval.

FORAGE CROP DISEASES

Table 3–6. Control Options for Foliar and Stem Diseases in Forage Crops — Common Leaf Spot, Lepto Leaf Spot, Spring Black Stem, Stephylium Leaf Spot

LEGEND: PHI = Pre-Harvest Interval (in days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
LEPTO LEAF SPOT (*Leptosphaerulina trifolii*)					
Foliar Treatment					
Timely harvesting of forages is important to reduce leaf loss and minimize disease in the re-growth. There are no practical control strategies available for leaf spot diseases in forages. Balance the time of harvest between the optimum stage for highest protein (bud stage in alfalfa) and the level of leaf spot disease, as leaf spot can reduce the protein level in legume leaves. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	boscalid	Lance	420 g/ha (170 g/acre)	N/A	**For use in alfalfa for seed production only.** Ground and aerial application. Apply at 20%–50% flowering. Apply every 7–14 days if disease persists or weather conditions are favourable for disease development. Do not graze or feed treated hay to livestock. Maximum 3 applications/yr. 12-hr restricted entry interval.
	mancozeb	Dithane DG	1.46 kg/ha (584 g/acre)	N/A	**For use in alfalfa for seed production only.** Ground and aerial application. Apply prior to 50% bloom. Repeat 7–10 days after 1st application and 10 days after second application. Do not graze treated crop or cut for hay. Maximum 3 applications/yr.
		Manzate Pro-Stick			
		Rainshield NT			
		Manzate Max	2.28 L/ha (923 mL/acre)		
SPRING BLACK STEM (*Phoma medicaginis*)					
Foliar Treatment					
This disease is favoured by cool, wet weather conditions. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	boscalid	Lance	420 g/ha (170 g/acre)	N/A	**For use in alfalfa for seed production only.** Ground and aerial application. Apply at 20%–50% flowering. Apply every 7–14 days if disease persists or weather conditions are favourable for disease development. Do not graze or feed treated hay to livestock. Maximum 3 applications/yr. 12-hr restricted entry interval.
STEPHYLIUM LEAF SPOT (*Stephylium botryosum*)					
Foliar Treatment					
The disease is favoured by cool, wet conditions. Leaf symptoms typically appear as oval (round) light brown lesions with a dark brown border, which may be surrounded by a light-yellow halo. The lesions may expand and form concentric rings.	picoxystrobin	Acapela	0.44–0.88 L/ha (178–356 mL/acre)	14	Ground and aerial application. Begin applications in the spring at green-up and once 1–3 new leaves have grown after each cutting. Initiate applications prior to disease development and no later than 14 days prior to cutting. Use higher rate and shorter interval when disease pressure is high. Make no more than 2 sequential applications of Acapela fungicide before switching to a fungicide with a different mode of action registered for the same use. Feeding/Grazing Restriction: DO NOT harvest alfalfa seeds, forage or cut hay within 14 days of application. Maximum 3 applications/yr high rate. 12-hr restricted entry interval.

4. Cereals

WHEAT, BARLEY, OAT AND RYE INSECTS

Table 4–1. 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, restricted entry intervals, etc.)
WIREWORMS (*Limonius* spp. and others)				
Seed Treatment				
See OMAFRA Publication 811, *Agronomy Guide for Field Crops*, for sampling methods. One wireworm/bait trap may warrant control. Fields at risk include those on sandy and silty soils with a high frequency of grassy crop rotation (cereals, mixed forages and especially following sod), canola or vegetable crops including carrots, potatoes and sweet potatoes.	chlorantraniliprole	Lumivia CPL Insecticides	24–40 mL product (15–25 g a.i.)/ 100 kg seed	For use in commercial and on-farm treating facilities. Do not make a subsequent foliar application of any Group 28 insecticide (e.g., Coragen) for a minimum of 60 days after planting seed treated with Lumivia CPL Insecticide Seed Treatment. If a foliar spray is required during this window it must be made with an insecticide other than Group 28. This product contains no colourant. An appropriate colourant must be added when this product is applied. Toxic to bees. This product is systemic. However, bees are unlikely to be exposed to product residues in pollen and/or nectar resulting from seed treatment applications. When this product is applied and used according to label directions, risk to bees is expected to be negligible. Toxic to birds and small wild mammals. Any spilled or exposed seed must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to aquatic organisms. Do not apply where contamination of groundwater or run-off into aquatic sites is possible.
	clothianidin	NipsIt INSIDE 600	(17 mL/ 100 kg seed **for suppression**) 33–100 mL/ 100 kg seed	**For use in wheat only.** For use in commercial seed treatment facilities or on-farm treating. 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. This product contains no colourant. An appropriate colourant must be added when this product is applied. Clothianidin is toxic to bees. Dust generated during planting of treated seed may be harmful to bees and other pollinators. To help minimize the dust generated during planting, refer to the complete guidance “Pollinator Protection and Responsible Use of Treated Seed-Best Management Practices” on the Health Canada webpage on pollinator protection at www.canada.ca/pollinators. When using a seed flow lubricant with this treated seed, only a dust reducing fluency agent is permitted. Talc and graphite are not permitted to be used as a seed flow lubricant for corn seed treated with these insecticides. Carefully follow use directions for this seed flow lubricant. Toxic to birds and small wild mammals. Any spilled or exposed seed must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to aquatic organisms. Do not apply where contamination of groundwater or run-off into aquatic sites is possible.

WHEAT, BARLEY, OAT AND RYE INSECTS

Table 4–1. 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, restricted entry intervals, etc.)
WIREWORMS (*Limonius* spp. and others) (continued)				
Seed Treatment (continued)				
(continued)	clothianidin + metalaxyl + metconazole	NipsIt SUITE Cereals	326 mL/ 100 kg seed	**For use in wheat only. Suppression only.** The product is formulated for use as an on-farm and commercial seed treatment product. Clothianidin is toxic to bees. Dust generated during planting of treated seed may be harmful to bees and other pollinators. To help minimize the dust generated during planting, refer to the complete guidance "Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices" on the Health Canada webpage on pollinator protection at www.canada.ca/pollinators. When using a seed flow lubricant with this treated seed, only a dust reducing fluency agent is permitted. Talc and graphite are not permitted to be used as a seed flow lubricant for corn seed treated with these insecticides. Carefully follow use directions for this seed flow lubricant. Toxic to birds and small wild mammals. Any spilled or exposed seed must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to aquatic organisms. Do not apply where contamination of groundwater or run-off into aquatic sites is possible. Left over seed should be sown in headlands or buried away from water sources.
	imidacloprid	Alias 240 SC	42–125 mL/ 100 kg seed	**For use in wheat, barley and oats.** For use in commercial and on-farm seed treatment equipment. Use higher rates for fields with history of moderate-to-high wireworm pressure. This product contains no colourant. An appropriate colourant must be added when this product is applied to seed. Imidacloprid is toxic to bees. Dust generated during planting of treated seed may be harmful to bees and other pollinators. To help minimize the dust generated during planting, refer to the complete guidance "Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices" on the Health Canada webpage on pollinator protection at www.canada.ca/pollinators. When using a seed flow lubricant with this treated seed, only a dust reducing fluency agent is permitted. Talc and graphite are not permitted to be used as a seed flow lubricant for corn seed treated with these insecticides. Carefully follow use directions for this seed flow lubricant. Toxic to birds and small wild mammals. Any spilled or exposed seed must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to aquatic organisms. Do not apply where contamination of groundwater or run-off into aquatic sites is possible. Left-over seed should be sown in headlands or buried away from water sources.

WHEAT, BARLEY, OAT AND RYE INSECTS

Table 4–1. 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, restricted entry intervals, etc.)
WIREWORMS (*Limonius* spp. and others) (continued)				
Seed Treatment (continued)				
(continued)	Imidacloprid (continued)	Sombrero 600 FS	17–50 mL/ 100 kg seed	**For use in wheat, barley and oats.** For use in commercial and on-farm seed treatment equipment. For fields with a history of moderate-to-high wireworm pressure, treat crops at 34–50 mL/100 kg seed. Dilute in sufficient liquid to achieve uniform distribution on the seed. A colourant MUST be added to this product to colour seed in accordance with the *PCP Act* and the *Seeds Act* regulations. Imidacloprid is toxic to bees. Dust generated during planting of treated seed may be harmful to bees and other pollinators. To help minimize the dust generated during planting, refer to the complete guidance "Pollinator Protection and Responsible Use of Treated Seed-Best Management Practices" on the Health Canada webpage on pollinator protection at www.canada.ca/pollinators. When using a seed flow lubricant with this treated seed, only a dust reducing fluency agent is permitted. Talc and graphite are not permitted to be used as a seed flow lubricant for corn seed treated with these insecticides. Carefully follow use directions for this seed flow lubricant. Toxic to birds and small wild mammals. Any spilled or exposed seed must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to aquatic organisms. Do not apply where contamination of groundwater or run-off into aquatic sites is possible. Left-over seed should be sown in headlands or buried away from water sources.
		Stress Shield for Cereals	21–63 mL/ 100 kg seed (10–30 g a.i./ 100 kg seed)	**For use in wheat, barley and oats.** For commercial and on-farm treating. For fields with a history of moderate-to-high wireworm pressure, treat crops at 50 mL/100 kg seed. Stress Shield 600 may be mixed with certain fungicides. Follow all appropriate directions and precautions as specified on the fungicide labels. 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. Imidacloprid is toxic to bees. Dust generated during planting of treated seed may be harmful to bees and other pollinators. To help minimize the dust generated during planting, refer to the complete guidance "Pollinator Protection and Responsible Use of Treated Seed-Best Management Practices" on the Health Canada webpage on pollinator protection at www.canada.ca/pollinators. When using a seed flow lubricant with this treated seed, only a dust reducing fluency agent is permitted. Talc and graphite are not permitted to be used as a seed flow lubricant for corn seed treated with these insecticides. Carefully follow use directions for this seed flow lubricant. Toxic to birds and small wild mammals. Any spilled or exposed seed must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to aquatic organisms. Do not apply where contamination of groundwater or run-off into aquatic sites is possible. Left-over seed should be sown in headlands or buried away from water sources.

WHEAT, BARLEY, OAT AND RYE INSECTS

Table 4–1. 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, restricted entry intervals, etc.)
WIREWORMS (*Limonius* spp. and others) (continued)				
Seed Treatment (continued)				
(continued)	thiamethoxam	Cruiser 5 FS	33–50 mL/ 100 kg seed	**For use in wheat, barley and rye.** For commercial and on-farm treating. 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. This product contains no colourant. An appropriate colourant must be added when this product is applied to seed. Thiamethoxam is toxic to bees. Bees can be exposed to product residues in flowers, leaves, pollen and/or nectar resulting from seed treatment applications. When used according to label directions minimal exposure or risk is expected. Dust generated during planting of treated seed may be harmful to bees and other pollinators. To help minimize the dust generated during planting, refer to the “Pollinator Protection and Responsible Use of Treated Seed-Best Management Practices” on the Health Canada webpage on pollinator protection at www.canada.ca/pollinators. When using a seed flow lubricant with this treated seed, only a dust reducing fluency agent is permitted. Talc and graphite are not permitted to be used as a seed flow lubricant for corn or soybean seed treated with this insecticide. Carefully follow use directions for the seed flow lubricant. Treated seed is toxic to birds and small wild animals. Any spilled or exposed seeds must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to fish and aquatic invertebrates. Do not apply directly to water, or to areas where surface water is present.
	thiamethoxam + difenoconazole + metalaxyl-M + sedaxane + fludioxonil	Cruiser Vibrance Quattro	325 mL/ 100 kg seed	For commercial and on-farm treating. This product contains colourant. 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. Additional Cruiser 5FS seed treatment may be needed when wireworm activity is high. Thiamethoxam is toxic to bees. Bees can be exposed to product residues in flowers, leaves, pollen and/or nectar resulting from seed treatment applications. When used according to label directions minimal exposure or risk is expected. Dust generated during planting of treated seed may be harmful to bees and other pollinators. To help minimize the dust generated during planting, refer to the “Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices” on the Health Canada webpage on pollinator protection at www.canada.ca/pollinators. When using a seed flow lubricant with this treated seed, only a dust reducing fluency agent is permitted. Talc and graphite are not permitted to be used as a seed flow lubricant for corn or soybean seed treated with this insecticide. Carefully follow use directions for the seed flow lubricant. Treated seed is toxic to birds and small wild animals. Any spilled or exposed seeds must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to fish and aquatic invertebrates. Do not apply directly to water, or to areas where surface water is present.

WHEAT, BARLEY, OAT AND RYE INSECTS

Table 4–1. 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, restricted entry intervals, etc.)
GRUB — EUROPEAN CHAFER (*Rhizotrogus majalis*)				
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, *Agronomy Guide for Field Crops*, for more details.	imidacloprid	Stress Shield 600	17–50 mL/ 100 kg seed (10–30 g a.i./ 100 kg seed)	**For use in wheat, barley and oats.** For commercial and on-farm treating. Stress Shield 600 may be mixed with certain fungicides. Follow all appropriate directions and precautions as specified on the fungicide labels. 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. Imidacloprid is toxic to bees. Dust generated during planting of treated seed may be harmful to bees and other pollinators. To help minimize the dust generated during planting, refer to the complete guidance "Pollinator Protection and Responsible Use of Treated Seed-Best Management Practices" on the Health Canada webpage on pollinator protection at www.canada.ca/pollinators. When using a seed flow lubricant with this treated seed, only a dust reducing fluency agent is permitted. Talc and graphite are not permitted to be used as a seed flow lubricant for corn seed treated with these insecticides. Carefully follow use directions for this seed flow lubricant. Toxic to birds and small wild mammals. Any spilled or exposed seed must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to aquatic organisms. Do not apply where contamination of groundwater or run-off into aquatic sites is possible. Left-over seed should be sown in headlands or buried away from water sources.
	thiamethoxam	Cruiser 5 FS	50 mL/ 100 kg seed	**For use in wheat and barley.** For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 45 days after planting. This product contains no colourant. An appropriate colourant must be added when this product is applied to seed. Thiamethoxam is toxic to bees. Bees can be exposed to product residues in flowers, leaves, pollen and/or nectar resulting from seed treatment applications. When used according to label directions minimal exposure or risk is expected. Dust generated during planting of treated seed may be harmful to bees and other pollinators. To help minimize the dust generated during planting, refer to the "Pollinator Protection and Responsible Use of Treated Seed-Best Management Practices" on the Health Canada webpage on pollinator protection at www.canada.ca/pollinators. When using a seed flow lubricant with this treated seed, only a dust reducing fluency agent is permitted. Talc and graphite are not permitted to be used as a seed flow lubricant for corn or soybean seed treated with this insecticide. Carefully follow use directions for the seed flow lubricant. Treated seed is toxic to birds and small wild animals. Any spilled or exposed seeds must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to fish and aquatic invertebrates. Do not apply directly to water, or to areas where surface water is present.

WHEAT, BARLEY, OAT AND RYE INSECTS

Table 4–1. 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, restricted entry intervals, etc.)
GRUB — EUROPEAN CHAFER (*Rhizotrogus majalis*) (continued)				
(continued)	thiamethoxam + difenoconazole + metalaxyl-M + sedaxane + fludioxonil	Cruiser Vibrance Quattro	325 mL/ 100 kg seed	**For use in wheat and barley.** For commercial and on-farm treating. This product contains colourant. 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. Additional Cruiser 5FS seed treatment may be needed when European chafer activity is high. Thiamethoxam is toxic to bees. Bees can be exposed to product residues in flowers, leaves, pollen and/or nectar resulting from seed treatment applications. When used according to label directions minimal exposure or risk is expected. Dust generated during planting of treated seed may be harmful to bees and other pollinators. To help minimize the dust generated during planting, refer to the “Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices” on the Health Canada webpage on pollinator protection at www.canada.ca/pollinators. When using a seed flow lubricant with this treated seed, only a dust reducing fluency agent is permitted. Talc and graphite are not permitted to be used as a seed flow lubricant for corn or soybean seed treated with this insecticide. Carefully follow use directions for the seed flow lubricant. Treated seed is toxic to birds and small wild animals. Any spilled or exposed seeds must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to fish and aquatic invertebrates. Do not apply directly to water, or to areas where surface water is present.

WHEAT, BARLEY, OAT AND RYE INSECTS

Table 4–2. 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, restricted entry intervals, etc.)
ARMYWORM (TRUE – *Pseudaletia unipuncta*, FALL – *Spodoptera frugiperda*)					
Chemical control is warranted by 4–5 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.	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. Do not make a foliar application of Coragen insecticide for a minimum of 60 days after planting of seed treated with any Group 28 insecticide (i.e., Fortenza or Lumivia). Toxic to aquatic organisms. Do not apply this product directly to freshwater habitats, estuarine and marine habitats. Observe buffer zones specified. Toxic to certain beneficial insects. Minimize spray drift to reduce harmful effects to beneficial insects in habitats adjacent to application site.
	lambda-cyhalothrin	Labamba Matador 120 E Silencer 120 EC	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 restricted entry interval. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.
	spinetoram	Delegate	100–200 g/ha (40–80 g/acre)	28	Ground and aerial application. Time the initial application to target small larvae, and use sufficient spray volume to ensure good coverage. Use the higher rate for heavy infestation and/or difficult spray coverage situations. Maximum of 3 applications/yr with re-treatment interval of 5 days. 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. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site. Toxic to small wild mammals. May be toxic to certain beneficial insects. Minimize spray drift to reduce harmful effects on beneficial insects in habitats next to the application site such as hedgerows and woodland.
CEREAL LEAF BEETLE (*Oulema melanopus*)					
Control is warranted if an average of 3 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, *Agronomy Guide for Field Crops*, for more information.	malathion	Malathion 500 EC	550–1,100 mL/ha (202–445 mL/acre)	7	Ground and aerial application. 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. Toxic to aquatic organisms. Avoid contamination of aquatic systems during application. Do not contaminate these systems through direct application, disposal of waste or cleaning equipment. Observe buffer zones specified on the label. To reduce runoff from treated areas into aquatic habitats avoid application to areas with a moderate to steep slope, compacted soil or clay.

WHEAT, BARLEY, OAT AND RYE INSECTS

Table 4–3. 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, restricted entry intervals, 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.	chlorantraniliprole	Coragen	125–250 mL/ha (50–101 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. Do not make a foliar application of Coragen insecticide for a minimum of 60 days after planting of seed treated with any Group 28 insecticide (i.e., Fortenza or Lumivia). Toxic to aquatic organisms. Do not apply this product directly to freshwater habitats, estuarine and marine habitats. Observe buffer zones specified. Toxic to certain beneficial insects. Minimize spray drift to reduce harmful effects to beneficial insects in habitats adjacent to 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. Toxic to aquatic organisms. Observe buffer zones and vegetative filter strips specified on the label.
	deltamethrin	Decis 100 EC	Ground: 50–75 mL/ha (20–30 mL/acre) Aerial: 75 mL/ha (30 mL/acre)	wheat, barley: 40 oat: 31	Ground and aerial application. Follow provincial forecast. Apply when insects are present as young hoppers or signs of insect damage are evident. Apply when the grasshoppers are in the 2–4 nymphal stage. Best control will be achieved when application is made prior to wing development. Under severe insect pressure, application should also be made to a 15-m strip along fence rows around the field. The higher rate should be used when the proportion of mature and late nymphal stages in the population is high and spray penetration is inhibited by dense crop canopy. Maximum of 3 applications/yr, maximum of 2 aerial applications/yr. Use a minimum of 100–200 L water/ha by ground or 11–22 L water/ha aerial. Minimum interval between applications is 5–7 days. Do not make aerial application of tank-mix of Decis 100 EC insecticide with Buctril M herbicide and Puma Advance herbicide. Toxic to bees for 1 day after application. DO NOT apply when crop or weeds are in bloom. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.
	dimethoate	Cygon 480 EC	550–1,000 mL/ha (220–404 mL/acre)	35	**For use in wheat, barley and oats.** 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. Apply when the grasshoppers are in the 2–4 nymphal stage. Use higher rate for adults and later stages of nymphs or when canopy is dense. Maximum 2 applications/yr.

WHEAT, BARLEY, OAT AND RYE INSECTS

Table 4–3. 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, restricted entry intervals, etc.)
GRASSHOPPERS (various species) (continued)					
(continued)	lambda-cyhalothrin	Labamba Matador 120 E Silencer 120 EC	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 restricted entry interval. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.
	malathion	Malathion 500 EC	2.25–2.75 L/ha (900–1,100 mL/acre)	7	Ground and aerial application. 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. Toxic to aquatic organisms. Avoid contamination of aquatic systems during application. Do not contaminate these systems through direct application, disposal of waste or cleaning equipment. Observe buffer zones specified on the label. To reduce runoff from treated areas into aquatic habitats avoid application to areas with a moderate to steep slope, compacted soil or clay.

WHEAT, BARLEY, OAT AND RYE INSECTS

Table 4–4. 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, restricted entry intervals, 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. Toxic to birds and small mammals. Cover or incorporate spilled treated seeds. This product contains no colourant. An appropriate colourant must be added when this product is applied. Clothianidin is toxic to bees. Dust generated during planting of treated seed may be harmful to bees and other pollinators. To help minimize the dust generated during planting, refer to the complete guidance "Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices" on the Health Canada webpage on pollinator protection at www.canada.ca/pollinators. When using a seed flow lubricant with this treated seed, only a dust reducing fluency agent is permitted. Talc and graphite are not permitted to be used as a seed flow lubricant for corn seed treated with these insecticides. Carefully follow use directions for this seed flow lubricant. Toxic to birds and small wild mammals. Any spilled or exposed seed must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to aquatic organisms. Do not apply where contamination of groundwater or run-off into aquatic sites is possible. Left over seed should be sown in headlands or buried away from water sources.
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	425 mL/ha (170 mL/acre)	35	**For use in wheat, barley and oats.** 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/yr. Toxic to bees.
	sulfoxaflor	Transform WG	25–50 g/ha (10–24 g/acre)	14	**For use in wheat and barley only.** 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. Maximum 2 applications/yr. Do not apply more than 200 g/ha/yr. 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.

WHEAT DISEASES

Table 4–5. 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, restricted entry intervals, etc.)
SEED-BORNE SEPTORIA (*Stagonospora nodorum*, formerly *Septoria nodorum*)				
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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	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 42 days after planting. Read label information for information regarding resistant strains of fungus.
	difenoconazole + metalaxyl-M	Dividend XL RTA	650 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treating. 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. For control of seed-borne septoria and early-season septoria leaf blotch, use the 360 mL/100 kg seed rate.
	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 commercial and on-farm treating. Do not graze or feed livestock on treated areas for 4 weeks after planting.

WHEAT DISEASES

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
SEED-BORNE, SEED ROT and SEEDLING BLIGHT (*Fusarium* 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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	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 42 days after planting. Read label information for information regarding resistant strains of fungus.
	clothianidin + metalaxyl + metconazole	NipsIt SUITE Cereals	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 seed protectant. NipsIt SUITE Cereals 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.
	difenoconazole + metalaxyl-M	Dividend XL RTA	325–650 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treating. 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.
	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.
	ipconazole + metalaxyl	Rancona Pinnacle	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. Read label for information regarding resistant strains of fungus.
	ipconazole + carbathiin + metalaxyl	Rancona Trio	300 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or cut for forage within 6 weeks after planting. Read label for information regarding resistant strains of fungus.
	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 + 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 + 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.
	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.
	thiamethoxam + difenoconazole + metalaxyl-M + sedaxane + fludioxonil	Cruiser Vibrance Quattro	325 mL/ 100 kg seed	For commercial and on-farm treating. This product contains colourant. 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. Control Options for Seedling Diseases in Wheat — Common Root Rot (Common Blight)

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
COMMON ROOT ROT (COMMON BLIGHT) (*Cochliobolus sativus*)				
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 blacking 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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	carbathiin + thiram	Vitaflo 280	230–330 mL/ 100 kg seed	**Provides suppression only. For use in commercial seed treatment facilities only.** Do not graze or feed livestock on treated areas for 42 days after planting. Read label information for information regarding resistant strains of fungus.
	clothianidin + metalaxyl + metconazole	NipsIt SUITE Cereals	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 seed protectant. NipsIt SUITE Cereals 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.
	difenoconazole + metalaxyl-M	Dividend XL RTA	325–650 mL/ 100 kg seed	**Provides suppression only.** For both commercial seed treatment plants and on-farm treating. 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.
	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.
	ipconazole + metalaxyl	Rancona Pinnacle	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. Read label for information regarding resistant strains of fungus.
	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.
	ipconazole + carbathiin + metalaxyl	Rancona Trio	300 mL/ 100 kg seed	**Provides suppression only.** For commercial and on-farm treating. Do not graze or cut for forage within 6 weeks after planting. Read label for information regarding resistant strains of fungus.
	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 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.

WHEAT DISEASES

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
COMMON ROOT ROT (COMMON BLIGHT) (*Cochliobolus sativus*) (continued)				
Seed Treatment (continued)				
(continued)	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.
	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.
	thiamethoxam + difenoconazole + metalaxyl-M + sedaxane + fludioxonil	Cruiser Vibrance Quattro	325 mL/ 100 kg seed	**Provides suppression only.** For commercial and on-farm treating. This product contains colourant. 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 4–8. Control Options for Seedling Diseases in Wheat — Pythium Damping-Off

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
PYTHIUM DAMPING-OFF (*Pythium* 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 increased drainage. Seed treatments containing metalaxyl or metalaxyl-M can reduce infection. Delay planting until conditions will result in a rapid and uniform emergence. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	clothianidin + metalaxyl + metconazole	NipsIt SUITE Cereals	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 seed protectant. NipsIt SUITE Cereals 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.
	ethaboxam	INTEGO Solo	13–17 mL/ 100 kg seed	For commercial and on-farm treating. Regulations under the *Seeds Act* 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. 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 *Rhizoctonia solani* and other fungal pathogens inciting seed and seedling disease. To deliver 5 g a.i./100 kg seed, apply 0.44 mL/100,000 seeds (equals 0.0017 mg a.i./seed) based on 28,634 seed/kg count.
	difenoconazole + metalaxyl-M	Dividend XL RTA	325–650 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treating. 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.
	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.
	ipconazole + carbathiin + metalaxyl	Rancona Trio	300 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or cut for forage within 6 weeks after planting. Read label for information regarding resistant strains of fungus.
	Ipconazole + metalaxyl	Rancona Pinnacle	325 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or cut for forage within 30 days after planting. Read label for information regarding resistant strains of fungus.
	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.
	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.

WHEAT DISEASES

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
PYTHIUM DAMPING-OFF (*Pythium* spp.) (continued)				
Seed Treatment (continued)				
(continued)	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 + 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.
	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.
	thiamethoxam + difenoconazole + metalaxyl-M + sedaxane + fludioxonil	Cruiser Vibrance Quattro	325 mL/ 100 kg seed	For commercial and on-farm treating. This product contains colourant. 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 4–9. Control Options for Seedling Diseases in Wheat — Penicillium, Aspergillus Seed Rot

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
PENICILLIUM (*Penicillium* spp.) and ASPERGILLUS SEED ROT (*Aspergillus* 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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	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 42 days after planting. Read label information for information regarding resistant strains of fungus.
	difenoconazole + metalaxyl-M	Dividend XL RTA	325–650 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treating. 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 + 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.
	ipconazole + carbathiin + metalaxyl	Rancona Trio	300 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or cut for forage within 6 weeks after planting. Read label for information regarding resistant strains of fungus.
	ipconazole + metalaxyl	Rancona Pinnacle	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. Read label for information regarding resistant strains of fungus.
	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.
	thiamethoxam + difenoconazole + metalaxyl-M + sedaxane + fludioxonil	Cruiser Vibrance Quattro	325 mL/ 100 kg seed	For commercial and on-farm treating. This product contains colourant. 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 4–10. Control Options for Seedling Diseases in Wheat — Loose Smut

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
LOOSE SMUT (*Ustilago tritici*)				
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 have been reduced substantially due to the effectiveness of fungicide seed treatments. Good coverage of seed with fungicide seed treatment is important. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	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 42 days after planting. Read label for information on resistant strains of fungus.
	clothianidin + metalaxyl + metconazole	NipsIt SUITE Cereals	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 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.
	difenoconazole + metalaxyl-M	Dividend XL RTA	325–650 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treating. 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.
	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.
	ipconazole + carbathiin + metalaxyl	Rancona Trio	300 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or cut for forage within 6 weeks after planting. Read label for information regarding resistant strains of fungus.
	ipconazole + metalaxyl	Rancona Pinnacle	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. Read label for information regarding resistant strains of fungus.
	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 + 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.

WHEAT DISEASES

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
LOOSE SMUT (*Ustilago tritici*) (continued)				
Seed Treatment (continued)				
(continued)	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.
	thiamethoxam + difenoconazole + metalaxyl-M + sedaxane + fludioxonil	Cruiser Vibrance Quattro	325 mL/ 100 kg seed	For commercial and on-farm treating. This product contains colourant. 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. 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, restricted entry intervals, etc.)
FUSARIUM CROWN and FOOT ROT (*Fusarium graminearum, F. culmorum, F. pseudogarminearum*) — 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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	difenoconazole + metalaxyl-M	Dividend XL RTA	325–650 mL/ 100 kg seed	**Provides suppression only.** For both commercial seed treatment plants and on-farm treating. 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 + 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.
	ipconazole + carbathiin + metalaxyl	Rancona Trio	300 mL/ 100 kg seed	**Provides suppression only.** For commercial and on-farm treating. Do not graze or cut for forage within 6 weeks after planting. Read label for information regarding resistant strains of fungus.
	ipconazole + metalaxyl	Rancona Pinnacle	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. Read label for information regarding resistant strains of fungus.
	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 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.
	thiamethoxam + difenoconazole + metalaxyl-M + sedaxane + fludioxonil	Cruiser Vibrance Quattro	325 mL/ 100 kg seed	**Provides suppression only.** For commercial and on-farm treating. This product contains colourant. 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. 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, restricted entry intervals, etc.)
RHIZOCTONIA (*Rhizoctonia solani*)				
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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	clothianidin + metalaxyl + metconazole	NipsIt SUITE Cereals	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 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	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.
	ipconazole + carbathiin + metalaxyl	Rancona Trio	300 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or cut for forage within 6 weeks after planting. Read label for information regarding resistant strains of fungus.
	Ipconazole + metalaxyl	Rancona Pinnacle	325 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or cut for forage within 30 days after planting. Read label for information regarding resistant strains of fungus.
	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.
TAKE-ALL (*Gaeumannomyces graminis*) — 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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	difenoconazole + metalaxyl-M	Dividend XL RTA	325–650 mL/ 100 kg seed	**Provides suppression only.** For both commercial seed treatment plants and on-farm treating. 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	**Provides suppression only.** 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.
	thiamethoxam + difenoconazole + metalaxyl-M + sedaxane + fludioxonil	Cruiser Vibrance Quattro	325 mL/ 100 kg seed	**Provides suppression only.** For commercial and on-farm treating. This product contains colourant. 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. Control Options for Seedling Diseases in Wheat — Common Bunt, Dwarf Bunt

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
COMMON BUNT (*Tilletia tritici* and *Tilletia laevis*) — SEED AND SOIL-BORNE COMMON BUNT				
Seed Treatment				
Cool soil temperatures after seeding favour these bunt diseases. Common bunt was quite important in Ontario wheat production, but the incidence and hence its impact have been reduced substantially due to the effectiveness of fungicide seed treatments. Dwarf bunt primarily occurs in the counties bordering Georgian Bay and Lake Huron where snow cover is deep and persistent in late winter and early spring. Use seed that is free of bunt spores (black). Infected seed produces a "fishy" smell. See OMAFRA Publication 811, *Agronomy Guide for Field Crops* for more details.	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 42 days after planting. Read label for information regarding resistant strains of fungus.
	clothianidin + metalaxyl + metconazole	NipsIt SUITE Cereals	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 seed protectant. NipsIt SUITE Cereals 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	Dividend XL RTA	325–650 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treating. 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.
	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.
	ipconazole + carbathiin + metalaxyl	Rancona Trio	300 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or cut for forage within 6 weeks after planting. Read label for information regarding resistant strains of fungus.
	ipconazole + metalaxyl	Rancona Pinnacle	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. Read label for information regarding resistant strains of fungus.
	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 + 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.
	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.
	thiamethoxam + difenoconazole + metalaxyl-M + sedaxane + fludioxonil	Cruiser Vibrance Quattro	325 mL/ 100 kg seed	For commercial and on-farm treating. This product contains colourant. 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. Control Options for Seedling Diseases in Wheat — Common Bunt, Dwarf Bunt

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
DWARF BUNT (*Tilletia controversa*) — SEED AND SOIL-BORNE DWARF BUNT				
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 years since the fungus is very persistent. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops.*	carbathiin + thiram	Vitaflo 280	230–330 mL/ 100 kg seed	**For control of seed-borne dwarf bunt only. For use in commercial seed treatment facilities only.** Do not graze or feed livestock on treated areas for 42 days after planting. Read label for information on resistant strains of fungus.
	difenoconazole + metalaxyl-M	Dividend XL RTA	325–650 mL/ 100 kg seed	**Controls both seed- and soil-borne dwarf bunt.** For both commercial seed treatment plants and on-farm treating. 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	**Controls both seed- and soil-borne dwarf bunt. 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	**Controls both seed- and soil-borne dwarf bunt.** 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.
	thiamethoxam + difenoconazole + metalaxyl-M + sedaxane + fludioxonil	Cruiser Vibrance Quattro	325 mL/ 100 kg seed	**Controls both seed- and soil-borne bunts (common and dwarf).** For commercial and on-farm treating. This product contains colourant. 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 4–13. Control Options for Foliar, Stem and Head Diseases in Wheat — Early-Season Septoria, Spot Blotch

See Appendix H. *Cereal Growth Stages*.

LEGEND: PHI = Pre-Harvest Interval (in days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
EARLY-SEASON SEPTORIA (*Septoria* 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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	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 treating. 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 (*Cochliobolus sativus*)					
Avoid growing wheat after barley, wheat or grasses in a rotation. Removal of residue/straw will lower risk. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	pyraclostrobin + metconazole	Headline AMP	0.75–1.0 L/ha (303–404 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. 12-hr restricted entry interval.
		Twinline	380–500 mL/ha (150–200 mL/acre)		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 restricted entry interval.

WHEAT DISEASES

Table 4–14. Control Options for Foliar, Stem and Head Diseases in Wheat — Septoria Leaf Spot

See Appendix H. *Cereal Growth Stages.*

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
SEPTORIA LEAF SPOT (*Septoria tritici*)					
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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	azoxystrobin + propiconazole	Blanket AP	200–300 mL/ha (80–120 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply once up to boot stage. Good spray coverage and canopy penetration are important for best results. Do not apply at boot stage (Zadok's 47 and beyond). Maximum 1 application/yr. Do not harvest for forage. 12-hr restricted entry interval. Apply in at least 45 L/ha water by air or 100 L/ha by ground.
		Fungtion SC Quilt	0.5–1.0 L/ha (202–404 mL/acre)		
		Topnotch	530 mL/ha (212 mL/acre)		
	azoxystrobin + propiconazole + benzovindiflupyr	Trivapro A + Trivapro B (sold as co-pack: Trivapro)	1 L/ha (404 mL/acre) + 300 mL/ha (120 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply only up to boot stage (Zadok's 47). Use a minimum water volume of 100 L/ha for ground application. Maximum 2 applications/yr. 12-hr restricted entry interval.
	fluoxastrobin	Evito	146–292 mL/ha (59–118 mL/acre)	Do not apply at boot stage and beyond.	**Provides suppression only.** Ground and aerial application. For optimum results, begin applications preventively and repeat if needed after a 14–21-day Interval. Use the higher rates and shorter interval when disease pressure is high. Do not apply at boot stage (Zadok's 47 and beyond). 12-hr restricted entry interval.
	mancozeb	Dithane DG Rainshield NT Manzate Pro-Stick	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.
		Manzate Max	early: 1.72 L/ha (0.7 L/acre) late: 3.52 L/ha (1.4 L/acre)		
	penthiopyrad	Vertisan	1.2–1.75 L/ha (0.48–0.7 L/acre)	Do not apply at boot stage and beyond.	**Provides 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 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 restricted entry interval.
	picoxystrobin	Acapela	0.22–0.29 L/ha (89–117 mL/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. Make no more than 2 sequential applications of a strobilurin fungicide, such as Acapela before switching to a fungicide with a different mode of action. **Maximum seasonal use rate is 2.64 L/ha.** Maximum 2 applications/yr. 12-hr restricted entry interval.

WHEAT DISEASES

Table 4–14. Control Options for Foliar, Stem and Head Diseases in Wheat — Septoria Leaf Spot

See Appendix H. *Cereal Growth Stages.*

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
SEPTORIA LEAF SPOT (*Septoria tritici*) (continued)					
Foliar Treatment (continued)					
(continued)	propiconazole	Bumper 432 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.
		Nufarm Propiconazole			
		Princeton			
		Propi Super 25EC	250–500 mL/ha (100–200 mL/acre)		
		Tilt 250 E			
	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 restricted entry interval.
	prothioconazole + tebuconazole	Prosaro XTR	800 mL/ha (324 mL/acre)	36	**Ground application only.** Begin application preventively. When disease pressure is high, or when agronomic or weather conditions are conducive to disease development, continue applications as needed on a 7–14-day interval. Use shorter intervals in this range for best protection. When conditions for heavy infestation exist or when growing a less resistant cultivar, use the higher rate. Ensure good canopy penetration for optimum results. Do not exceed 1.5 L/ha/season (2 applications). Do not graze treated area and do not harvest for forage or hay.
	prothioconazole + trifloxystrobin	Stratego PRO	440 mL/ha (178 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Should be applied as a preventive disease control measure or at the very early stages of disease development. This could occur anytime during tillering or stem elongation. Typically, 1 application from the tillering up to flag leaf emergence is required. A second application may be made if needed. DO NOT apply within 14 days of the first treatment and must be applied prior to head emergence. Do not apply more than 2 applications per season. Refer to label for grazing restrictions. DO NOT tank-mix with herbicides in barley, oats, rye, triticale or millet.
	pydiflumetofen + propiconazole	Miravis Ace	1 L/ha (404 mL/acre)	7	Ground and aerial application. For optimal disease control, begin applications prior to disease development. Application at the timing for fusarium head blight will control leaf diseases that occur later in the season. Application at this timing is not intended to provide curative control of established leaf diseases. Apply in sufficient water volume to obtain thorough coverage; a minimum spray volume of 100 L/ha and 50 L/ha is recommended for ground and aerial application, respectively. Apply with a 90% non-ionic surfactant at a rate of 0.125% v/v in the spray tank. Grain and straw may be fed at normal maturity. For harvest of forage and hay, one application with a minimum PHI of 7 days is required.

WHEAT DISEASES

Table 4–14. Control Options for Foliar, Stem and Head Diseases in Wheat — Septoria Leaf Spot

See Appendix H. *Cereal Growth Stages.*

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
SEPTORIA LEAF SPOT (*Septoria tritici*) (continued)					
Foliar Treatment (continued)					
(continued)	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 restricted entry interval.
	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 restricted entry interval.
	pyraclostrobin + metconazole	Headline AMP	0.75–1.0 L/ha (303–404 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. 12-hr restricted entry interval.
	tebuconazole + azoxystrobin	Custodia	465–630 mL/ha (190–250 L/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 beginning of heading. Use of the higher rate should be considered when weather conditions are conductive to heavy disease development. Maximum 1 application/yr. 12-hr restricted entry interval.
	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 restricted entry interval. 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 *Fusarium* control, where applications are targeted at head emergence.
		Orius 430 SC	220–290 mL/ha (89–118 mL/acre)	36	Ground and aerial application. Apply to the 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 flowering stage. Consider using a higher rate when weather conditions are conducive to heavy disease development. Maximum 1 application/yr. 12-hr restricted entry interval.
		Tebbie	375–500 mL/ha (152–200 mL/acre)		

WHEAT DISEASES

Table 4–15. Control Options for Foliar, Stem and Head Diseases in Wheat — Powdery Mildew

See Appendix H. *Cereal Growth Stages*.

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
POWDERY MILDEW (*Erysiphe graminis* f. sp. *tritici*)					
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, *Agronomy Guide for Field Crops*, 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.	fluoxastrobin	Evito	183–292 mL/ha (74–118 mL/acre)	Do not apply at boot stage and beyond.	For optimum results, begin applications preventively and repeat If needed after a 14–21-day Interval. Use the higher rates and shorter Interval when disease pressure Is high. Do not apply at boot stage (Zadok's 47 and beyond). Ground and aerial application. 12-hr restricted entry interval.
	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 boot stage (Zadok's 47). Apply no more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 2.64 L/ha per season. 12-hr restricted entry interval.
	propiconazole	Bumper 432 EC	300 mL/ha (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.
		Nufarm Propiconazole			
		Princeton			
		Propi Super 25 EC	250–500 mL/ha (100–200 mL/acre)		
		Tilt 250 E	500 mL/ha (200 mL/acre)		
	prothioconazole + tebuconazole	Prosaro XTR	800 mL/ha (324 mL/acre)	36	**Ground application only.** Begin application preventively. When disease pressure is high, or when agronomic or weather conditions are conducive to disease development, continue applications as needed on a 7–14-day interval. Use shorter intervals in this range for best protection. When conditions for heavy infestation exist or when growing a less resistant cultivar, use the higher rate. Ensure good canopy penetration for optimum results. Do not exceed 1.5 L/ha/season (2 applications). Do not graze treated area and do not harvest for forage or hay.
	prothioconazole + trifloxystrobin	Stratego PRO	440 mL/ha (178 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Should be applied as a preventive disease control measure or at the very early stages of disease development. This could occur anytime during tillering or stem elongation. Typically, one application from the tillering up to flag leaf emergence is required. A second application may be made if needed. DO NOT apply within 14 days of the first treatment and must be applied prior to head emergence. Do not apply more than 2 applications per season. Refer to label for grazing restrictions. DO NOT tank mix with herbicides in barley, oats, rye, triticale or millet.

WHEAT DISEASES

Table 4–15. Control Options for Foliar, Stem and Head Diseases in Wheat — Powdery Mildew

See Appendix H. *Cereal Growth Stages*.

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
POWDERY MILDEW (*Erysiphe graminis* f. sp. *tritici*) (continued)					
Foliar Treatment (continued)					
(continued)	pydiflumetofen + propiconazole	Miravis Ace	1 L/ha (404 mL/acre)	7	Ground and aerial application. For optimal disease control, begin applications prior to disease development. Application at the timing for fusarium head blight will control leaf diseases that occur later in the season. Application at this timing is not intended to provide curative control of established leaf diseases. Apply in sufficient water volume to obtain thorough coverage; a minimum spray volume of 100 L/ha and 50 L/ha is recommended for ground and aerial application, respectively. Apply with a 90% non-ionic surfactant at a rate of 0.125% v/v in the spray tank. Grain and straw may be fed at normal maturity. For harvest of forage and hay, one application with a minimum PHI of 7 days is required.
	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 restricted entry interval.
	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 restricted entry interval.
	pyraclostrobin + metconazole	Headline AMP	0.75–1.0 L/ha (303–404 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. 12-hr restricted entry interval.
		Twinline	380–500 mL/ha (150–200 mL/acre)		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 restricted entry interval.
	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 restricted entry interval. 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 *Fusarium* control, where applications are targeted at head emergence.
		Orius 430 SC	290 mL/ha (118 mL/acre)	36	Ground and aerial application. Apply to the 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 flowering stage. Maximum 1 application/yr. 12-hr restricted entry interval.
		Tebbie	375 mL/ha (152 mL/acre)		

WHEAT DISEASES

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

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
RUST (LEAF — *Puccinia triticina* and STEM — *P. graminis* f. sp. *tritici*)					
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). For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	azoxystrobin + propiconazole	Blanket AP	200–300 mL/ha (80–120 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply once up to boot stage. Good spray coverage and canopy penetration are important for best results.
		Quilt	0.75–1.0 L/ha (303–404 mL/acre)		Do not apply at boot stage (Zadok's 47 and beyond). Maximum 1 application/yr. Do not harvest for forage. 12-hr restricted entry interval.
		Topnotch	530 mL/ha (212 mL/acre)		Apply in at least 45 L/ha water by air or 100 L/ha by ground.
	azoxystrobin + propiconazole + benzovindiflupyr	Trivapro A + Trivapro B (sold as co-pack: Trivapro)	1 L/ha (404 mL/acre) + 300 mL/ha (120 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Do not apply at boot stage (Zadok's 47 and beyond). Use a minimum water volume of 100 L/ha for ground application. Maximum 2 applications/yr. 12-hr restricted entry interval.
	fluoxastrobin	Evito	146–292 mL/ha (59–118 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. For optimum results, begin applications preventively and repeat If needed after a 14–21-day Interval. Use the higher rates and shorter Interval when disease pressure Is high. Do not apply after boot stage (Zadok's 47). 12-hr restricted entry interval.
	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.
		Manzate Pro-Stick			
		Manzate Max	early: 1.72 L/ha (0.7 L/acre) late: 3.52 L/ha (1.4 L/acre)		
	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 restricted entry interval.
	picoxystrobin	Acapela	0.22–0.29 L/ha (89–117 mL/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. Make no more than 2 sequential applications of a strobilurin fungicide, such as Acapela before switching to a fungicide with a different mode of action. **Maximum seasonal use rate is 2.64 L/ha.** Maximum 2 applications/yr. 12-hr restricted entry interval.

WHEAT DISEASES

Table 4–16. Control Options for Foliar, Stem and Head Diseases in Wheat — Leaf Rust, Stem Rust

See Appendix H. *Cereal Growth Stages.*

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
RUST (LEAF — *Puccinia triticina* and STEM — *P. graminis* f. sp. *tritici*) (continued)					
(continued)	propiconazole	Bumper 432 EC	300 mL/ha (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.
		Nufarm Propiconazole			
		Princeton			
		Propi Super 25 EC	250–500 mL/ha (100–200 mL/acre)		
		Tilt 250 E	500 mL/ha (200 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 restricted entry interval.
	prothioconazole + tebuconazole	Prosaro XTR	800 mL/ha (324 mL/acre)	36	**Ground application only.** Begin application preventively. When disease pressure is high, or when agronomic or weather conditions are conducive to disease development, continue applications as needed on a 7–14-day interval. Use shorter intervals in this range for best protection. When conditions for heavy infestation exist or when growing a less resistant cultivar, use the higher rate. Ensure good canopy penetration for optimum results. Do not exceed 1.5 L/ha per season (2 applications). Do not graze treated area and do not harvest for forage or hay.
	prothioconazole + trifloxystrobin	Stratego PRO	440 mL/ha (178 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Should be applied as a preventive disease control measure or at the very early stages of disease development. This could occur anytime during tillering or stem elongation. Typically, 1 application from the tillering up to flag leaf emergence is required. A second application may be made if needed. DO NOT apply within 14 days of the first treatment and must be applied prior to head emergence. Do not apply more than 2 applications per season. Refer to label for grazing restrictions. DO NOT tank-mix with herbicides in barley, oats, rye, triticale or millet.
	pydiflumetofen + propiconazole	Miravis Ace	1 L/ha (404 mL/acre)	7	Ground and aerial application. For optimal disease control, begin applications prior to disease development. Application at the timing for fusarium head blight will control leaf diseases that occur later in the season. Application at this timing is not intended to provide curative control of established leaf diseases. Apply in sufficient water volume to obtain thorough coverage; a minimum spray volume of 100 L/ha and 50 L/ha is recommended for ground and aerial application, respectively. Apply with a 90% non-ionic surfactant at a rate of 0.125% v/v in the spray tank. Grain and straw may be fed at normal maturity. For harvest of forage and hay, one application with a minimum PHI of 7 days is required.
	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 restricted entry interval.

WHEAT DISEASES

Table 4–16. Control Options for Foliar, Stem and Head Diseases in Wheat — Leaf Rust, Stem Rust

See Appendix H. *Cereal Growth Stages.*

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
RUST (LEAF — *Puccinia triticina* and STEM — *P. graminis* f. sp. *tritici*) (continued)					
(continued)	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 restricted entry interval.
	pyraclostrobin + metconazole	Headline AMP	0.75–1.0 L/ha (303–404 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. 12-hr restricted entry interval.
		Twinline	380–500 mL/ha (150–200 mL/acre)		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 restricted entry interval.
	tebuconazole + azoxystrobin	Custodia	465–630 mL/ha (190–250 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 beginning of heading. Use of the higher rate should be considered when weather conditions are conducive to heavy disease development. Maximum 1 application/yr. 12-hr restricted entry interval.
	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 restricted entry interval. Before using Folicur for wheat leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for *Fusarium* control, where applications are targeted at head emergence.
		Orius 430 SC	220–290 mL/ha (89–118 mL/acre)	36	Ground and aerial application. Apply to the 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 flowering stage. Consider using a higher rate when weather conditions are conducive to heavy disease development. Maximum 1 application/yr. 12-hr restricted entry interval.
		Tebbie	375–500 mL/ha (152–200 mL/acre)		

WHEAT DISEASES

Table 4–17. Control Options for Foliar, Stem and Head Diseases in Wheat — Tan Spot

See Appendix H. *Cereal Growth Stages.*

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
TAN SPOT (*Pyrenophora tritici-repentis*)					
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 years. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	azoxystrobin + propiconazole	Blanket AP	200–300 mL/ha (80–120 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply once up to boot stage. Good spray coverage and canopy penetration are important for best results.
		Fungtion SC Quilt	0.75–1.0 L/ha (303–404 mL/acre)		Do not apply at boot stage and beyond. Maximum 1 application/yr. Do not harvest for forage. 12-hr restricted entry interval.
		Topnotch	530 mL/ha (212 mL/acre)		Apply in at least 45 L/ha water by air or 100 L/ha by ground.
	azoxystrobin + propiconazole + benzovindiflupyr	Trivapro A + Trivapro B (sold as co-pack: Trivapro)	1 L/ha (404 mL/acre) + 300 mL/ha (120 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply only up to boot stage (Zadok's 47). Use a minimum water volume of 100 L/ha for ground application. Maximum 2 applications/yr. 12-hr restricted entry interval.
	fluoxastrobin	Evito	146–292 mL/ha (59–118 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. For optimum results, begin applications preventively and repeat If needed after a 14–21-day Interval. Use the higher rates and shorter Interval when disease pressure Is high. Do not apply at boot stage (Zadok's 47 and beyond). 12-hr restricted entry interval.
	mancozeb	Dithane DG Rainshield NT Manzate Pro-Stick	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.
		Manzate Max	early: 1.72 L/ha (0.7 L/acre) late: 3.52 L/ha (1.4 L/acre)		
	picoxystrobin	Acapela	0.22–0.29 L/ha (89–117 mL/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. Make no more than 2 sequential applications of a strobilurin fungicide, such as Acapela before switching to a fungicide with a different mode of action. **Maximum seasonal use rate is 2.64 L/ha.** Maximum 2 applications/yr. 12-hr restricted entry interval.

WHEAT DISEASES

Table 4–17. Control Options for Foliar, Stem and Head Diseases in Wheat — Tan Spot

See Appendix H. *Cereal Growth Stages.*

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
TAN SPOT (*Pyrenophora tritici-repentis*) (continued)					
Foliar Treatment (continued)					
(continued)	propiconazole	Bumper 432 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.
		Nufarm Propiconazole			
		Princeton			
		Propi Super 25EC	250–500 mL/ha (100–200 mL/acre)		
		Tilt 250 E			
	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 restricted entry interval.
	prothioconazole + tebuconazole	Prosaro XTR	800 mL/ha (324 mL/acre)	36	**Ground application only.** Begin application preventively. When disease pressure is high, or when agronomic or weather conditions are conducive to disease development, continue applications as needed on a 7–14-day interval. Use shorter intervals in this range for best protection. When conditions for heavy infestation exist or when growing a less resistant cultivar, use the higher rate. Ensure good canopy penetration for optimum results. Do not exceed 1.5 L/ha per season (2 applications). Do not graze treated area and do not harvest for forage or hay.
	prothioconazole + trifloxystrobin	Stratego PRO	440 mL/ha (178 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Should be applied as a preventive disease control measure or at the very early stages of disease development. This could occur anytime during tillering or stem elongation. Typically, 1 application from the tillering up to flag leaf emergence is required. A second application may be made if needed. DO NOT apply within 14 days of the first treatment and must be applied prior to head emergence. Do not apply more than 2 applications per season. Refer to label for grazing restrictions. DO NOT tank-mix with herbicides in barley, oats, rye, triticale or millet.
	pydiflumetofen + propiconazole	Miravis Ace	1 L/ha (404 mL/acre)	7	Ground and aerial application. For optimal disease control, begin applications prior to disease development. Application at the timing for fusarium head blight will control leaf diseases that occur later in the season. Application at this timing is not intended to provide curative control of established leaf diseases. Apply in sufficient water volume to obtain thorough coverage; a minimum spray volume of 100 L/ha and 50 L/ha is recommended for ground and aerial application, respectively. Apply with a 90% non-ionic surfactant at a rate of 0.125% v/v in the spray tank. Grain and straw may be fed at normal maturity. For harvest of forage and hay, one application with a minimum PHI of 7 days is required.

WHEAT DISEASES

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

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
TAN SPOT (*Pyrenophora tritici-repentis*) (continued)					
Foliar Treatment (continued)					
(continued)	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 restricted entry interval.
	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 restricted entry interval.
	pyraclostrobin + metconazole	Headline AMP	0.75–1.0 L/ha (303–404 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. 12-hr restricted entry interval.
		Twinline	380–500 mL/ha (150–200 mL/acre)		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 restricted entry interval.
	tebuconazole + azoxystrobin	Custodia	465–630 mL/ha (190–250 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 beginning of heading. Use of the higher rate should be considered when weather conditions are conducive to heavy disease development. Maximum 1 applications/yr. 12-hr restricted entry interval.
	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 restricted entry interval. Before using Folicur for wheat leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for *Fusarium* control, where applications are targeted at head emergence.
		Orius 430 SC	220–290 mL/ha 89–118 mL/acre	36	Ground and aerial application. Apply to the 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 flowering stage. Consider using a higher rate when weather conditions are conducive to heavy disease development. Maximum 1 applications/yr. 12-hr restricted entry interval.
		Tebbie	375–500 mL/ha (152–200 mL/acre)		

WHEAT DISEASES

Table 4–18. Control Options for Foliar, Stem and Head Diseases in Wheat — Fusarium Head Blight

See Appendix H. *Cereal Growth Stages.*

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
FUSARIUM HEAD BLIGHT (*Fusarium graminearum*)					
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 *Fusarium* 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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	metconazole	Caramba	0.5–1 L/ha (200–404 mL/acre)	30	**Provides suppression only.** Ground and aerial application. For foliar diseases 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 (404 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 restricted entry interval.
	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 restricted entry interval.
	prothioconazole + tebuconazole	Prosaro XTR	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 restricted entry interval.
	pydiflumetofen + propiconazole	Miravis Ace	1 L/ha (404 mL/acre)	7	**Provides suppression only.** Ground and aerial application. Apply Miravis Ace within the range of at least 75% of heads on the main stem fully emerged to when 50% of the heads on the main stem are flowering, using sprayer nozzles configured to provide excellent coverage to the wheat head. Apply in sufficient water volume to obtain thorough coverage; a minimum spray volume of 100 mL/ha and 50 L/ha is recommended for ground and aerial application, respectively. Apply with a 90% non-ionic surfactant at a rate of 0.125% v/v in the spray tank. Grain and straw may be fed at normal maturity. For harvest of forage and hay, one application with a minimum PHI of 7 days is required.
	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 restricted entry interval.
		Orius 430 SC	220–290 mL/ha 89–118 mL/acre	36	**Provides suppression only.** Ground and aerial application. For optimum suppression of fusarium head blight, apply at the time period from when at least 75% of the wheat heads on the main stem are fully emerged to when 50% of the heads on the main stem are in flower. Spray coverage is essential, ensure thorough coverage of all wheat heads. Maximum 1 application/yr. 12-hr restricted entry interval.
		Tebbie	500 mL/ha (200 mL/acre)		

WHEAT DISEASES

Table 4–19. Control Options for Foliar, Stem and Head Diseases in Wheat — Stagonospora Glume Blotch

See Appendix H. *Cereal Growth Stages.*

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
STAGONOSPORA GLUME BLOTCH (*Stagonospora nodorum*)					
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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	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	Bumper 432 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). Can be tank-mixed with several cereal herbicides. Maximum 2 applications/yr.
		Nufarm Propiconazole			
		Princeton			
		Tilt 250 E	500 mL/ha (200 mL/acre)		
	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 restricted entry interval.
	prothioconazole + tebuconazole	Prosaro XTR	800 mL/ha (324 mL/acre)	36	**Ground application only.** Begin application preventively. When disease pressure is high, or when agronomic or weather conditions are conducive to disease development, continue applications as needed on a 7–14-day interval. Use shorter intervals in this range for best protection. When conditions for heavy infestation exist or when growing a less resistant cultivar, use the higher rate. Ensure good canopy penetration for optimum results. Do not exceed 1.5 L/ha per season (2 applications). Do not graze treated area and do not harvest for forage or hay.
	pydiflumetofen + propiconazole	Miravis Ace	1 L/ha (404 mL/acre)	7	Ground and aerial application. For optimal disease control, begin applications prior to disease development. Application at the timing for fusarium head blight will control leaf diseases that occur later in the season. Application at this timing is not intended to provide curative control of established leaf diseases. Apply in sufficient water volume to obtain thorough coverage; a minimum spray volume of 100 L/ha and 50 L/ha is recommended for ground and aerial application, respectively. Apply with a 90% non-ionic surfactant at a rate of 0.125% v/v in the spray tank. Grain and straw may be fed at normal maturity. For harvest of forage and hay, one application with a minimum PHI of 7 days is required.
	pyraclostrobin + metconazole	Headline AMP	0.75–1.0 L/ha (303–404 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. 12-hr restricted entry interval.

WHEAT DISEASES

Table 4–19. Control Options for Foliar, Stem and Head Diseases in Wheat — Stagonospora Glume Blotch

See Appendix H. *Cereal Growth Stages.*

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
STAGONOSPORA GLUME BLOTCH (*Stagonospora nodorum*) (continued)					
Foliar Treatment (continued)					
(continued)	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 restricted entry interval. Before using Folicur for wheat leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for *Fusarium* control, where applications are targeted at head emergence.
		Orius 430 SC	220–290 mL/ha (89–118 mL/acre)	36	Ground and aerial application. For optimum control of septoria glume blotch apply at the time period from when at least 75% of the wheat heads on the main stem are fully emerged to when 50% of the heads on the main stem are in flower. Spray coverage is essential, ensure thorough coverage of all wheat heads. Maximum 1 application/yr. 12-hr restricted entry interval.
		Tebbie	500 mL/ha (200 mL/acre)		

WHEAT DISEASES

Table 4–20. Control Options for Foliar, Stem and Head Diseases in Wheat — Stripe Rust

See Appendix H. *Cereal Growth Stages.*

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
STRIPE RUST (*Puccinia striiformis*)					
Foliar Treatment					
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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	azoxystrobin + propiconazole	Blanket AP	200–300 mL/ha (80–120 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply once up to boot stage. Good spray coverage and canopy penetration are important for best results.
		Fungtion SC	0.75–1.0 L/ha (303–404 mL/acre)		Do not apply at boot stage and beyond. Maximum 1 application/yr. Do not harvest for forage. 12-hr restricted entry interval.
		Quilt			
		Topnotch	530 mL/ha (212 mL/acre)		Apply in at least 45 L/ha water by air or 100 L/ha by ground.
	azoxystrobin + propiconazole + benzovindiflupyr	Trivapro A + Trivapro B (sold as co-pack: Trivapro)	1 L/ha (404 mL/acre) + 300 mL/ha (120 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply only up to boot stage (Zadok's 47). Use a minimum water volume of 100 L/ha for ground application. Maximum 2 applications/yr. 12-hr restricted entry interval.
	fluoxastrobin	Evito	146–292 mL/ha (59–118 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. For optimum results, begin applications preventively and repeat If needed after a 14–21-day Interval. Use the higher rates and shorter Interval when disease pressure Is high. Do not apply at boot stage (Zadok's 47 and beyond). 12-hr restricted entry interval.
	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 boot stage (Zadok's 47). Apply no more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 2.64 L/ha per season. 12-hr restricted entry interval.
	propiconazole	Bumper 432 EC	300 mL/ha (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.
		Nufarm Propiconazole			
		Princeton			
		Propi Super 25 EC	250–500 mL/ha (100–200 mL/acre)		
		Tilt 250 E	500 mL/ha (200 mL/acre)		

WHEAT DISEASES

Table 4–20. Control Options for Foliar, Stem and Head Diseases in Wheat — Stripe Rust

See Appendix H. *Cereal Growth Stages.*

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
STRIPE RUST (*Puccinia striiformis*) (continued)					
Foliar Treatment (continued)					
(continued)	prothioconazole + tebuconazole	Prosaro XTR	800 mL/ha (324 mL/acre)	36	**Ground application only.** Begin application preventively. When disease pressure is high, or when agronomic or weather conditions are conducive to disease development, continue applications as needed on a 7–14-day interval. Use shorter intervals in this range for best protection. When conditions for heavy infestation exist or when growing a less resistant cultivar, use the higher rate. Ensure good canopy penetration for optimum results. Do not exceed 1.5 L/ha/season (2 applications). Do not graze treated area and do not harvest for forage or hay.
	prothioconazole + trifloxystrobin	Stratego PRO	440 mL/ha (178 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Should be applied as a preventive disease control measure or at the very early stages of disease development. This could occur anytime during tillering or stem elongation. Typically, 1 application from the tillering up to flag leaf emergence is required. A second application may be made if needed. DO NOT apply within 14 days of the first treatment and must be applied prior to head emergence. Do not apply more than 2 applications per season. Refer to label for grazing restrictions. DO NOT tank-mix with herbicides in barley, oats, rye, triticale or millet.
	pydiflumetofen + propiconazole	Miravis Ace	1 L/ha (404 mL/acre)	7	Ground and aerial application. For optimal disease control, begin applications prior to disease development. Application at the timing for fusarium head blight will control leaf diseases that occur later in the season. Application at this timing is not intended to provide curative control of established leaf diseases. Apply in sufficient water volume to obtain thorough coverage; a minimum spray volume of 100 L/ha and 50 L/ha is recommended for ground and aerial application, respectively. Apply with a 90% non-ionic surfactant at a rate of 0.125% v/v in the spray tank. Grain and straw may be fed at normal maturity. For harvest of forage and hay, one application with a minimum PHI of 7 days is required.
	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 restricted entry interval.

WHEAT DISEASES

Table 4–20. Control Options for Foliar, Stem and Head Diseases in Wheat — Stripe Rust

See Appendix H. *Cereal Growth Stages.*

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
STRIPE RUST (*Puccinia striiformis*) (continued)					
Foliar Treatment (continued)					
(continued)	pyraclostrobin + metconazole	Headline AMP	0.75–1.0 L/ha (303–404 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. 12-hr restricted entry interval.
		Twinline	380–500 mL/ha (150–200 mL/acre)		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 restricted entry interval. No later than end of flowering.
	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 restricted entry interval.
	tebuconazole + azoxystrobin	Custodia	465–630 mL/ha (190–250 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 beginning of heading. Use of the higher rate should be considered when weather conditions are conducive to heavy disease development. Maximum 1 application/yr. 12-hr restricted entry interval.
	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 restricted entry interval. Before using Folicur for wheat leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for *Fusarium* control, where applications are targeted at head emergence.
		Orius 430 SC	220–290 mL/ha (89–118 mL/acre)	36	Ground and aerial application. Apply to the 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 flowering stage. Consider using a higher rate when weather conditions are conducive to heavy disease development. Maximum 1 application/yr. 12-hr restricted entry interval.
		Tebbie	375–500 mL/ha (200 mL/acre)		

BARLEY DISEASES

Table 4–21. 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, restricted entry intervals, 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 years will reduce risk of disease. Avoid deep seeding. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	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 42 days after planting. Read label for information regarding resistant strains of fungus.
	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.
	ipconazole + carbathiin + metalaxyl	Rancona Trio	300 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or cut for forage within 6 weeks after planting. Read label for information regarding resistant strains of fungus.
	ipconazole + metalaxyl	Rancona Pinnacle	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. Read label for information regarding resistant strains of fungus.
	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 + metalaxyl	Raxil MD	300 mL/ 100 kg seed	For commercial and on-farm treating 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 + 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.
	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.

BARLEY DISEASES

Table 4–22. Control Options for Seed and Seedling Diseases in Barley — Seed-Borne Septoria

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, 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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	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.
	ipconazole + metalaxyl	Rancona Pinnacle	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. Read label for information regarding resistant strains of fungus.
	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 + metalaxyl	Raxil MD	300 mL/ 100 kg seed	For commercial and on-farm treating 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 + 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.
	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.

BARLEY DISEASES

Table 4–23. 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, restricted entry intervals, etc.)
RHIZOCTONIA (*Rhizoctonia solani*)				
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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	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.
	ipconazole + carbathiin + metalaxyl	Rancona Trio	300 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or cut for forage within 6 weeks after planting. Read label for information regarding resistant strains of fungus.
	Ipconazole + metalaxyl	Rancona Pinnacle	325 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or cut for forage within 30 days after planting. Read label for information regarding resistant strains of fungus.
	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.
	thiamethoxam + difenoconazole + metalaxyl-M + sedaxane + fludioxonil	Cruiser Vibrance Quattro	325 mL/ 100 kg seed	For commercial and on-farm treating. This product contains colourant. 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.

BARLEY DISEASES

Table 4–23. 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, restricted entry intervals, etc.)
COMMON SEEDLING BLIGHT (*Cochliobolus sativus*)				
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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	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 42 days after planting. Read label for information regarding resistant strains of fungus.
	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.
	ipconazole + carbathiin + metalaxyl	Rancona Trio	300 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or cut for forage within 6 weeks after planting. Read label for information regarding resistant strains of fungus.
	ipconazole + metalaxyl	Rancona Pinnacle	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. Read label for information regarding resistant strains of fungus.
	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 + metalaxyl	Raxil MD	300 mL/ 100 kg seed	**Provides suppression only.** For commercial and on-farm treating 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 + 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.
	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.
	thiamethoxam + difenoconazole + metalaxyl-M + sedaxane + fludioxonil	Cruiser Vibrance Quattro	325 mL/ 100 kg seed	**Provides suppression only.** For commercial and on-farm treating. This product contains colourant. 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.

BARLEY DISEASES

Table 4–24. 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, restricted entry intervals, etc.)
COVERED SMUT (COMMON BUNT) (*Ustilago hordei*)				
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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	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 42 days after planting. Read label for information regarding resistant strains of fungus.
	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.
	ipconazole + carbathiin + metalaxyl	Rancona Trio	300 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or cut for forage within 6 weeks after planting. Read label for information regarding resistant strains of fungus.
	ipconazole + metalaxyl	Rancona Pinnacle	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. Read label for information regarding resistant strains of fungus.
	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 + metalaxyl	Raxil MD	300 mL/ 100 kg seed	For commercial and on-farm treating 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 + 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.
	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.
	thiamethoxam + difenoconazole + metalaxyl-M + sedaxane + fludioxonil	Cruiser Vibrance Quattro	325 mL/ 100 kg seed	For commercial and on-farm treating. This product contains colourant. 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.

BARLEY DISEASES

Table 4–25. Control Options for Seed and Seedling Diseases in Barley — True Loose Smut

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
TRUE LOOSE SMUT (*Ustilago nuda*)				
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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	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 42 days after planting. Read label for information regarding resistant strains of fungus.
	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.
	ipconazole + carbathiin + metalaxyl	Rancona Trio	300 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or cut for forage within 6 weeks after planting. Read label for information regarding resistant strains of fungus.
	ipconazole + metalaxyl	Rancona Pinnacle	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. Read label for information regarding resistant strains of fungus.
	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 + metalaxyl	Raxil MD	300 mL/ 100 kg seed	For commercial and on-farm treating 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 + 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.
	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.
	thiamethoxam + difenoconazole + metalaxyl-M + sedaxane + fludioxonil	Cruiser Vibrance Quattro	325 mL/ 100 kg seed	For commercial and on-farm treating. This product contains colourant. 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.

BARLEY DISEASES

Table 4–26. Control Options for Seed and Seedling Diseases in Barley — Pythium

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
PYTHIUM (*Pythium* 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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	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.
	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.
	ipconazole + carbathiin + metalaxyl	Rancona Trio	300 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or cut for forage within 6 weeks after planting. Read label for information regarding resistant strains of fungus.
	ipconazole + metalaxyl	Rancona Pinnacle	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. Read label for information regarding resistant strains of fungus.
	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 + metalaxyl	Raxil MD	300 mL/ 100 kg seed	For commercial and on-farm treating 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 + 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.
	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.
	thiamethoxam + difenoconazole + metalaxyl-M + sedaxane + fludioxonil	Cruiser Vibrance Quattro	325 mL/ 100 kg seed	For commercial and on-farm treating. This product contains colourant. 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 4–27. Control Options for Seed and Seedling Diseases in Barley — False Loose Smut

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
FALSE LOOSE SMUT (*Ustilago nigra*)				
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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	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 42 days after planting. Read label for information regarding resistant strains of fungus.
	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.
	ipconazole + carbathiin + metalaxyl	Rancona Trio	300 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or cut for forage within 6 weeks after planting. Read label for information regarding resistant strains of fungus.
	ipconazole + metalaxyl	Rancona Pinnacle	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. Read label for information regarding resistant strains of fungus.
	tebuconazole + metalaxyl	Raxil MD	300 mL/ 100 kg seed	For commercial and on-farm treating 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	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.
	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.
	thiamethoxam + difenoconazole + metalaxyl-M + sedaxane + fludioxonil	Cruiser Vibrance Quattro	325 mL/ 100 kg seed	For commercial and on-farm treating. This product contains colourant. 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 4–28. Control Options for Seed and Seedling Diseases in Barley — Fusarium

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, 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 years will reduce risk. Use disease-free seed and avoid deep seeding. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	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 42 days after planting. Read label for information regarding resistant strains of fungus.
	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.
	ipconazole + carbathiin + metalaxyl	Rancona Trio	300 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or cut for forage within 6 weeks after planting. Read label for information regarding resistant strains of fungus.
	ipconazole + metalaxyl	Rancona Pinnacle	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. Read label for information regarding resistant strains of fungus.
	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 + metalaxyl	Raxil MD	300 mL/ 100 kg seed	For commercial and on-farm treating 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	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.
	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.
	thiamethoxam + difenoconazole + metalaxyl-M + sedaxane + fludioxonil	Cruiser Vibrance Quattro	325 mL/ 100 kg seed	For commercial and on-farm treating. This product contains colourant. 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 4–29. Control Options for Seed and Seedling Diseases in Barley — Aspergillus

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, 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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	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 42 days after planting. Read label for information regarding resistant strains of fungus.
	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.
	ipconazole + carbathiin + metalaxyl	Rancona Trio	300 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or cut for forage within 6 weeks after planting. Read label for information regarding resistant strains of fungus.
	ipconazole + metalaxyl	Rancona Pinnacle	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. Read label for information regarding resistant strains of fungus.
	penflufen + prothioconazole + metalaxyl	EverGol Energy	65 mL/ 100 kg seed	For commercial and on-farm treating May be tank-mixed, but see the registered label of the tank-mix partner for application rates, precautions and directions.
	tebuconazole + metalaxyl	Raxil MD	300 mL/ 100 kg seed	For commercial and on-farm treating 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	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.
	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.
	thiamethoxam + difenoconazole + metalaxyl-M + sedaxane + fludioxonil	Cruiser Vibrance Quattro	325 mL/ 100 kg seed	For commercial and on-farm treating. This product contains colourant. 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 4–30. Control Options for Seed and Seedling Diseases in Barley — Barley Leaf Stripe

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
BARLEY LEAF STRIPE (*Pyrenophora graminea*)				
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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	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 42 days after planting. Read label for information regarding resistant strains of fungus.
	ipconazole + carbathiin + metalaxyl	Rancona Trio	300 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or cut for forage within 6 weeks after planting. Read label for information regarding resistant strains of fungus.
	ipconazole + metalaxyl	Rancona Pinnacle	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. Read label for information regarding resistant strains of fungus.
	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 + metalaxyl	Raxil MD	300 mL/ 100 kg seed	For commercial and on-farm treating 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 + 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.
	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.

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Table 4–31. 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, restricted entry intervals, etc.)
NET BLOTCH (*Pyrenophora teres*)					
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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	azoxystrobin + propiconazole	Blanket AP	200–300 mL/ha (80–120 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply once up to boot stage. Good spray coverage and canopy penetration are important for best results. 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 restricted entry interval. Apply in at least 45 L/ha water by air or 100 L/ha by ground.
		Fungtion SC	750 mL/ha (305 mL/acre)		
		Quilt			
		Topnotch	530 mL/ha (212 mL/acre)		
	azoxystrobin + propiconazole + benzovindiflupyr	Trivapro A + Trivapro B (sold as co-pack: Trivapro)	1 L/ha (404 mL/acre) + 300 mL/ha (120 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply only up to boot stage (Zadok's 47). Use a minimum water volume of 100 L/ha for ground application. Maximum 2 applications/yr. 12-hr restricted entry interval.
	fluoxastrobin	Evito	146–292 mL/ha (59–118 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. For optimum results, begin applications preventively and repeat If needed after a 14–21-day Interval. Use the higher rates and shorter Interval when disease pressure Is high. Do not apply at boot stage (Zadok's 47 and beyond). 12-hr restricted entry interval.
	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 restricted entry.
	picoxystrobin	Acapela	0.29 L/ha (117 mL/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. Make no more than 2 sequential applications of a strobilurin fungicide, such as Acapela before switching to a fungicide with a different mode of action. **Do not apply early-season rate after flowering (Feekes 10.5.1 or Zadoks 60). Maximum seasonal use rate is 2.64 L/ha.** Maximum 2 applications/yr. 12-hr restricted entry interval.

BARLEY DISEASES

Table 4–31. 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, restricted entry intervals, etc.)
NET BLOTCH (*Pyrenophora teres*) (continued)					
Foliar Treatment (continued)					
(continued)	propiconazole	Bumper 432 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.
		Nufarm Propiconazole			
		Princeton			
		Propi Super 25 EC	250–500 mL/ha (100–200 mL/acre)		
		Tilt 250 E			
	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 restricted entry interval.
	prothioconazole + tebuconazole	Prosaro XTR	800 mL/ha (324 mL/acre)	36	**Ground application only.** Begin application preventively. When disease pressure is high, or when agronomic or weather conditions are conducive to disease development, continue applications as needed on a 7–14-day interval. Use shorter intervals in this range for best protection. When conditions for heavy infestation exist or when growing a less resistant cultivar, use the higher rate. Ensure good canopy penetration for optimum results. Do not exceed 1.5 L/ha per season (2 applications). Do not graze treated area and do not harvest for forage or hay.
	prothioconazole + trifloxystrobin	Stratego PRO	440 mL/ha (178 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Should be applied as a preventive disease control measure or at the very early stages of disease development. This could occur anytime during tillering or stem elongation. Typically, 1 application from the tillering up to flag leaf emergence is required. A second application may be made if needed. DO NOT apply within 14 days of the first treatment and must be applied prior to head emergence. Do not apply more than 2 applications per season. Refer to label for grazing restrictions. DO NOT tank mix with herbicides in barley, oats, rye, triticale or millet.

BARLEY DISEASES

Table 4–31. 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, restricted entry intervals, etc.)
NET BLOTCH (*Pyrenophora teres*) (continued)					
Foliar Treatment (continued)					
(continued)	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 restricted entry interval.
	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 restricted entry interval.
	pyraclostrobin + metconazole	Headline AMP	0.75–1.0 L/ha (303–404 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. 12-hr restricted entry interval.
		Twinline	380–500 mL/ha (150–200 mL/acre)		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 restricted entry interval.
	tebuconazole + azoxystrobin	Custodia	465–630 mL/ha (190–250 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 beginning of heading. Use of the higher rate should be considered when weather conditions are conducive to heavy disease development. Maximum 1 application/yr. 12-hr restricted entry interval.
	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 restricted entry interval. Before using Folicur for control of leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for *Fusarium* control, where applications are targeted at head emergence.
		Orius 430 SC	220–290 mL/ha (89–118 mL/acre)	36	Ground and aerial application. Apply at the very early stages of disease development. Consider using the higher rate when weather conditions are conducive to heavy disease development. Maximum 1 application/yr. 12-hr restricted entry interval.
		Tebbie	375–500 mL/ha (152–200 mL/acre)		

BARLEY DISEASES

Table 4–32. 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, restricted entry intervals, etc.)
SPOT BLOTCH (*Cochliobolus sativus*)					
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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	propiconazole	Bumper 432 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.
		Nufarm Propiconazole			
		Princeton			
		Propi Super 25 EC	500 mL/ha (200 mL/acre)		
		Tilt 250 E			
	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 restricted entry interval.
	prothioconazole + tebuconazole	Prosaro XTR	800 mL/ha (324 mL/acre)	36	**Ground application only.** Begin application preventively. When disease pressure is high, or when agronomic or weather conditions are conducive to disease development, continue applications as needed on a 7–14-day interval. Use shorter intervals in this range for best protection. When conditions for heavy infestation exist or when growing a less resistant cultivar, use the higher rate. Ensure good canopy penetration for optimum results. Do not exceed 1.5 L/ha per season (2 applications). Do not graze treated area and do not harvest for forage or hay.
	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 restricted entry interval.
	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 restricted entry interval.

BARLEY DISEASES

Table 4–32. 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, restricted entry intervals, etc.)
SPOT BLOTCH (*Cochliobolus sativus*) (continued)					
Foliar Treatment (continued)					
(continued)	pyraclostrobin + metconazole	Headline AMP	0.75–1.0 L/ha (303–404 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. 12-hr restricted entry interval.
		Twinline	380–500 mL/ha (150–200 mL/acre)		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 restricted entry interval.
	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 restricted entry interval. Before using Folicur for control of leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for *Fusarium* control, where applications are targeted at head emergence.
	tebuconazole + azoxystrobin	Custodia	465–630 mL/ha (190–250 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 beginning of heading. Use of the higher rate should be considered when weather conditions are conducive to heavy disease development. Maximum 1 application/yr. 12-hr restricted entry interval.
	tebuconazole	Orius 430 SC	220–290 mL/ha (89–118 mL/acre)	36	Ground and aerial application. Apply at the very early stages of disease development. Consider using the higher rate when weather conditions are conducive to heavy disease development. Maximum 1 application/yr. 12-hr restricted entry interval.
		Tebbie	375–500 mL/ha (152–200 mL/acre)		

BARLEY DISEASES

Table 4–33. 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, restricted entry intervals, etc.)
SCALD (*Rhynchosporium secalis*)					
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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	azoxystrobin + propiconazole	Blanket AP	200–300 mL/ha (80–120 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply once up to boot stage. Good spray coverage and canopy penetration are important for best results. Do not apply at boot stage and beyond. Maximum 1 application/yr. Do not harvest for forage. 12-hr restricted entry interval. Apply in at least 45 L/ha water by air or 100 L/ha by ground.
		Fungtion SC	750 mL/ha (305 mL/acre)		
		Quilt			
		Topnotch	530 mL/ha (212 mL/acre)		
	azoxystrobin + propiconazole + benzovindiflupyr	Trivapro A + Trivapro B (sold as co-pack: Trivapro)	1 L/ha (404 mL/acre) + 300 mL/ha (120 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply only up to boot stage (Zadok's 47) head half emerged. Use a minimum water volume of 100 L/ha for ground application. Maximum 2 applications/yr. 12-hr restricted entry interval.
	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 restricted entry.
	picoxystrobin	Acapela	0.29 L/ha (117 mL/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. Make no more than 2 sequential applications of a strobilurin fungicide, such as Acapela before switching to a fungicide with a different mode of action. **Do not apply early-season rate after flowering (Feekes 10.5.1 or Zadoks 60). Maximum seasonal use rate is 2.64 L/ha.** Maximum 2 applications/yr. 12-hr restricted entry interval.
	propiconazole	Bumper 432 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.
		Nufarm Propiconazole			
		Princeton			
		Propi Super 25 EC	500 mL/ha (200 mL/acre)		
		Tilt 250 E			

BARLEY DISEASES

Table 4–33. 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, restricted entry intervals, etc.)
SCALD (*Rhynchosporium secalis*) (continued)					
Foliar Treatment (continued)					
(continued)	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 restricted entry interval.
	prothioconazole + tebuconazole	Prosaro XTR	800 mL/ha (324 mL/acre)	36	**Ground application only.** Begin application preventively. When disease pressure is high, or when agronomic or weather conditions are conducive to disease development, continue applications as needed on a 7–14-day interval. Use shorter intervals in this range for best protection. When conditions for heavy infestation exist or when growing a less resistant cultivar, use the higher rate. Ensure good canopy penetration for optimum results. Do not exceed 1.5 L/ha/season (2 applications). Do not graze treated area and do not harvest for forage or hay.
	prothioconazole + trifloxystrobin	Stratego PRO	440 mL/ha (178 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Should be applied as a preventive disease control measure or at the very early stages of disease development. This could occur anytime during tillering or stem elongation. Typically, 1 application from the tillering up to flag leaf emergence is required. A second application may be made if needed. DO NOT apply within 14 days of the first treatment and must be applied prior to head emergence. Do not apply more than 2 applications per season. Refer to label for grazing restrictions. DO NOT tank mix with herbicides in barley, oats, rye, triticale or millet.
	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 restricted entry interval.
	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 restricted entry interval.

BARLEY DISEASES

Table 4–33. 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, restricted entry intervals, etc.)
SCALD (*Rhynchosporium secalis*) (continued)					
Foliar Treatment (continued)					
(continued)	pyraclostrobin + metconazole	Headline AMP	0.75–1.0 L/ha (303–404 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. 12-hr restricted entry interval.
		Twinline	380–500 mL/ha (150–200 mL/acre)		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 restricted entry interval.
	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 restricted entry interval. Before using Folicur for control of leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for *Fusarium* control, where applications are targeted at head emergence.
		Orius 430 SC	220–290 mL/ha (89–118 mL/acre)	36	Ground and aerial application. Apply at the very early stages of disease development. Consider using the higher rate when weather conditions are conducive to heavy disease development. Maximum 1 application/yr. 12-hr restricted entry interval.
		Tebbie	375–500 mL/ha (152–200 mL/acre)		

BARLEY DISEASES

Table 4–34. 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, restricted entry intervals, etc.)
SEPTORIA LEAF SPOT (*Septoria tritici*)					
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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	azoxystrobin + propiconazole	Blanket AP	200–300 mL/ha (80–120 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply once up to boot stage. Good spray coverage and canopy penetration are important for best results. Do not apply at boot stage and beyond. Maximum 1 application/yr. Do not harvest for forage. 12-hr restricted entry interval. Apply in at least 45 L/ha water by air or 100 L/ha by ground.
		Fungtion SC	750 mL/ha (305 mL/acre)		
		Quilt			
		Topnotch	530 mL/ha (212 mL/acre)		
	azoxystrobin + propiconazole + benzovindiflupyr	Trivapro A + Trivapro B (sold as co-pack: Trivapro)	1 L/ha (404 mL/acre) + 300 mL/ha (120 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply only up to boot stage (Zadok's 47) head half emerged. Use a minimum water volume of 100 L/ha for ground application. Maximum 2 applications/yr. 12-hr restricted entry interval.
	picoxystrobin	Acapela	0.29 L/ha (117 mL/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. Make no more than 2 sequential applications of a strobilurin fungicide, such as Acapela before switching to a fungicide with a different mode of action. **Do not apply early-season rate after flowering (Feekes 10.5.1 or Zadoks 60). Maximum seasonal use rate is 2.64 L/ha.** Maximum 2 applications/yr. 12-hr restricted entry interval.
	propiconazole	Bumper 432 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.
		Nufarm Propiconazole			
		Princeton			
		Propi Super 25 EC	500 mL/ha (200 mL/acre)		
		Tilt 250 E			
	prothioconazole + tebuconazole	Prosaro XTR	800 mL/ha (324 mL/acre)	36	**Ground application only.** Begin application preventively. When disease pressure is high, or when agronomic or weather conditions are conducive to disease development, continue applications as needed on a 7–14-day interval. Use shorter intervals in this range for best protection. When conditions for heavy infestation exist or when growing a less resistant cultivar, use the higher rate. Ensure good canopy penetration for optimum results. Do not exceed 1.5 L/ha per season (2 applications). Do not graze treated area and do not harvest for forage or hay.

BARLEY DISEASES

Table 4–34. 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, restricted entry intervals, etc.)
SEPTORIA LEAF SPOT (*Septoria tritici*) (continued)					
Foliar Treatment (continued)					
(continued)	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 restricted entry interval.
	tebuconazole + azoxystrobin	Custodia	465–630 mL/ha (190–250 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 beginning of heading. Use of the higher rate should be considered when weather conditions are conducive to heavy disease development. Maximum 1 application/yr. 12-hr restricted entry interval.
	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 restricted entry interval. Before using Folicur for control of leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for *Fusarium* control, where applications are targeted at head emergence.
	tebuconazole	Orius 430 SC	220–290 mL/ha (89–118 mL/acre)	36	Ground and aerial application. Apply to the 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 flowering stage. Consider using a higher rate when weather conditions are conducive to heavy disease development. Maximum 1 application/yr. 12-hr restricted entry interval.
		Tebbie	375–500 mL/ha (152–200 mL/acre)		

BARLEY DISEASES

Table 4–35. 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, restricted entry intervals, etc.)
RUST (LEAF — *Puccinia hordei*, STEM — *Puccinia graminis* f. sp. *tritici*)					
Foliar Treatment					
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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	azoxystrobin + propiconazole	Blanket AP	200–300 mL (80–120 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply once up to boot stage. Good spray coverage and canopy penetration are important for best results. Do not apply at boot stage and beyond. Maximum 1 application/yr. Do not harvest for forage. 12-hr restricted entry interval. Apply in at least 45 L/ha water by air or 100 L/ha by ground.
		Fungtion SC	750 mL/ha (305 mL/acre)		
		Quilt	1.0 L/ha (404 mL/acre)		
		Topnotch	530 mL/ha (212 mL/acre)		
	azoxystrobin + propiconazole + benzovindiflupyr	Trivapro A + Trivapro B (sold as co-pack: Trivapro)	1 L/ha (404 mL/acre) + 300 mL/ha (120 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply only up to boot stage (Zadok's 47). Use a minimum water volume of 100 L/ha for ground application. Maximum 2 applications/yr. 12-hr restricted entry interval.
	fluoxastrobin	Evito	146–292 mL/ha (59–118 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. For optimum results, begin applications preventively and repeat If needed after a 14–21-day Interval. Use the higher rates and shorter Interval when disease pressure Is high. Do not apply at boot stage (Zadok's 47 and beyond). 12-hr restricted entry interval.
	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 restricted entry interval.
	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 restricted entry interval.
	propiconazole	Bumper 432 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.
		Nufarm Propiconazole			
		Princeton	300 mL/ha (121 mL/acre)		
		Propi Super 25 EC	500 mL/ha (200 mL/acre)		
		Tilt 250 E			

BARLEY DISEASES

Table 4–35. 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, restricted entry intervals, etc.)
RUST (LEAF — *Puccinia hordei*, STEM — *Puccinia graminis* f. sp. *tritici*) (continued)					
Foliar Treatment (continued)					
(continued)	prothioconazole + tebuconazole	Prosaro XTR	800 mL/ha (324 mL/acre)	36	**Ground application only.** Begin application preventively. When disease pressure is high, or when agronomic or weather conditions are conducive to disease development, continue applications as needed on a 7–14-day interval. Use shorter intervals in this range for best protection. When conditions for heavy infestation exist or when growing a less resistant cultivar, use the higher rate. Ensure good canopy penetration for optimum results. Do not exceed 1.5 L/ha per season (2 applications). Do not graze treated area and do not harvest for forage or hay.
	prothioconazole + trifloxystrobin	Stratego PRO	440 mL/ha (178 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Should be applied as a preventive disease control measure or at the very early stages of disease development. This could occur anytime during tillering or stem elongation. Typically, 1 application from the tillering up to flag leaf emergence is required. A second application may be made if needed. DO NOT apply within 14 days of the first treatment and must be applied prior to head emergence. Do not apply more than 2 applications per season. Refer to label for grazing restrictions. DO NOT tank mix with herbicides in barley, oats, rye, triticale or millet.
	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 restricted entry interval. Before using Folicur for control of leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for *Fusarium* control, where applications are targeted at head emergence.
		Orius 430 SC	220–290 mL/ha (89–118 mL/acre)	36	Ground and aerial application. Apply at the very early stages of disease development. Consider using the higher rate when weather conditions are conducive to heavy disease development. Maximum 1 application/yr. 12-hr restricted entry interval.
		Tebbie	375–500 mL/ha (152–200 mL/acre)		
	tebuconazole + azoxystrobin	Custodia	465–630 mL/ha (190–250 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 beginning of heading. Use of the higher rate should be considered when weather conditions are conducive to heavy disease development. Maximum 1 application/yr. 12-hr restricted entry interval.

BARLEY DISEASES

Table 4–36. 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, restricted entry intervals, etc.)
STRIPE RUST (*Puccinia striiformis* f. sp. *hordei*)					
Foliar Treatment					
This disease is most noticeable in seasons with a prolonged cool spring (3°C–15°C). Symptoms often disappear as temperatures increase. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	azoxystrobin + propiconazole	Blanket AP	200–300 mL/ha (80–120 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply once up to boot stage. Good spray coverage and canopy penetration are important for best results.
		Quilt	0.75–1.0 L/ha (303–404 mL/acre)		Do not apply at boot stage and beyond. Maximum 1 application/yr. Do not harvest for forage. 12-hr restricted entry interval.
		Topnotch	530 mL/ha (212 mL/acre)		Apply in at least 45 L/ha water by air or 100 L/ha by ground.
	azoxystrobin + propiconazole + benzovindiflupyr	Trivapro A + Trivapro B (sold as co-pack: Trivapro)	1 L/ha (404 mL/acre) + 300 mL/ha (120 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply only up to boot stage (Zadok's 47). Use a minimum water volume of 100 L/ha for ground application. Maximum 2 applications/yr. 12-hr restricted entry interval.
	fluoxastrobin	Evito	146–292 mL/ha (59–118 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. For optimum results, begin applications preventively and repeat If needed after a 14–21-day Interval. Use the higher rates and shorter Interval when disease pressure Is high. Do not apply at boot stage (Zadok's 47 and beyond). 12-hr restricted entry interval.
	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 per season. 12-hr restricted entry interval.
	prothioconazole + tebuconazole	Prosaro XTR	800 mL/ha (324 mL/acre)	36	**Ground application only.** Begin application preventively. When disease pressure is high, or when agronomic or weather conditions are conducive to disease development, continue applications as needed on a 7–14-day interval. Use shorter intervals in this range for best protection. When conditions for heavy infestation exist or when growing a less resistant cultivar, use the higher rate. Ensure good canopy penetration for optimum results. Do not exceed 1.5 L/ha per season (2 applications). Do not graze treated area and do not harvest for forage or hay.
	prothioconazole + trifloxystrobin	Stratego PRO	440 mL/ha (178 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Should be applied as a preventive disease control measure or at the very early stages of disease development. This could occur anytime during tillering or stem elongation. Typically, 1 application from the tillering up to flag leaf emergence is required. A second application may be made if needed. DO NOT apply within 14 days of the first treatment and must be applied prior to head emergence. Do not apply more than 2 applications per season. Refer to label for grazing restrictions. DO NOT tank mix with herbicides in barley, oats, rye, triticale or millet.

BARLEY DISEASES

Table 4–36. 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, restricted entry intervals, etc.)
STRIPE RUST (*Puccinia striiformis* f. sp. *hordei*) (continued)					
Foliar Treatment (continued)					
(continued)	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 restricted entry interval.
	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 restricted entry interval.
		Headline AMP	0.75–1.0 L/ha (303–404 mL/acre)		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. 12-hr restricted entry interval.
	tebuconazole + azoxystrobin	Custodia	465–630 mL/ha 190–250 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 beginning of heading. Use of the higher rate should be considered when weather conditions are conducive to heavy disease development. Maximum 1 applications/yr. 12-hr restricted entry interval.
	tebuconazole	Orius 430 SC	220–292 mL/ha (89–118 mL/acre)	36	Ground and aerial application. Apply at the very early stages of disease development. Consider using the higher rate when weather conditions are conducive to heavy disease development. Maximum 1 applications/yr. 12-hr restricted entry interval.
		Tebbie	375–500 mL/ha (152–200 mL/acre)		
FUSARIUM HEAD BLIGHT (*Fusarium graminearum*)					
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. For information on this disease, see Table 4–18. *Control Options for Foliar, Stem and Head Diseases in Wheat — Fusarium Head Blight*, as well as OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	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 restricted entry interval.
	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 restricted entry interval.
	prothioconazole + tebuconazole	Prosaro XTR	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 restricted entry interval.

BARLEY DISEASES

Table 4–37. 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, restricted entry intervals, etc.)
POWDERY MILDEW (*Erysiphe graminis*)					
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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	fluoxastrobin	Evito	183–292 mL/ha (74–118 mL/acre)	grain: 40 hay, forage: 7	Ground and aerial application. For optimum results, begin applications preventively and repeat if needed after a 14–21-day Interval. Use the higher rates and shorter interval when disease pressure is high. Apply prior to disease development from Feekes 5 up to late head emergence, Feekes 10.5. 12-hr restricted entry interval.
	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 per season. 12-hr restricted entry interval.
	propiconazole	Bumper 432 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.
		Nufarm Propiconazole			
		Princeton			
		Propi Super 25 EC	500 mL/ha (200 mL/acre)		
		Tilt 250 E			
	prothioconazole + tebuconazole	Prosaro XTR	800 mL/ha (324 mL/acre)	36	**Ground application only.** Begin application preventively. When disease pressure is high, or when agronomic or weather conditions are conducive to disease development, continue applications as needed, on a 7–14-day interval. Use shorter intervals in this range for best protection. When conditions for heavy infestation exist or when growing a less resistant cultivar, use the higher rate. Ensure good canopy penetration for optimum results. Do not exceed 1.5 L/ha per season (2 applications). Do not graze treated area and do not harvest for forage or hay.

BARLEY DISEASES

Table 4–37. 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, restricted entry intervals, etc.)
POWDERY MILDEW (*Erysiphe graminis*) (continued)					
(continued)	prothioconazole + trifloxystrobin	Stratego PRO	440 mL/ha (178 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Should be applied as a preventive disease control measure or at the very early stages of disease development. This could occur anytime during tillering or stem elongation. Typically, 1 application from the tillering up to flag leaf emergence is required. A second application may be made if needed. DO NOT apply within 14 days of the first treatment and must be applied prior to head emergence. Do not apply more than 2 applications per season. Refer to label for grazing restrictions. DO NOT tank mix with herbicides in barley, oats, rye, triticale or millet.
	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 restricted entry interval. Before using Folicur for control of leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for *Fusarium* control, where applications are targeted at head emergence.
		Orius 430 SC	220–290 mL/ha (89–118 mL/acre)	36	Ground and aerial application. Apply at the very early stages of disease development. Consider using the higher rate when weather conditions are conducive to heavy disease development. Maximum 1 application/yr. 12-hr restricted entry interval.
		Tebbie	375–500 mL/ha (152–200 mL/acre)		

OAT DISEASES

Table 4–38. 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, restricted entry intervals, etc.)
SEED ROT and SEEDLING BLIGHT (*Pyrenopora avenae*, *Fusarium* 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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	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 42 days after planting. Read label for information regarding resistant strains of fungus.
	difenoconazole + metalaxyl-M	Dividend XL RTA	325–650 mL/ 100 kg seed	For commercial and on-farm treating. 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.
	ipconazole + carbathiin + metalaxyl	Rancona Trio	300 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or cut for forage within 6 weeks after planting. Read label for information regarding resistant strains of fungus and specific causal agents controlled.
	ipconazole + metalaxyl	Rancona Pinnacle	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. Read label for information regarding resistant strains of fungus.
	penflufen + prothioconazole + metalaxyl	EverGol Energy	65 mL/ 100 kg seed	For commercial and on-farm treating. May be tank-mixed but see the registered label of the tank-mix partner for application rates, precautions and directions.
	tebuconazole + metalaxyl-M	Raxil MD	300 mL/ 100 kg seed	For commercial and on-farm treating 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 + 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.
	thiamethoxam + difenoconazole + metalaxyl-M + sedaxane + fludioxonil	Cruiser Vibrance Quattro	325 mL/ 100 kg seed	For commercial and on-farm treating. This product contains colourant. 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.

OAT DISEASES

Table 4–39. 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, restricted entry intervals, etc.)
COVERED SMUT (COMMON BUNT) (*Ustilago kolleri*), LOOSE SMUT (*Ustilago avenae*)				
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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	carbathiin + thiram	Vitaflo 280	230–330 mL/ 100 kg seed	**For use in commercial seed treatment facilities** 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 commercial and on-farm treating. 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.
	ipconazole + carbathiin + metalaxyl	Rancona Trio	300 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or cut for forage within 6 weeks after planting. Read label for information regarding resistant strains of fungus and specific causal agents controlled.
	ipconazole + metalaxyl	Rancona Pinnacle	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. Read label for information regarding resistant strains of fungus.
	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 + metalaxyl-M	Raxil MD	300 mL/ 100 kg seed	For commercial and on-farm treating 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 + 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.
	tebuconazole + thiram	Raxil T	225 mL/ 100 kg seed	For commercial and on-farm treating. **For loose smut control only.** Do not graze or feed livestock on treated areas for 4 weeks after planting.
	thiamethoxam + difenoconazole + metalaxyl-M + sedaxane + fludioxonil	Cruiser Vibrance Quattro	325 mL/ 100 kg seed	For commercial and on-farm treating. This product contains colourant. 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.

OAT DISEASES

Table 4–39. 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, restricted entry intervals, etc.)
ASPERGILLUS (*Aspergillus* 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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	ipconazole + carbathiin + metalaxyl	Rancona Trio	300 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or cut for forage within 6 weeks after planting. Read label for information regarding resistant strains of fungus and specific causal agents controlled.
	Ipconazole + metalaxyl	Rancona Pinnacle	325 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or cut for forage within 30 days after planting. Read label for information regarding resistant strains of fungus.
	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.
	thiamethoxam + difenoconazole + metalaxyl-M + sedaxane + fludioxonil	Cruiser Vibrance Quattro	325 mL/ 100 kg seed	For commercial and on-farm treating. This product contains colourant. 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.

OAT DISEASES

Table 4–40. 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, restricted entry intervals, etc.)
COMMON ROOT ROT (*Cochliobolus*)				
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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	carbathiin + thiram	Vitaflo 280	230–330 mL/ 100 kg seed	**Provides suppression only. For use in commercial seed treatment facilities only.** Do not graze or feed livestock on treated areas for 42 days after planting. Read label for information regarding resistant strains of fungus.
	ipconazole + carbathiin + metalaxyl	Rancona Trio	300 mL/ 100 kg seed	**Provides suppression only.** For commercial and on-farm treating. Do not graze or cut for forage within 6 weeks after planting. Read label for information regarding resistant strains of fungus.
	Ipconazole + metalaxyl	Rancona Pinnacle	325 mL/ 100 kg seed	**Provides suppression only.** For commercial and on-farm treating. Do not graze or cut for forage within 30 days after planting. Read label for information regarding resistant strains of fungus.
	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.
	thiamethoxam + difenoconazole + metalaxyl-M + sedaxane + fludioxonil	Cruiser Vibrance Quattro	325 mL/ 100 kg seed	**Provides suppression only.** For commercial and on-farm treating. This product contains colourant. 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 (*Rhizoctonia solani*)				
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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	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.
	ipconazole + carbathiin +metalaxyl	Rancona Trio	300 mL/ 100 kg seed	For commercial and on farm treating. Do not graze or cut for forage within 6 weeks after planting. Read label for information regarding resistant strains of fungus.
	ipconazole + metalaxyl	Rancona Pinnacle	325 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or cut for forage within 30 days after planting. Read label for information regarding resistant strains of fungus.

OAT DISEASES

Table 4–40. 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, restricted entry intervals, etc.)
PYTHIUM DAMPING-OFF (*Pythium* 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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	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 42 days after planting. Read label for information regarding resistant strains of fungus.
	difenoconazole + metalaxyl-M	Dividend XL RTA	325–650 mL/ 100 kg seed	For commercial and on-farm treating. 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.
	ipconazole + carbathiin + metalaxyl	Rancona Trio	300 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or cut for forage within 6 weeks after planting. Read label for information.
	ipconazole + metalaxyl	Rancona Pinnacle	325 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or cut for forage within 30 days after planting. Read label for information regarding resistant strains of fungus.
	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 + metalaxyl-M	Raxil MD	300 mL/ 100 kg seed	For commercial and on-farm treating 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 + 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.
	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.
	thiamethoxam + difenoconazole + metalaxyl-M + sedaxane + fludioxonil	Cruiser Vibrance Quattro	325 mL/ 100 kg seed	For commercial and on-farm treating. This product contains colourant. 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.

OAT DISEASES

Table 4–41. 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, restricted entry intervals, etc.)
CROWN (LEAF) RUST (*Puccinia coronata* var. *avenae*)					
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). For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	azoxystrobin	Topnotch	530 mL/ha (212 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply in at least 45 L/ha water by air and in at least 100 L/ha water by ground.
	azoxystrobin + propiconazole	Quilt	0.75–1 L/ha (304–404 mL/acre)	30	Ground and aerial application. Apply once between stem elongation and half-head emergence (G.S. 29–55). Good spray coverage and canopy penetration are important for best results. Where a rate range is indicated, use the higher rate if there is a history of high disease pressures in the field and/or field conditions favour disease development.
	azoxystrobin + propiconazole + benzovindiflupyr	Trivapro A + Trivapro B (sold as co-pack: Trivapro)	1 L/ha (404 mL/ha) + 300 mL/ha (120 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply only up to boot stage (Zadok's 47). Use a minimum water volume of 100 L/ha for ground application. Maximum 2 applications/yr. 12-hr restricted entry interval.
	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 restricted entry interval.
	fluoxastrobin	Evito	146–292 mL/ha (59–118 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. For optimum results, begin applications preventively and repeat if needed after a 14–21-day interval. Use the higher rates and shorter interval when disease pressure is high. Do not apply at boot stage (Zadok's 47 and beyond). 12-hr restricted entry interval.
	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 per season. 12-hr restricted entry interval.
	propiconazole	Bumper 432 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.
		Nufarm Propiconazole			
		Princeton			
		Propi Super 25 EC	500 mL/ha (200 mL/acre)		
		Tilt 250 E			

OAT DISEASES

Table 4–41. 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, restricted entry intervals, etc.)
CROWN (LEAF) RUST (*Puccinia coronata* var. *avenae*) (continued)					
Foliar Treatment (continued)					
(continued)	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 restricted entry interval.
	prothioconazole + tebuconazole	Prosaro XTR	800 mL/ha (324 mL/acre)	36	**Ground application only.** Begin application preventively. When disease pressure is high, or when agronomic or weather conditions are conducive to disease development, continue applications as needed on a 7–14-day interval. Use shorter intervals in this range for best protection. When conditions for heavy infestation exist or when growing a less resistant cultivar, use a higher rate. Ensure good canopy penetration for optimum results. Do not exceed 1.5 L/ha per season (2 applications). Do not graze treated area and do not harvest for forage or hay.
	prothioconazole + trifloxystrobin	Stratego PRO	440 mL/ha (178 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Should be applied as a preventive disease control measure or at the very early stages of disease development. This could occur at any time during tillering or stem elongation. Typically, 1 application from the tillering to flag leaf emergence is required. A second application may be made if needed. DO NOT apply within 14 days of the first treatment and must be applied prior to head emergence. Do not apply more than 2 applications per season. Refer to label for grazing restrictions. DO NOT tank mix with herbicides in barley, oats, rye, triticale or millet.
	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 restricted entry interval.
	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 restricted entry interval.

OAT DISEASES

Table 4–41. 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, restricted entry intervals, etc.)
CROWN (LEAF) RUST (*Puccinia coronata* var. *avenae*) (continued)					
Foliar Treatment (continued)					
(continued)	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 restricted entry interval.
		Headline AMP	0.75–1.0 L/ha (303–404 mL/acre)	30	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. 12-hr restricted entry interval.
	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 restricted entry interval. Before using Folicur for control of leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for *Fusarium* control, where applications are targeted at head emergence.
		Orius 430 SC	220 mL/ha (89 mL/acre)	36	Ground and aerial application. Apply at the very early stages of disease development. Maximum 1 application/yr. 12-hr restricted entry interval.
		Tebbie	375 mL/ha (152 mL/acre)		

OAT DISEASES

Table 4–42. 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, restricted entry intervals, etc.)
SEPTORIA LEAF SPOT (*Septoria tritici*) and SEPTORIA LEAF BLOTCH (*Stagonospora avenae* f. sp. *avenaria* (*Septoria avenae*))					
Foliar Treatment					
Avoid planting oat after oat or mixed grains. Humid, wet, windy weather promotes this disease. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	azoxystrobin + propiconazole	Quilt	0.75 L/ha (304 mL/acre)	30	Ground and aerial application. Apply once between stem elongation and half-head emergence (G.S. 29–55). Good spray coverage and canopy penetration are important for best results.
	azoxystrobin + propiconazole	Topnotch	530 mL/ha (212 mL/acre)	Do not apply at boot stage or beyond.	Ground and aerial application. Apply in at least 45 L/ha water by air or 100 L/ha by ground.
	azoxystrobin + propiconazole + benzovindiflupyr	Trivapro A + Trivapro B (sold as co-pack: Trivapro)	1 L/ha (404 mL/acre) + 300 mL/ha (120 mL/acre)	Do not apply at boot stage or beyond.	Ground and aerial application. Apply only up to boot stage (Zadok's 47). Use a minimum water volume of 100 L/ha for ground application. Maximum 2 applications/yr. 12-hr restricted entry interval.
	fluoxastrobin	Evito	146–292 mL/ha (59–118 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. For optimum results, begin applications preventively and repeat if needed after a 14–21 day interval. Use the higher rates and shorter interval when disease pressure is high. Do not apply at boot stage (Zadok's 47 and beyond). 12-hr restricted entry interval.
	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 restricted entry interval.
	propiconazole	Bumper 432 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.
		Nufarm Propiconazole			
		Princeton			
		Propi Super 25 EC	500 mL/ha (200 mL/acre)		
		Tilt 250 E			
	prothioconazole + tebuconazole	Prosaro XTR	800 mL/ha (324 mL/acre)	36	**For septoria leaf blotch only. Ground application only.** Begin application preventively. When disease pressure is high, or when agronomic or weather conditions are conducive to disease development, continue applications as needed on a 7–14-day interval. Use shorter intervals in this range for best protection. When conditions for heavy infestation exist or when growing a less resistant cultivar, use the higher rate. Ensure good canopy penetration for optimum results. Do not exceed 1.5 L/ha per season (2 applications). Do not graze treated area and do not harvest for forage or hay.

OAT DISEASES

Table 4–42. 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, restricted entry intervals, etc.)
SEPTORIA LEAF SPOT (*Septoria tritici*) and SEPTORIA LEAF BLOTCH (*Stagonospora avenae* f. sp. *avenaria* (*Septoria avenae*)) (continued)					
Foliar Treatment (continued)					
(continued)	prothioconazole + trifloxystrobin	Stratego PRO	440 mL/ha (178 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Should be applied as a preventive disease control measure or at the very early stages of disease development. This could occur anytime during tillering or stem elongation. Typically, 1 application from the tillering up to flag leaf emergence is required. A second application may be made if needed. DO NOT apply within 14 days of the first treatment and must be applied prior to head emergence. Do not apply more than 2 applications per season. Refer to label for grazing restrictions. DO NOT tank mix with herbicides in barley, oats, rye, triticale or millet.
	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 restricted entry interval.
	tebuconazole	Folicur 250 EW	375 mL/ha	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 restricted entry interval. Before using Folicur for control of leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for *Fusarium* control, where applications are targeted at head emergence.
		Orius 430 SC	220 mL/ha (89 mL/acre)	36	Ground and aerial application. Apply at the early stages of disease development. Maximum 1 applications/yr. 12-hr restricted entry interval.
FUSARIUM HEAD BLIGHT (*Fusarium graminearum*)					
For information on this disease, see Table 4–18. *Control Options for Foliar, Stem and Head Diseases in Wheat — Fusarium Head Blight*, as well as OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	metconazole	Caramba	1 L/ha (404 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 restricted entry interval.
	prothioconazole + tebuconazole	Prosaro XTR	800 mL/ha (324 mL/acre)	36	**Provides suppression only.** Ground and aerial application. Timing of application is critical. Apply as a preventive spray when the earliest disease symptoms appear on the leaves and stems. Fields should be observed closely for early disease symptoms, particularly when susceptible varieties are planted and/or under prolonged conditions favourable for disease development. 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 restricted entry interval.

OAT DISEASES

Table 4–42. 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, restricted entry intervals, etc.)
STEM RUST (*Puccinia graminis*)					
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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	azoxystrobin + propiconazole + benzovindiflupyr	Trivapro A + Trivapro B (sold as co-pack: Trivapro)	1 L/ha (404 mL/acre) + 300 mL/ha (120 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply only up to boot stage (Zadok's 47). Use a minimum water volume of 100 L/ha for ground application. Maximum 2 applications/yr. 12-hr restricted entry interval.
	fluoxastrobin	Evito	146–292 mL/ha (59–118 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. For optimum results, begin applications preventively and repeat if needed after a 14–21 day interval. Use the higher rates and shorter interval when disease pressure is high. Do not apply at boot stage (Zadok's 47 and beyond). 12-hr restricted entry interval.
	prothioconazole + tebuconazole	Prosaro XTR	800 mL/ha (324 mL/acre)	36	**Ground application only.** Begin application preventively. When disease pressure is high, or when agronomic or weather conditions are conducive to disease development, continue applications as needed on a 7–14-day interval. Use shorter intervals in this range for best protection. When conditions for heavy infestation exist or when growing a less resistant cultivar, use the higher rate. Ensure good canopy penetration for optimum results. Do not exceed 1.5 L/ha per season (2 applications). Do not graze treated area and do not harvest for forage or hay.
	prothioconazole + trifloxystrobin	Stratego PRO	440 mL/ha (178 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Should be applied as a preventive disease control measure or at the very early stages of disease development. This could occur anytime during tillering or stem elongation. Typically, 1 application from the tillering up to flag leaf emergence is required. A second application may be made if needed. DO NOT apply within 14 days of the first treatment and must be applied prior to head emergence. Do not apply more than 2 applications per season. Refer to label for grazing restrictions. DO NOT tank mix with herbicides in barley, oats, rye, triticale or millet.
	tebuconazole	Folicur 250 EW	375 mL/ha	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 restricted entry interval. Before using Folicur for control of leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for *Fusarium* control, where applications are targeted at head emergence.
		Orius 430 SC	220 mL/ha (89 mL/acre)	36	Ground and aerial application. Apply at the early stages of disease development. Maximum 1 applications/yr. 12-hr restricted entry interval.
		Tebbie	375–500 mL/ha (152–200 mL/acre)		

RYE DISEASES

Table 4–43. 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, restricted entry intervals, etc.)
SEEDLING BLIGHT (*Pythium* spp., *Rhizoctonia* spp., *Fusarium* 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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	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 42 days after planting. Read label for information regarding resistant strains of fungus.
	difenoconazole + metalaxyl-M	Dividend XL RTA	325–650 mL/ 100 kg seed	For commercial and on-farm treating. 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 + carbathiin + metalaxyl	Rancona Trio	300 mL/ 100 kg seed	For commercial and on-farm treatment. Do not graze or cut for forage within 6 weeks after planting. Read label for information regarding resistant strains of fungus.
	ipconazole + metalaxyl	Rancona Pinnacle	325 mL/ 100 kg seed	For commercial and on-farm treatment. Do not graze or cut for forage within 30 days after planting. Read label for information regarding resistant strains of fungus.
	thiamethoxam + difenoconazole + metalaxyl-M + sedaxane + fludioxonil	Cruiser Vibrance Quattro	325 mL/ 100 kg seed	For commercial and on-farm treating. This product contains colourant. 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.
PYTHIUM DAMPING-OFF (*Pythium* 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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	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 42 days after planting. Read label for information regarding resistant strains of fungus.
	difenoconazole + metalaxyl-M	Dividend XL RTA	325–650 mL/ 100 kg seed	For commercial and on-farm treating. 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 + carbathiin + metalaxyl	Rancona Trio	300 mL/ 100 kg seed	For commercial and on-farm treatment. Do not graze or cut for forage within 6 weeks after planting. Read label for information regarding resistant strains of fungus.
	Ipconazole + metalaxyl	Rancona Pinnacle	325 mL/ 100 kg seed	For commercial and on-farm treatment. Do not graze or cut for forage within 30 days after planting. Read label for information regarding resistant strains of fungus.
	thiamethoxam + difenoconazole + metalaxyl-M + sedaxane + fludioxonil	Cruiser Vibrance Quattro	325 mL/ 100 kg seed	For commercial and on-farm treating. This product contains colourant. 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.

RYE DISEASES

Table 4–43. 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, restricted entry intervals, etc.)
SEED-BORNE SEPTORIA (*Septoria* 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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	difenoconazole + metalaxyl-M	Dividend XL RTA	325–650 mL/ 100 kg seed	For commercial and on-farm treating. 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 (*Tilletia caries*), DWARF BUNT (*Tilletia controversa*)				
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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	difenoconazole + metalaxyl-M	Dividend XL RTA	325–650 mL/ 100 kg seed	For commercial and on-farm treating. 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.
	thiamethoxam + difenoconazole + metalaxyl-M + sedaxane + fludioxonil	Cruiser Vibrance Quattro	325 mL/ 100 kg seed	For commercial and on-farm treating. This product contains colourant. 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.

RYE DISEASES

Table 4–44. 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, restricted entry intervals, etc.)
LEAF RUST (*Puccinia recondita* f. sp. *recondita*)					
Foliar Treatment					
Leaf rust in rye is caused by the same fungus that infects wheat. See Table 4–16. *Control Options for Foliar, Stem and Head Diseases in Wheat — Leaf Rust, Stem Rust*, for management options and details. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	azoxystrobin + propiconazole + benzovindiflupyr	Trivapro A + Trivapro B (sold as co-pack: Trivapro)	1 L/ha (404 mL/acre) + 300 mL/ha (120 mL/acre)	Do not apply at boot stage and beyond.	Ground and aerial application. Apply only up to boot stage (Zadok's 47). Use a minimum water volume of 100 L/ha for ground application. Maximum 2 applications/yr. 12-hr restricted entry interval.
	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 restricted entry interval.
	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 restricted entry interval.
	picoxystrobin	Acapela	0.29 L/ha (117 mL/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. Make no more than 2 sequential applications of a strobilurin fungicide, such as Acapela before switching to a fungicide with a different mode of action. **Do not apply early-season rate after flowering (Feekes 10.5.1 or Zadok's 60). Maximum seasonal use rate is 2.64 L/ha.** Maximum 2 applications/yr. 12-hr restricted entry interval.
	prothioconazole + tebuconazole	Prosaro XTR	800 mL/ha (324 mL/acre)	36	**Ground application only.** Begin application preventively. When disease pressure is high, or when agronomic or weather conditions are conducive to disease development, continue applications as needed on a 7–14-day interval. Use shorter intervals in this range for best protection. When conditions for heavy infestation exist or when growing a less resistant cultivar, use the higher rate. Ensure good canopy penetration for optimum results. Do not exceed 1.5 L/ha per season (2 applications). Do not graze treated area and do not harvest for forage or hay.

RYE DISEASES

Table 4–44. 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, restricted entry intervals, etc.)
LEAF RUST (*Puccinia recondita* f. sp. *recondita*) (continued)					
Foliar Treatment (continued)					
(continued)	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 restricted entry interval.
	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 restricted entry interval.
	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 restricted entry interval.
		Headline AMP	0.75–1.0 L/ha (303–404 mL/acre)		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. 12-hr restricted entry interval.

RYE DISEASES

Table 4–45. Control Options for Diseases in Rye — Powdery Mildew

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
POWDERY MILDEW (*Erysiphe graminis* f. sp. *secalis*)					
Foliar Treatment					
In most cases, powdery mildew has little impact on rye since the crop is very resistant to the disease. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	fluoxastrobin	Evito	183–292 mL/ha (74–118 mL/acre)	Do not apply at boot stage and beyond.	For optimum results, begin applications preventively and repeat if needed after a 14–21-day Interval. Use the higher rates and shorter interval when disease pressure is high. Do not apply at boot stage (Zadok's 47 and beyond). Ground and aerial application. 12-hr restricted entry interval.
	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 restricted entry interval.
	prothioconazole + tebuconazole	Prosaro XTR	800 mL/ha (324 mL/acre)	36	**Ground application only.** Begin application preventively. When disease pressure is high, or when agronomic or weather conditions are conducive to disease development, continue applications as needed on a 7–14-day interval. Use shorter intervals in this range for best protection. When conditions for heavy infestation exist or when growing a less resistant cultivar, use the higher rate. Ensure good canopy penetration for optimum results. Do not exceed 1.5 L/ha per season (2 applications). Do not graze treated area and do not harvest for forage or hay.
	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 restricted entry interval.
	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 restricted entry interval.
	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 restricted entry interval.
		Headline AMP	0.75–1.0 L/ha (303–404 mL/acre)		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. 12-hr restricted entry interval.

RYE DISEASES

Table 4–46. Control Options for Diseases in Rye — Fusarium Head Blight

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
FUSARIUM HEAD BLIGHT (*Fusarium graminearum*)					
Foliar Treatment					
For more information, see Table 4–18. *Control Options for Foliar, Stem and Head Diseases in Wheat — Fusarium Head Blight*, as well as OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	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 restricted entry interval.
	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 per season. 12-hr restricted entry interval.
	prothioconazole + tebuconazole	Prosaro XTR	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 75% of the heads on the mains stem are fully emerged to when 50% of the heads on the mains steam are in flower. 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 restricted entry interval.

RYE DISEASES

Table 4–47. Control Options for Diseases in Rye — Septoria Leaf Spot, Scald

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
SEPTORIA LEAF SPOT *(Septoria tritici)*					
Foliar Treatment					
Wet, windy weather and moderate temperatures favour the development of this disease. Reducing crop residue and crop rotation can help reduce risk of infection. Plant less susceptible varieties. Consult with your seed company for variety profiles. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	azoxystrobin + propiconazole	Quilt	0.75 L/ha (304 mL/acre)	30	Ground and aerial application. Apply once between stem elongation and half-head emergence (G.S. 29–55). Good spray coverage and canopy penetration are important for best results.
	picoxystrobin	Acapela	0.29 L/ha (117 mL/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. Make no more than 2 sequential applications of a strobilurin fungicide, such as Acapela before switching to a fungicide with a different mode of action. **Do not apply early-season rate after flowering (Feekes 10.5.1 or Zadok's 60). Maximum seasonal use rate is 2.64 L/ha.** Maximum 2 applications/yr. 12-hr restricted entry interval.
SCALD (*Rhynchosporium secalis*)					
Net blotch and scald occur especially in cool, humid seasons. Two-rowed cultivars are usually more susceptible to net blotch and scald than six-rowed cultivars. To help prevent the build-up of these diseases, avoid growing barley after barley; plow down stubble and straw as completely as possible, and treat seed with fungicide. For more information, please refer to *Septoria leaf spot* in wheat in OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	azoxystrobin + propiconazole	Quilt	0.75 L/ha (304 mL/acre)	30	Ground and aerial application. Apply once between stem elongation and half-head emergence (G.S. 29–55). Good spray coverage and canopy penetration are important for best results.
	picoxystrobin	Acapela	0.29 L/ha (117 mL/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. Make no more than 2 sequential applications of a strobilurin fungicide, such as Acapela before switching to a fungicide with a different mode of action. **Do not apply early-season rate after flowering (Feekes 10.5.1 or Zadok's 60). Maximum seasonal use rate is 2.64 L/ha.** Maximum 2 applications/yr. 12-hr restricted entry interval.

CEREAL GROWTH REGULATORS

Table 4–48. 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, restricted entry intervals, 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. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops.*	ethephon	Ethrel	**Spring barley** 1.0–1.5 L/ha (0.4–0.6 L/acre) *2-row cultivar* 1.0–2.0 L/ha (0.4–0.8 L/acre) *6-row cultivar* **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.
	chlormequat chloride	Manipulator 620	**Winter wheat** *Single application:* 1.8 L/ha (0.73 L/acre) between Zadok's GS 31–39 *Split application:* 1 L/ha (0.4 L/acre) between Zadok's GS 12–30 followed by 0.8 L/ha (0.32 L/acre) between Zadok's GS 31–39	NA	**Winter, spring, durum wheat, barley and oats.** Ground application. Apply when risk of lodging is high or when a high nitrogen fertilizer system is used. Apply in a minimum of 100 L water/ha. Do not use in tank mixture with liquid nitrogen fertilizer. **Do not apply later than Zadok's GS 39. Do not exceed 1.8 L/ha (0.73 L/acre) per season.** 12-hr re-entry interval. DO NOT apply to crops under stress from waterlogging, drought or nutrient deficiency. In hot, dry weather a better result may be obtained from application in the early morning or evening. Although Manipulator 620 may be applied under normal seasonal temperatures (down to 1°C) and ground conditions, DO NOT spray onto plants covered with frost. For optimal results, Manipulator 620 requires 2 hr before rain or frost occurs. Do not allow Manipulator 620 to drift onto neighbouring crops. Do not use in tank mixture with liquid nitrogen fertilizer. DO NOT apply later than GS39. May be used on crops under-sown with clovers and grasses.
			Spring and durum wheat *Single application:* 1.8 L/ha (0.73 L/acre) between Zadok's GS 31–39 *Split application:* 0.8 L/ha (0.32 L/acre) between Zadok's GS 12–30 followed by 1 L/ha (0.4 L/acre) between Zadok's GS 31–32		
			Barley *Single application:* 2.3 L/ha (0.93 L/acre) between Zadok's GS 30–32 *Split application:* 1.15 L/ha (0.47 L/acre) between Zadok's GS 14–32 followed by 1.15 L/ha (0.47 L/acre) between Zadok's GS 32–39		
			Oats *Single application:* 2.3 L/ha (0.93 L/acre) between Zadok's GS 30–32 *Split application:* 1.15 L/ha (0.47 L/acre) between Zadok's GS 14–32 followed by 1.15 L/ha (0.47 L/acre) between Zadok's GS 32–39		

5. Dry Edible Beans

DRY EDIBLE BEAN INSECTS

Table 5–1. Control Options for Insects in Dry Edible Beans — Seedcorn Maggot, Wireworms

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
SEEDCORN MAGGOT (*Delia platura*)				
Seed Treatment				
Seedcorn maggot problems in dry beans are rare in Ontario. Risk factors include cool, wet springs when germination is delayed. In fields at high risk, including early-planted fields where large amounts of manure, green manure or residue have recently been incorporated, use insecticide seed treatment. Due to the threat of anthracnose infection to this crop, ALL edible bean seed should be treated with Dynasty 100FS. See Table 5–8, *Control Options for Seed and Seedling Diseases in Dry Edible Beans — Anthracnose, Phytophthora spp.*, for more details. Other seed treatment products may be needed to protect against other edible bean diseases.	thiamethoxam	Cruiser 5FS	50–83 mL/ 100 kg seed	**For use in commercial seed treatment facilities only.** Use higher rate when expecting high insect populations. Do not graze or feed livestock on treated areas for 45 days after planting. This product contains no colourant. An appropriate colourant must be added when this product is applied. Toxic to bees. Bees can be exposed to product residues in flowers, leaves, pollen and/or nectar resulting from seed treatment applications. When used according to label directions minimal exposure or risk is expected. Dust generated during planting of treated seed may be harmful to bees and other pollinators. To help minimize the dust generated during planting refer to the "Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices" on the Health Canada webpage on pollinator protection at www.canada.ca/pollinators. Toxic to fish and aquatic invertebrates. Do not apply directly to water or to areas where surface water is present. Toxic to birds and small wild mammals. Spilled or exposed seeds and dust must be incorporated into the soil or cleaned up from the soil surface.
	thiamethoxam + metalaxyl-M + fludioxonil + sedaxane	Cruiser Maxx Beans + Vibrance 500 FS (sold as a co-pack: Cruiser Maxx Vibrance Beans)	195 mL + 5–10 mL/ 100 kg seed (2.5–5 g a.i./ 100 kg seed)	**For use in commercial seed treatment facilities only.** Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting. This product contains no colourant. An appropriate colourant must be added when this product is applied. Toxic to bees. Bees can be exposed to product residues in flowers, leaves, pollen and/or nectar resulting from seed treatment applications. When used according to label directions minimal exposure or risk is expected. Dust generated during planting of treated seed may be harmful to bees and other pollinators. To help minimize the dust generated during planting refer to "Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices" on the Health Canada webpage on pollinator protection at www.canada.ca/pollinators. Toxic to fish and aquatic invertebrates. Do not apply directly to water or to areas where surface water is present. Toxic to birds and small wild mammals. Spilled or exposed seeds and dust must be incorporated into the soil or cleaned up from the soil surface.

DRY EDIBLE BEAN INSECTS

Table 5–1. Control Options for Insects in Dry Edible Beans — Seedcorn Maggot, Wireworms

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
WIREWORMS (*Limonius* spp. and others)				
Seed Treatment				
See OMAFRA Publication 811, *Agronomy Guide for Field Crops*, for sampling methods. Due to the threat of anthracnose infection to this crop, ALL edible bean seed should be treated with Dynasty 100FS. See Table 5–8, *Control Options for Seed and Seedling Diseases in Dry Edible Beans — Anthracnose, Phytophthora spp.*, for more details. Other seed treatment products may be needed to protect against other edible bean diseases.	imidacloprid	Stress Shield 600	104 mL/ 100 kg seed (62.5 g a.i./ 100 kg seed)	**For use in commercial seed treatment facilities only.** May be tank-mixed with certain fungicide. See label for registered tank-mix partners. 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. Toxic to bees. Dust generated during planting of treated seed may be harmful to bees and other pollinators. To help minimize the dust generated during planting, refer to the complete guidance "Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices" on the Health Canada webpage on pollinator protection at www.canada.ca/pollinators. Toxic to birds and small animals. Any spilled or exposed seed must be incorporated into the soil or otherwise cleaned up from the soil and other surfaces.
	thiamethoxam + metalaxyl-M + fludioxonil + sedaxane	Cruiser Maxx Beans + Vibrance 500 FS (sold as a co-pack: Cruiser Maxx Vibrance Beans)	195 mL + 5–10 mL/ 100 kg seed (2.5–5 g a.i./ 100 kg seed)	**For use in commercial seed treatment facilities only.** Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting. This product contains no colourant. An appropriate colourant must be added when this product is applied. Thiamethoxam is toxic to bees. Bees can be exposed to product residues in flowers, leaves, pollen and/or nectar resulting from seed treatment applications. When used according to label directions minimal exposure or risk is expected. Dust generated during planting of treated seed may be harmful to bees and other pollinators. To help minimize the dust generated during planting refer to the "Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices" on the Health Canada webpage on pollinator protection at www.canada.ca/pollinators. Toxic to fish and aquatic invertebrates. Do not apply directly to water or to areas where surface water is present. Toxic to birds and small wild mammals. Spilled or exposed seeds and dust must be incorporated into the soil or cleaned up from the soil surface.

DRY EDIBLE BEAN INSECTS

Table 5–2. Control Options for Insects in Dry Edible Beans — Potato Leafhopper

LEGEND: PHI = Pre-Harvest Interval (in days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
POTATO LEAFHOPPER (*Empoasca fabae*)					
Seed Treatments					
Consider using insecticide seed treatment on fields with a history of leafhopper infestations, to reduce the number of foliar applications required. Insecticide seed treatments protect the seedling crop, eliminating the need for at least one foliar insecticide application. Due to the threat of anthracnose infection to this crop, ALL edible bean seed should be treated with Dynasty 100FS. See Table 5–8, *Control Options for Seed and Seedling Diseases in Dry Edible Beans — Anthracnose, Phytophthora spp.*, for more details. Other seed treatment products may be needed to protect against other edible bean diseases.	imidacloprid	Stress Shield 600	104 mL/ 100 kg seed (62.5 g a.i./ 100 kg seed)	N/A	**For use in commercial seed treatment facilities only.** May be tank-mixed with certain fungicide. See label for registered tank-mix partners. 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. Toxic to bees. Dust generated during planting of treated seed may be harmful to bees and other pollinators. To help minimize the dust generated during planting, refer to the complete guidance "Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices" on the Health Canada webpage on pollinator protection at www.canada.ca/pollinators. Toxic to birds and small animals. Any spilled or exposed seed must be incorporated into the soil or otherwise cleaned up from the soil and other surfaces.
	thiamethoxam	Cruiser 5FS	86–143 mL/ 100 kg seed	N/A	**For use in commercial seed treatment facilities only.** Do not graze or feed livestock on treated areas for 45 days after planting. This product contains no colourant. An appropriate colourant must be added when this product is applied. Toxic to bees. Bees can be exposed to product residues in flowers, leaves, pollen and/or nectar resulting from seed treatment applications. When used according to label directions minimal exposure or risk is expected. Dust generated during planting of treated seed may be harmful to bees and other pollinators. To help minimize the dust generated during planting refer to the "Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices" on the Health Canada webpage on pollinator protection at www.canada.ca/pollinators. Toxic to fish and aquatic invertebrates. Do not apply directly to water or to areas where surface water is present. Toxic to birds and small wild mammals. Spilled or exposed seeds and dust must be incorporated into the soil or cleaned up from the soil surface.
	thiamethoxam + metalaxyl-M + fludioxonil + sedaxane	Cruiser Maxx Beans + Vibrance 500 FS (sold as a co-pack: Cruiser Maxx Vibrance Beans)	195 mL + 5–10 mL/ 100 kg seed (2.5–5 g a.i./ 100 kg seed)	N/A	**For use in commercial seed treatment facilities only.** Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting. This product contains no colourant. An appropriate colourant must be added when this product is applied. Thiamethoxam is toxic to bees. Bees can be exposed to product residues in flowers, leaves, pollen and/or nectar resulting from seed treatment applications. When used according to label directions minimal exposure or risk is expected. Dust generated during planting of treated seed may be harmful to bees and other pollinators. To help minimize the dust generated during planting refer to the "Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices" on the Health Canada webpage on pollinator protection at www.canada.ca/pollinators. Toxic to fish and aquatic invertebrates. Do not apply directly to water or to areas where surface water is present. Toxic to birds and small wild mammals. Spilled or exposed seeds and dust must be incorporated into the soil or cleaned up from the soil surface.

DRY EDIBLE BEAN INSECTS

Table 5–2. Control Options for Insects in Dry Edible Beans — Potato Leafhopper

LEGEND: PHI = Pre-Harvest Interval (in days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
POTATO LEAFHOPPER (*Empoasca fabae*) (continued)					
Foliar Treatment					
Some tolerant varieties are available (www.gobeans.ca). See OMAFRA Publication 811, *Agronomy Guide for Field Crops*, for action threshold charts and sampling methods.	dimethoate	Cygon 480 EC Lagon 480 EC	0.7–1.0 L/ha (280–404 mL/acre)	7	Ground or aerial application. Do not feed treated threshings or crop refuse to livestock. Maximum 2 applications/yr. Some residual activity is expected from this product. 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. Toxic to birds, mammals and aquatic organisms. Observe buffer zones specified on the label. Avoid contamination of aquatic systems and consider the characteristics and conditions of the site before treatment to reduce runoff into aquatic habitats.
	flupyradifurone	Sivanto Prime	500–750 mL/ha (202–303 mL/acre)	7	Ground and aerial application. Minimum of 100 L/ha of water for ground application; 20 L/ha for aerial application. Toxic to adult bees in laboratory studies via oral exposure, however, not toxic to bees through contact exposure, and field studies conducted with this product have shown no effects on honeybee colony development. Minimize spray drift to reduce exposure to bees in habitats close to the application site. Application during the crop blooming period, and when flowering weeds are present, may only be made in the early morning and the evening when most bees are not foraging. Toxic to aquatic organisms. Observe buffer zones specified on the label. Toxic to certain beneficial insects. Minimize spray drift to reduce harmful effects on beneficial insects in habitats next to the application sites.
	lambda-cyhalothrin	Labamba Matador 120 E	83 mL/ha (34 mL/acre)	14	Ground and aerial application. This product has no systemic activity. For best results, apply during the early morning, before temperatures rise, and during the evening. Use 100–200 L of water/ha for ground application. Use 20 L of water/ha for aerial applications. Do not graze or feed on treated forage. Maximum 3 applications/yr. 24-hr restricted entry interval. 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. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.
		Silencer 120 EC	83 mL/ha (34 mL/acre)	21	
	lambda-cyhalothrin + chlorantraniliprole	Voliam Xpress	225 mL/ha (91 mL/acre)	14	Ground and aerial application. Apply in a minimum of 100–200 L of water/ha for ground applications, 40 L of water/ha for aerial applications. Maximum of 3 applications/yr by ground, 1 application/yr by air. 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. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.

DRY EDIBLE BEAN INSECTS

Table 5–3. Control Options for Insects in Dry Edible Beans — Bean Leaf Beetle

LEGEND: PHI = Pre-Harvest Interval (in days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
BEAN LEAF BEETLE (*Certoma trifurcata*)					
Seed Treatments					
Use in fields with a history of early-season infestations. If defoliation after seeding is a concern, a well-timed foliar will provide control. Due to the threat of anthracnose infection to this crop, ALL edible bean seed should be treated with Dynasty 100FS. See Table 5–8, *Control Options for Seed and Seedling Diseases in Dry Edible Beans — Anthracnose, Phytophthora spp.*, for more details. Other seed treatment products may be needed to protect against other edible bean diseases.	thiamethoxam + metalaxyl-M + fludioxonil + sedaxane	Cruiser Maxx Beans + Vibrance 500 FS (sold as a co-pack: Cruiser Maxx Vibrance Beans)	195 mL + 5–10 mL/ 100 kg seed (2.5–5 g a.i./ 100 kg seed)	N/A	**For use in commercial seed treatment facilities only.** Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting. This product contains no colourant. An appropriate colourant must be added when this product is applied. Toxic to bees. Bees can be exposed to product residues in flowers, leaves, pollen and/or nectar resulting from seed treatment applications. When used according to label directions minimal exposure or risk is expected. Dust generated during planting of treated seed may be harmful to bees and other pollinators. To help minimize the dust generated during planting refer to the “Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices” on the Health Canada webpage on pollinator protection at www.canada.ca/pollinators. Toxic to fish and aquatic invertebrates. Do not apply directly to water or to areas where surface water is present. Toxic to birds and small wild mammals. Spilled or exposed seeds and dust must be incorporated into the soil or cleaned up from the soil surface.

DRY EDIBLE BEAN INSECTS

Table 5–3. Control Options for Insects in Dry Edible Beans — Bean Leaf Beetle

LEGEND: PHI = Pre-Harvest Interval (in days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
BEAN LEAF BEETLE (*Certoma trifurcata*) (continued)					
Foliar Treatment					
Use defoliation thresholds for dry beans found in OMAFRA Publication 811, *Agronomy Guide for Field Crops*. During pod stages, with higher value and stringent quality standards in dry beans, if 5%–8% of the pods inspected have feeding scars, control may be necessary. Ensure that adults are still presently active in the field before a spray is applied.	dimethoate	Cygon 480 EC Lagon 480 EC	0.7–1.0 L/ha (280–404 mL/acre)	7	Ground or aerial application. Do not feed treated threshings or crop refuse to livestock. Maximum 2 applications/yr. Some residual activity is expected from this product. 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. Toxic to birds, mammals and aquatic organisms. Observe buffer zones specified on the label. Avoid contamination of aquatic systems and consider the characteristics and conditions of the site before treatment to reduce runoff into aquatic habitats.
	lambda-cyhalothrin	Labamba Matador 120 E	Ground: 83–233 mL/ha (34–94 mL/acre) Aerial: 83 mL/ha (34 mL/acre)	14	Ground and aerial application. For best results, apply during the early morning, before temperatures rise, and during the evening. Use 100–200 L of water/ha for ground application. Use 20 L of water/ha for aerial applications. Do not graze or feed on treated forage. Maximum 3 applications/yr. 24-hr restricted entry interval. 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. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.
		Silencer 120 EC	Ground: 83–233 mL/ha (34–94 mL/acre) Aerial: 83 mL/ha (34 mL/acre)	21	
	lambda-cyhalothrin + chlorantraniliprole	Voliam Xpress	225–500 mL/ha (91–202 mL/acre)	14	Ground and aerial application. Apply in a minimum of 100–200 L of water/ha for ground applications, 40 L of water/ha for aerial applications. Maximum of 3 applications/yr by ground, 1 application/yr by air. 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. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.

DRY EDIBLE BEAN INSECTS

Table 5–3. Control Options for Insects in Dry Edible Beans — Bean Leaf Beetle

LEGEND: PHI = Pre-Harvest Interval (in days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
BEAN LEAF BEETLE (*Certoma trifurcata*) (continued)					
Foliar Treatment (continued)					
(continued)	thiamethoxam + lambda-cyhalothrin	Endigo	180 mL/ha (73 mL/acre)	21	Ground and aerial application. Use a minimum of 100–200 L of water/ha for ground application and 20 L of water/ha for aerial applications. Do not exceed a total of 540 mL/ha of Endigo per season. Maximum of 3 applications/yr. Allow at least 7 days between treatments. Do not graze or harvest treated forage, straw or hay for livestock feed. Do not apply this product within 45 days of planting if seeds were treated with a neonicotinoid seed treatment (Cruiser, Cruiser Maxx or Stress Shield). Do not apply pre-bloom or during bloom (do not apply until after stage R3.5 (petal fall)). Toxic to bees. Do not apply when bees are present. To minimize exposure to bees from foliar application, 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. Toxic to non-target terrestrial plants. This product contains an active ingredient and aromatic petroleum distillates that are toxic to aquatic organisms. Observe buffer zones specified on label. To reduce runoff from treated areas into aquatic habitats avoid application to areas with a moderate to steep slope, compacted soil, or clay.

DRY EDIBLE BEAN INSECTS

Table 5–4. Control Options for Insects in Dry Edible Beans — Western Bean Cutworm, Tarnished Plant Bug

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
WESTERN BEAN CUTWORM (*Striacosta albicosta*)					
Foliar Treatment					
Larvae mine into the pod, feeding directly on the seed. Their entry holes also allow for the introduction of pod diseases. All these activities have a negative impact on yield, seed quality and increase pick. It is difficult to scout for WBC eggs or larvae in dry beans. Use pheromone traps to monitor for presence and peak flight. If traps have accumulated more than 150 moths, spray may be warranted. If pod feeding is easily found, spray is necessary. Apply insecticide 10–20 days after peak moth flight when larval feeding is expected. Additional information on pest status and management recommendations are provided at Field Crop News and the Great Lakes and Maritimes Pest Monitoring Network at: fieldcropnews.com/.	chlorantraniliprole	Coragen	250–375 mL/ha (101–151 mL/acre)	1	Ground or aerial application. For ground application, use a minimum water volume of 100 L/ha and 50 L/ha for aerial. Use high rate of Coragen under heavy pest pressure. Minimum of 3 days between applications. Maximum 4 applications/yr. Do not exceed a total of 1.125 L of Coragen/ha/season. 12-hr restricted entry interval. Toxic to aquatic organisms. Do not apply this product directly to freshwater, estuarine and marine habitats. Observe buffer zones specified. Toxic to certain beneficial insects. Minimize spray drift to reduce harmful effects to beneficial insects in habitats adjacent to application site.
	lambda-cyhalothrin	Matador 120 EC	83–187 mL/ha (34–76 mL/acre)	14	Ground or aerial application. For best results, apply in the early morning, before temperatures rise, or during the evening. Use 100–200 L water/ha for ground application, 20 L water/ha for aerial application. Spray no later than 10 days after egg hatch. Maximum 3 applications/yr. Do not make more than 2 applications of 83 mL/ha by air. 24-hr restricted entry interval. 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. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.
		Silencer 120 EC	83–187 mL/ha (34–76 mL/acre)	21	
	lambda-cyhalothrin + chlorantraniliprole	Voliam Xpress	500 mL/ha (202 mL/acre)	14	Ground or aerial application. Maximum of 3 applications/yr by ground, 1 application/yr by air. Apply in a minimum of 100–200 L of water/ha for ground applications, 40 L of water/ha for aerial applications. 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. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.

DRY EDIBLE BEAN INSECTS

Table 5–4. Control Options for Insects in Dry Edible Beans — Western Bean Cutworm, Tarnished Plant Bug

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
TARNISHED PLANT BUG (*Lygus lineolaris*) and *LYGUS* spp.					
Foliar Treatment					
Lygus spp. can sting the developing pods, resulting in damaged seeds. Monitor beans during the early pod-filling stages. A treatment may be required when there are 1–2 bugs per sweep later in the season.	dimethoate	Cygon 480 EC Lagon 480 E	0.7–1 L/ha (280–404 mL/acre)	7	Ground or aerial application. Do not feed treated threshings or crop refuse to livestock. Maximum 2 applications/yr. Some residual activity is expected from this product. 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. Toxic to birds, mammals and aquatic organisms. Observe buffer zones specified on the label. Avoid contamination of aquatic systems and consider the characteristics and conditions of the site before treatment to reduce runoff into aquatic habitats.
	lambda-cyhalothrin	Matador 120 E	83 mL/ha (34 mL/acre)	14	Ground and aerial application. This product has no systemic activity. For best results, apply during the early morning, before temperatures rise, and during the evening. Use 100–200 L of water/ha for ground application. Use 20 L of water/ha for aerial applications. Do not graze or feed on treated forage. Maximum 3 applications/yr. 24-hr restricted entry interval. 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	83 mL/ha (34 mL/acre)	21	
	lambda-cyhalothrin + chlorantraniliprole	Voliam Xpress	225 mL/ha (91 mL/acre)	14	Ground and aerial application. Apply in a minimum of 100–200 L of water/ha for ground applications, 40 L of water/ha for aerial applications. Maximum of 3 applications/yr by ground, 1 application/yr by air. 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. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.

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Table 5–5. Control Options for Seed and Seedling Diseases in Dry Edible Beans — Seedling Diseases, Pythium Damping-Off

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
PYTHIUM DAMPING-OFF (*Pythium* spp.)				
Seed Treatment				
This disease can occur on all soil types but losses are greatest on wet, clay soils. Minimize soil compaction and remove excess moisture through increased drainage. Treat seed with metalaxyl or metalaxyl-M, and plant into warm soils (16°C). Rotate 3–4 years between bean crops. Due to the threat of anthracnose infection to this crop, ALL edible bean seed should be treated with Dynasty 100FS. See Table 5–8. *Control Options for Seed and Seedling Diseases in Dry Edible Beans — Anthracnose, Phytophthora spp.*, for more details. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	ethaboxam	INTEGO Solo	19.6–39.1 mL/ 100 kg seed	For commercial and on-farm treating. Regulations under the *Seeds Act* require that an appropriate colourant be added when this product is applied to seed. 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 *Rhizoctonia solani* and other fungal pathogens inciting seed and seedling disease.
	fludioxonil + metalaxyl-M	Apron Maxx RFC	100 mL + 230 mL of water/ 100 kg seed	For commercial and on-farm treating. Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting. For anthracnose control, tank-mix with 10 mL of Dynasty 100FS/100 kg seed.
		Apron Maxx RTA	325 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treatment using standard gravity- or mist-type seed treatment equipment. Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers prior to use. Ensure uniform coverage.
	metalaxyl	Allegiance FL Apron FL	46–110 mL/ 100 kg seed	**For use in commercial seed treatment facilities only.** Do not graze or feed livestock on seeded area for 4 weeks after planting.
	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. Do not graze or feed livestock on seeded area for 4 weeks after planting. Read label for information regarding resistant strains of fungus.
	metalaxyl-M + fludioxonil + sedaxane	Vibrance Maxx RFC	100 mL/ 100 kg seed	For commercial and on-farm treating. Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting. For anthracnose control, tank-mix with 10 mL of Dynasty 100FS/100 kg seed.
	metalaxyl-M + sedaxane + fludioxonil	Vibrance Trio	100 mL/ 100 kg seed	For commercial and on-farm treating. Apply 100 mL of Vibrance Trio Fungicide plus 225 mL of water (or *Rhizobia* inoculant at rates recommended by the manufacturer to achieve proper total slurry volumes) per 100 kg of 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.
	thiamethoxam + metalaxyl-M + fludioxonil + sedaxane	Cruiser Maxx Beans + Vibrance 500 FS (sold as a co-pack: Cruiser Maxx Vibrance Beans)	195 mL + 5–10 mL/ 100 kg seed (2.5–5 g a.i./ 100 kg seed)	**For use in commercial seed treatment facilities only.** Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting. This product contains no colourant. An appropriate colourant must be added when this product is applied.

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Table 5–6. Control Options for Seed and Seedling Diseases in Dry Edible Beans — Fusarium Seed and Root Rot

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
SEED and SEEDLING DISEASES				
FUSARIUM SEED and ROOT ROT (*Fusarium solani* f. sp. *phaseoli*)				
Seed Treatment				
Fusarium begins as small, reddish-brown lesions on the taproot that join to form larger lesions, or streaks, as the plant ages. The lesion can extend up to the soil line. The splitting of the tap root, crown and lower stem often reveals a brown-reddish internal discolouration of the water-conducting tissue. Longitudinal cracks and adventitious roots may develop on damaged plants. These adventitious roots are formed above the damaged area. Late infection seldom results in dead plants but rather in stunted, unthrifty-looking ones. Disease development is promoted by soil compaction, short crop rotations and moisture stress. Due to the threat of anthracnose infection to this crop, ALL edible bean seed should be treated with Dynasty 100FS. See Table 5–8. *Control Options for Seed and Seedling Diseases in Dry Edible Beans — Anthracnose, Phytophthora spp.*, for more details. Other seed treatment products may be needed to protect against other edible bean diseases. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	fludioxonil + metalaxyl-M	Apron Maxx RFC	100 mL + 230 mL of water/ 100 kg seed	For commercial and on-farm treating. Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturer for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting. For anthracnose control, tank-mix with 10 mL of Dynasty 100FS/100 kg seed.
	fludioxonil + metalaxyl-M mandestrobin	Apron Maxx RTA	325 mL/ 100 kg seed	For commercial and on-farm treating. Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturer prior to use. Ensure uniform coverage.
		S-2200 3.2FS	26 mL/ 100 kg seed	For commercial and on-farm treating. Regulations under the *Seeds Act* require that an appropriate colourant be added when this product is applied to seed. Ensure uniform seed coverage and do not apply this product in a hopper-box or planter-box at planting time. For resistance management, please note that S-2200 3.2 FS fungicide is a Group 11 fungicide. Any fungal population may contain individuals naturally resistant to S-2200 3.2 FS fungicide and other Group 11 fungicides.
	ipconazole + carbathiin + metalaxyl	Rancona Trio	500 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or cut for forage within 4 weeks after planting. Read label for information regarding resistant strains of fungus. **Provides suppression only of seedling root rot caused by *Fusarium* spp.**
	metalaxyl-M + sedaxane + fludioxonil	Vibrance Maxx RFC	100 mL/ 100 kg seed	For commercial and on-farm treating. Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting. For anthracnose control, tank-mix with 10 mL of Dynasty 100FS/100 kg seed.
		Vibrance Trio	100 mL/ 100 kg seed	For commercial and on-farm treating. Apply 100 mL of Vibrance Trio fungicide plus 225 mL of water (or *Rhizobia* inoculant at rates recommended by the manufacturer to achieve proper total slurry volumes) per 100 kg of 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.
	thiamethoxam + metalaxyl-M + fludioxonil + sedaxane	Cruiser Maxx Beans + Vibrance 500 FS (sold as a co-pack: Cruiser Maxx Vibrance Beans)	195 mL + 5–10 mL/ 100 kg seed (2.5–5 g a.i./ 100 kg seed)	**For use in commercial seed treatment facilities only.** Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting. This product contains no colourant. An appropriate colourant must be added when this product is applied. For additional anthracnose control, tank-mix with 10 mL of Dynasty 100FS/100 kg seed.
	trifloxystrobin	Trilex FS	21 mL/ 100 kg seed	**For use in commercial seed treatment facilities only.** Apply using standard commercial seed treatment equipment. Not for use in hopper-box, planter-box, slurry-box or similar seed treatment applications. Uniform application on seed is necessary to ensure seed safety and best disease protection.

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Table 5–7. Control Options for Seed and Seedling Diseases in Dry Edible Beans — Anthracnose, *Phytophthora* spp.

LEGEND: PHI = Pre-Harvest Interval (in days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
ANTHRACNOSE (*Colletotrichum lindemuthianum*)					
Seed Treatment					
Anthracnose is best controlled by planting disease-free seed and using a seed treatment containing Dynasty 100FS. Should disease still appear, use a foliar fungicide as a rescue treatment.	azoxystrobin	Dynasty 100FS	10 mL/ 100 kg seed	N/A	**For use in commercial seed treatment facilities only.** Due to the threat of anthracnose infection to this crop, **ALL edible bean seed should be treated with Dynasty 100FS**. For additional disease control, use in combination with other fungicide seed treatments.
	carbathiin + thiram	Vitaflo 280	260 mL/ 100 kg seed	N/A	For commercial and on-farm treating. Will not protect from wind-borne spores. This product will not control anthracnose if seed is severely infected. Do not graze or feed livestock on treated areas for 42 days after planting. Read label for information regarding resistant strains of fungus.
Foliar Treatment					
Rainy weather favours this disease, as spores are splashed from diseased areas and carried in wind-borne water droplets or by surface water throughout the field. Take note of weather forecasts, as wet conditions over a prolonged period of time can result in epidemics. Timing of foliar fungicides is important. Apply treatment when disease first appears.	azoxystrobin	Quadris	500 mL/ha (200 mL/acre)	15	Ground and aerial application. Apply 1st application at early flower or when disease first appears. If necessary, re-apply 10–14 days later if disease persists. Maximum 2 applications/yr.
	azoxystrobin + propiconazole	Topnotch	0.77–1.54 L/ha (311–622 mL/acre)	30	Ground and aerial application. Apply when disease first appears, followed by a second application 14 days after, if environmental conditions are favourable for disease development. Maximum 2 applications/yr. 12-hr restricted entry interval.
	fluazinam	Allegro 500F	0.6–1 L/ha (243–404 mL/acre)	30	Ground and aerial application. Apply when plants are at early to mid-bloom (10%–30% bloom). If needed, a second application may be applied 10–14 days later. Under conditions favourable for severe disease development use higher rate. Use sufficient water to ensure thorough coverage. Maximum 2 applications/yr. 24-hr restricted entry interval.
	fluopyram + prothioconazole	Propulse	500–750 mL/ha (202–303 mL/acre)	14	**Ground application only.** Begin application preventively. When disease pressure is high, or when agronomic or weather conditions are conducive to disease development, continue applications as needed on a 7–14-day interval. Use shorter intervals in this range for best protection. When conditions for heavy infestation exist or when growing a less resistant cultivar, use the higher rate. Ensure good canopy penetration for optimum results. Do not exceed 1.5 L/ha/season (2 applications). Do not graze treated area and do not harvest for forage or hay.
	picoxystrobin	Acapela	0.6–0.88 L/ha (1.48–2.17 mL/acre)	15	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.
	pyraclostrobin	Headline EC	400 mL/ha (160 mL/acre)	30	Ground and aerial application. Apply when disease first appears. If necessary, re-apply 10–14 days later if disease persists. This product should not be tank-mixed with Lance, as precipitates can develop. To minimize risk of precipitates forming, use water >10°C and spray solution promptly. Maximum 2 applications per season.
	pyraclostrobin + fluxapyroxad	Priaxor	0.3 L/ha (120 mL/acre)	30	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. Maximum 2 applications/yr. 12-hr restricted entry interval.

DRY EDIBLE BEAN DISEASES

Table 5–7. Control Options for Seed and Seedling Diseases in Dry Edible Beans — Anthracnose, *Phytophthora* spp.

LEGEND: PHI = Pre-Harvest Interval (in days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
***PHYTOPHTHORA* spp. — Suppression only**					
Seed Treatment					
See Table 2–9. *Control Options for Diseases in Soybeans — Phytophthora Root Rot.*	ethaboxam	INTEGO Solo	19.6–39.1 mL/ 100 kg seed	N/A	For commercial and on-farm treating. Regulations under the *Seeds Act* require that an appropriate colourant be added when this product is applied to seed. 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 *Rhizoctonia solani* and other fungal pathogens inciting seed and seedling disease.

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Table 5–8. Control Options for Seed and Seedling Diseases in Dry Edible Beans — Rhizoctonia

Integrate Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
RHIZOCTONIA (*Rhizoctonia solani*)				
Seed Treatment				
This disease occurs when conditions are cool and wet during planting or when these conditions result in a delay in seedling emergence or development. Mid-to-late-season moisture stress (dry conditions) can increase the disease incidence. Management practices include: (1) selecting varieties with good general tolerance to root rots, (2) promoting root growth through a good fertility program, (3) rotating crop (3 yr between bean crops), (4) not overworking the soil and avoiding working it when it is wet, (5) removing excessive water through increased tile drainage and minimizing compaction and (6) applying seed treatments that protect the plant during germination and early growth. Consult your seed company for variety information. Due to the threat of anthracnose infection to this crop, ALL edible bean seed should be treated with Dynasty 100FS. See Table 5–8, *Control Options for Seed and Seedling Diseases in Dry Edible Beans — Anthracnose, Phytophthora spp.*, for more details. Other seed treatment products may be needed to protect against other edible bean diseases. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	azoxystrobin	Dynasty 100FS	10 mL/ 100 kg seed	**For use in commercial seed treatment facilities only.** One application as a seed treatment. For additional disease control, use in combination with Apron Maxx RFC or Cruiser Maxx Beans.
	fludioxonil + metalaxyl-M	Apron Maxx RFC	100 mL + 230 mL of water/ 100 kg seed	For commercial and on-farm treating. Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting.
		Apron Maxx RTA	325 mL/ 100 kg seed	For both commercial seed treatment plants and on-farm treating. Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers prior to use. Ensure uniform coverage.
	ipconazole + carbathiin + metalaxyl	Rancona Trio	500 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or cut for forage within 4 weeks after planting. Read label for information regarding resistant strains of fungus.
	mandestrobin	S-2200 3.2FS	26 mL/ 100 kg seed	For commercial and on-farm treating. Regulations under the *Seeds Act* require that an appropriate colourant be added when this product is applied to seed. Ensure uniform seed coverage and do not apply this product in a hopper-box or planter-box at planting time. For resistance management, please note that S-2200 3.2 FS fungicide is a Group 11 fungicide. Any fungal population may contain individuals naturally resistant to S-2200 3.2 FS fungicide and other Group 11 fungicides.
	metalaxyl-M + fludioxonil + sedaxane	Vibrance Maxx RFC	100 mL/ 100 kg seed	For commercial and on-farm treating. Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting. For anthracnose control, tank-mix with 10 mL of Dynasty 100FS/100 kg 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.
	thiamethoxam + metalaxyl-M + fludioxonil + sedaxane	Cruiser Maxx Beans + Vibrance 500 FS (sold as a co-pack: Cruiser Maxx Vibrance Beans)	195 mL + 5–10 mL/ 100 kg seed (2.5–5 g a.i./ 100 kg seed)	**For use in commercial seed treatment facilities only.** Compatible with *Rhizobium*-based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting. This product contains no colourant. An appropriate colourant must be added when this product is applied.
	trifloxystrobin	Trilex FS	21 mL/ 100 kg seed	**For use in commercial seed treatment facilities only.** Apply using standard commercial seed treatment equipment. Not for use in hopper-box, planter-box, slurry-box or similar seed treatment applications. Uniform application on seed is necessary to ensure seed safety and best disease protection.

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Table 5–9. Control Options for Foliar, Stem and Pod Diseases in Dry Edible Beans — Asian Soybean Rust

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
ASIAN SOYBEAN RUST (*Phakopsora pachyrhizi*)					
Foliar Treatment					
Edible beans are a host for Asian soybean rust. The extent to which these crops are impacted has yet to be determined. See Table 2–16. *Control Options for Diseases in Soybeans — Asian Soybean Rust*, for more details on this disease.	azoxystrobin	Azoshy 250 SC Quadris	500 mL/ha (200 mL/acre)	15	Ground and aerial application. Apply 1st application at early flower or when disease first appears. If necessary, re-apply 10–14 days later if disease persists. Maximum 2 applications/yr.
	azoxystrobin + propiconazole	Fungtion SC Quilt	1.0–1.5 L/ha (404–600 mL/acre)	30	Ground and aerial application. Make the first application at the first sign of disease. Apply the high rate only under conditions of high disease pressures. A second application at a 14-day interval may be needed if disease persists. Good spray coverage and canopy penetration are important for best results. Apply in a minimum of 45 L of water/ha for ground application. See label for resistance management strategy. Maximum 2 applications/yr.
	fluopyram + prothioconazole	Propulse	500–750 mL/ha (202–303 mL/acre)	14	**Ground application only.** Begin application preventively. When disease pressure is high, or when agronomic or weather conditions are conducive to disease development, continue applications as needed on a 7–14-day interval. Use shorter intervals in this range for best protection. When conditions for heavy infestation exist or when growing a less resistant cultivar, use the higher rate. Ensure good canopy penetration for optimum results. Do not exceed 1.5 L/ha/season (2 applications). Do not graze treated area and do not harvest for forage or hay.
	penthiopyrad	Vertisan	1–1.75 L/ha (0.4–0.7 L/acre)	21	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. Do not apply more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 3 L/ha/yr. 12-hr restricted entry interval.
	picoxystrobin	Acapela	0.6–0.88 L/ha (240–350 mL/acre)	14	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. Apply no more than 1 application before switching to a fungicide with a different mode of action. Maximum 1.75 L/ha/season. 12-hr restricted entry interval.
	propiconazole	Propi Super 25 EC Tilt 250 E	500–750 mL/ha (200–300 mL/acre)	30	Ground and aerial application. Make first application at the first sign of disease followed by a second application 14 days after the first application, if environmental conditions continue to be favourable for disease development. See label for resistance management strategy. Maximum 2 applications/yr.
	pyraclostrobin	Headline EC	400–600 mL/ha (160–240 mL/acre)	30	Ground and aerial application. Classified as a strobilurin fungicide; use in a preventive fungicide program (pre-infection). See label for resistance management strategy. Maximum 2 applications/yr.
	pyraclostrobin + fluxapyroxad	Priaxor	0.3–0.45 L/ha (120–160 mL/acre)	30	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. Maximum 2 applications/yr. 12-hr restricted entry interval.

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Table 5–10. Control Options for Foliar, Stem and Pod Diseases in Dry Edible Beans — Bean Rust

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
BEAN RUST (*Uromyces appendiculatus*)					
Foliar Treatment					
This disease is extremely rare in Ontario, arriving late in the season. Some dry bean market classes (e.g., pinto beans) can be very susceptible to rust. Consult your seed company for variety information or www.gobeans.ca for more information. If rust arrives during flowering and early pod set, a treatment may be necessary. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops.*	copper octanoate	Cueva	0.5%–2% solution, applied at 470–940 L/ha	1	**Ground application only.** For best control, begin treatment 2 weeks before disease normally appears or when weather forecasts predict a long period of wet weather. Alternatively, begin treatment when disease first appears and repeat at 5–10-day intervals. Maximum 15 applications/yr. 4-hr restricted entry interval.
	myclobutanil	Nova	340 g/ha (138 g/acre)	14	Ground application only. Apply as soon as weather conditions are favourable for rust development or when first rust pustules are present and continue if conditions remain favourable. Apply as a foliar spray with a water volume of 300 L/ha to insure thorough coverage of all plant foliage. Maximum of 3 applications/yr with a 7-10 day retreatment interval. 12-hr restricted entry interval.
	propiconazole	Bumper 432 EC	300 mL/ha (121 mL/acre)	30	Ground and aerial application. Apply when disease is first detected. Maximum 2 applications/yr.
		Nufarm Propiconazole			
		Princeton			
		Tilt 250 E	500 mL/ha (200 mL/acre)	30	Ground and aerial application. Apply when disease is first detected. Maximum 2 applications/yr.
	pyraclostrobin	Headline EC	400–600 mL/ha (160–240 mL/acre)	30	Ground and aerial application. Apply when disease first appears. If necessary, re-apply 10–14 days later if disease persists. Do not tank-mix with Lance, as precipitates can develop. Maximum 2 applications/yr.
	pyraclostrobin + fluxapyroxad	Priaxor	0.3 L/ha (120 mL/acre)	30	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. Maximum 2 applications/yr. 12-hr restricted entry interval.

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Table 5–11. Control Options for Foliar, Stem and Pod Diseases in Dry Edible Beans — White Mould

LEGEND: PHI = Pre-Harvest Interval (in days) — = no information on label

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
WHITE MOULD (*Sclerotinia sclerotiorum*)					
Avoid soybeans, canola and other hosts in a 3-yr rotation, since these crops are susceptible to white mould. Rotate with non-host crops such as wheat, corn and barley. In fields with a history of the disease, select varieties with an upright structure. Lower plant populations and increased row width promote rapid drying of the plants and soil surface and therefore reduce potential for infection. Avoid excess fertilization. Those fields at risk have a past history of white mould and above-average foliage growth. All products must be used as a preventive measure, as they will not be effective once the disease is present. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	azoxystrobin + propiconazole	Topnotch	0.77 L/ha (311 mL/acre)	30	**Provides suppression only.** Ground and aerial application. Apply when disease first appears, followed by a second application 14 days after, if environmental conditions are favourable for disease development. Maximum 2 applications/yr. 12-hr restricted entry interval.
	Bacillus subtilis QST 713 strain	Serenade OPTI	1.7–3.3 kg/ha (0.69–1.34 kg/acre)	0	**Provides suppression only.** Good option for organically grown beans. Ground and aerial application. Make the first application at planting (or immediately following planting but prior to crop emergence). Make a second application as a directed spray with multiple nozzles per seed line in sufficient water to ensure thorough coverage of lower plant leaves and surrounding soil surface within 7 days of thinning. Repeat applications at 7–10-day intervals if conditions for disease development persist.
	boscalid	Lance	560–770 g/ha (227–312 g/acre)	21	Ground and aerial application. Best used as a preventive measure. Apply at 20%–50% flowering. Apply a second time 7–10 days later, up to 50% flowering, if disease persists or weather conditions are favourable for disease development. Do not tank-mix with Headline, as precipitates can develop. Plant-back interval of 14 days for crops not on label. 4-hr restricted entry interval.
	boscalid + prothioconazole	Cotegra	0.7 L/ha (280 mL/acre)	21	Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100–200 L/ha for ground application. Ensure thorough coverage of foliage. Apply a second time 7–14 days later if disease persists, or weather conditions are favourable for disease development. Use shorter interval when disease pressure is high. Maximum 2 applications/yr.
	Coniothyrium minitans	Contans WG	0.5–4 kg/ha (0.20–1.6 kg/acre)	0	**Provides suppression only.** Good option for organically grown beans. **Ground application only.** This product should be applied at least 3 months prior to anticipated outbreak (e.g., prior to planting). Product should be incorporated as thoroughly as possible to a depth of 5–20 cm. Rate should be increased to 2–4 kg/ha (0.8–1.6 kg/acre) if incorporated to a depth greater than 5 cm. A post-harvest application may be applied in the fall to treat the soil prior to spring planting of a susceptible crop. Treated soils in the fall should not be disturbed to avoid bringing untreated sclerotia from lower soil layers to the top soil layer. Maximum 2 applications/yr.
	dicloran	Botran 75 WP	3.25 kg/ha (1.3 kg/acre)	2	Begin application when disease is anticipated, usually close to full bloom. Do not feed treated bean refuse to livestock.
	fluazinam	Allegro 500F	0.6–1.0 L/ha (243–404 mL/acre)	14	Ground and aerial application. Best used as a preventive measure. Apply when plants are at early to mid-bloom (10%–30% bloom) and with repeat application, if necessary, 7–10 days later. Use sufficient water to ensure thorough coverage of foliage. Maximum 2 applications/yr and maximum of 2 L of product per season. 24-hr restricted entry interval.

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Table 5–11. Control Options for Foliar, Stem and Pod Diseases in Dry Edible Beans — White Mould

LEGEND: PHI = Pre-Harvest Interval (in days) — = no information on label

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
WHITE MOULD (*Sclerotinia sclerotiorum*) (continued)					
(continued)	fluopyram + prothioconazole	Propulse	750 mL/ha (303 mL/acre)	14	**Ground application only.** Begin applications preventively. When disease pressure is high, or when agronomic or weather conditions are conducive to disease development, continue applications as needed on a 7–14-day interval. Use shorter intervals for best protection. Ensure good penetration for optimum results. Do not exceed 1.5 L/ha/season (2 applications). Do not graze treated area and do not harvest for forage or hay.
	fluoxastrobin + tetraconazole	Zolera FX	350–500 mL/ha (142–202 mL/acre)	14	**Ground application only**. For optimum results, begin applications preventively and continue as needed on a 7–14-day interval. There is a maximum number of 2 applications per season. 12-hr restricted entry interval.
	iprodione	Rovral WP	1.0–1.5 kg/ha (0.4–0.6 kg/acre)	14	Apply at 25%–75% bloom. Do not feed treated bean refuse to livestock. 12-hr restricted entry interval.
	isofetamid	Kenja	1.25 L/ha (0.51 L/acre)	30	Initiate applications prior to disease development and continue on a 7–14-day interval. Beans and other legumes are most susceptible to white mould infection during the bloom period. The PHI for dry beans is 30 days. 12-hr restricted entry interval.
	metconazole	Quash	280 g/ha (113.3 g/acre)	21	Ground and aerial application. Apply prior to disease development. Make first application at 20%–50% bloom stage, before disease symptoms are visible. Make a second application at full bloom (minimum 7-day interval). Do not make more than 2 applications or apply more than 560 g/ha per season.
	picoxystrobin	Acapela	0.88 L/ha (350 mL/acre)	14	Ground and aerial application. Make preventive application at 100% bloom (1 flower blooming on all plants) and follow with second application 7–10 days later at full bloom. Apply no more than 1 application before switching to a fungicide with a different mode of action. Maximum 1.75 L/ha/season. 12-hr restricted entry interval.
	thiophanate-methyl	Cercobin	Ground: 2.45–3.15 L/1,000 L of water/ha (0.99– 1.27 L/405 L of water/acre) Aerial: 2.45–3.15 L/50-60 L of water/ha (0.99– 1.27 L/20–24 L of water/acre)	21	Ground and aerial application. Commence when conditions favouring development of disease exist (e.g., warm, humid weather combined with heavy, dense crop foliage). This usually occurs during the early stages of bloom prior to the rows closing in. Spray to achieve optimum coverage and penetration on all parts of the plant. If disease conditions persist, a second application may be warranted with a minimal retreatment interval of 7 days. Maximum of 6.3L (3.15 kg a.i.) of product/ha/year. Restricted entry interval is when product dries.

DRY EDIBLE BEAN DISEASES

Table 5–12. Control Options for Halo Blight, Common Blight, Brown Spot and Powdery Mildew

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
HALO BLIGHT (*Pseudomonas syringae* pv. *phaseolicola*)					
Foliar Treatment					
Check with your seed supplier for dry bean varieties resistant to common bacterial blight or halo blight. The bacteria usually do not overwinter in the field. However, to be safe, allow 1 year between susceptible crops. Do not plant seed that has been harvested from infected fields or plant crop next to a field that had significant blight in the previous year. Incorporate infected bean debris into the soil after harvest. Bacterial blights spread easily when plants are wet from rain or dew. Stay out of wet fields with equipment and workers. Clean cultivators when moving from field to field. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	copper octanoate	Cueva	0.5%–2% solution, applied at 470–940 L/ha	1	**Ground application only.** For best control, begin treatment 2 weeks before disease normally appears or when weather forecasts predict a long period of wet weather. Alternatively, begin treatment when disease first appears and repeat at 5–10-day intervals. Maximum 15 applications/yr. 4-hr restricted entry interval.
COMMON BLIGHT (*Xanthomonas campestris* pv. *phaseoli*)					
Check with your seed supplier for dry bean varieties resistant to common bacterial blight or halo blight. The bacteria usually do not overwinter in the field. However, to be safe, allow 1 year between susceptible crops. Do not plant seed that has been harvested from infected fields or plant crop next to a field that had significant blight in the previous year. Incorporate infected bean debris into the soil after harvest. Bacterial blights spread easily when plants are wet from rain or dew. Stay out of wet fields with equipment and workers. Clean cultivators when moving from field to field. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	copper octanoate	Cueva	0.5%–2% solution, applied at 470–940 L/ha	1	**Ground application only.** For best control, begin treatment 2 weeks before disease normally appears or when weather forecasts predict a long period of wet weather. Alternatively, begin treatment when disease first appears and repeat at 5–10-day intervals. Maximum 15 applications/yr. 4-hr restricted entry interval.
BROWN SPOT (*Pseudomonas syringae* pv. *syringae*)					
This disease has been increasing, especially in specialty bean types. Leaf lesions often don't appear water soaked and are much smaller than common bacterial blight and halo blight. When the disease becomes systemic, tan and sunken lesions with reddish-brown borders develop on stems and petioles. Pods may appear bent or have water-soaked lesions with a reddish-brown margin. For more information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.	copper octanoate	Cueva	0.5%–2% solution, applied at 470–940 L/ha	1	**Ground application only.** For best control, begin treatment 2 weeks before disease normally appears or when weather forecasts predict a long period of wet weather. Alternatively, begin treatment when disease first appears and repeat at 5–10-day intervals. Maximum 15 applications/yr. 4-hr restricted entry interval.

DRY EDIBLE BEAN DISEASES

Table 5–12. Control Options for Halo Blight, Common Blight, Brown Spot and Powdery Mildew

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
POWDERY MILDEW (*Erysiphe* spp.)					
See Table 2–15. *Control Options for Diseases in Soybeans — Powdery Mildew*, for information.	azoxystrobin + propiconazole	Quilt Topnotch	0.77 L/ha (311 mL/acre)	30	Ground and aerial application. Apply when disease first appears, followed by a second application 14 days after, if environmental conditions are favourable for disease development. Maximum 2 applications/yr. 12-hr restricted entry interval.
	copper octanoate	Cueva	0.5%–2% solution, applied at 470–940 L/ha	1	**Ground application only.** For best control, begin treatment 2 weeks before disease normally appears or when weather forecasts predict a long period of wet weather. Alternatively, begin treatment when disease first appears and repeat at 5–10-day intervals. Maximum 15 applications/yr. 4-hr restricted entry interval.

6. Canola and Mustard

CANOLA AND MUSTARD INSECTS

Table 6–1. Control Options for Insects in Canola and Mustard — Flea Beetles

LEGEND: PHI = Pre-Harvest Interval (in days) — = no information on label N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
FLEA BEETLES (*Phyllotreta cruciferae* and *Phyllotreta striolata*)					
Seed Treatment					
Hot, dry weather favours this pest. Once the crop reaches the 3–4-leaf stage, the plants are generally established and can compensate for the feeding damage. Canola seedlings can withstand up to 25% defoliation in the cotyledon stage under good growing conditions without a significant reduction in yield. No thresholds are available for late-season pod feeding by the second generation of adults. Only when adult populations are extreme, and dry conditions are hindering the crop from compensating for the pod damage, is a spray recommended. Honeybees and other pollinators regularly visit canola and mustard flowers. Keep insecticide application to a minimum while the crop is in bloom to avoid bee-kills. Advise local beekeepers before you apply a pesticide, so that they may take precautions to protect their bees. For more information on preventing bee poisonings, see *Bee Poisoning*.	clothianidin + carbathiin + thiram + metalaxyl	Prosper FL	1.25 L/ 100 kg seed	N/A	**For use in commercial seed treatment facilities only.** Not for use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment application. 30-day plant-back on cereal grains, grasses, non-grass animal feeds, and soybean and dried beans is required. 1-yr plant-back interval is required for leafy, root and tuber vegetables. Can be tank-mixed with Poncho 600 FS for longer season control of flea beetles. Follow resistance management Instructions as stated on label. Toxic to bees. Bees can be exposed to product residues in flowers, leaves, pollen and/or nectar resulting from seed treatments. Toxic to birds and small wild animals. Any spilled or exposed seeds must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to aquatic organisms. Dispose of all excess treated seed. Left-over treated seed may be double-sown around the headlands or buried away from water sources in accordance with local requirements.
	clothianidin + metalaxyl + metconazole	NipsIt SUITE Canola Seed Protection	1.43 L/ 100 kg seed	N/A	**For use in commercial seed treatment facilities only.** Do not make any subsequent application of a Group 4 insecticide (e.g. in-furrow or foliar application) following treatment with NipsIt SUITE. Toxic to bees. Bees can be exposed to product residues in flowers, leaves, pollen and/or nectar resulting from seed treatments. Toxic to birds and small wild animals. Any spilled or exposed seeds must be incorporated into the soil or otherwise cleaned-up from the soil surface. Toxic to aquatic organisms. Dispose of all excess treated seed. Left-over treated seed may be double-sown around the headlands or buried away from water sources in accordance with local requirements.

CANOLA AND MUSTARD INSECTS

Table 6–1. Control Options for Insects in Canola and Mustard — Flea Beetles

LEGEND: PHI = Pre-Harvest Interval (in days) — = no information on label N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
FLEA BEETLES (*Phyllotreta cruciferae* and *Phyllotreta striolata*) (continued)					
Seed Treatment (continued)					
(continued)	cyantraniliprole	Fortenza	1.3 L/ 100 kg seed	N/A	**For use in commercial seed treatment facilities only.** Apply Fortenza as a water-based slurry utilizing standard slurry seed treatment equipment that provides uniform seed coverage. This product contains no colourant. An appropriate colourant must be added when this product is applied. Follow resistance management instructions as stated on label. Toxic to bees. This product is systemic, however, bees are unlikely to be exposed to the product residues in pollen and/or nectar resulting from seed treatment applications. When this product is applied and used according to label directions, risk to bees is expected to be negligible. Toxic to aquatic organisms. Dispose of all excess treated seed. Left-over treated seed may be double-sown around the headlands or buried away from water sources in accordance with local requirements.
		Lumiderm	960 mL–1.6 L/ 100 kg seed	N/A	**For use in commercial seed treatment facilities only.** Use high rates in areas where extended pest control is required. Do not apply a subsequent application of a Group 28 insecticide (anthranilic diamide) in a crop with Lumiderm seed treatment. See label for tank-mix options. Toxic to bees. This product is systemic, however, bees are unlikely to be exposed to the product residues in pollen and/or nectar resulting from seed treatment applications. When this product is applied and used according to label directions, risk to bees is expected to be negligible. Toxic to aquatic organisms. Dispose of all excess treated seed. Left-over treated seed may be double-sown around the headlands or buried away from water sources in accordance with local requirements.

CANOLA AND MUSTARD INSECTS

Table 6–1. Control Options for Insects in Canola and Mustard — Flea Beetles

LEGEND: PHI = Pre-Harvest Interval (in days) — = no information on label N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
FLEA BEETLES (*Phyllotreta cruciferae* and *Phyllotreta striolata*) (continued)					
Seed Treatment (continued)					
(continued)	imidacloprid	Gaucho 480 FL	820 mL–1.64 L/ 100 kg seed	N/A	**For use in commercial seed treatment facilities only.** Not for use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment application. Do not graze livestock on treated areas for 4 weeks after planting. Do not use mustard greens that have had Gaucho 480 FL seed treatment for human consumption. Use higher rate if flea beetle populations are high. Toxic to bees. Bees can be exposed to product residues in flowers, leaves, pollen and/or nectar resulting from seed treatments. Toxic to birds, wildlife and aquatic invertebrates. Any spilled or exposed seeds must be incorporated into the soil or otherwise cleaned-up from the soil surface. Left-over treated seed may be double-sown around the headlands or buried away from water sources in accordance with local requirements. Keep out of lakes, streams, ponds and other aquatic habitats.
		Sombrero 600 FS	670 mL–1.33 L/ 100 kg seed	N/A	**For use in commercial seed treatment facilities only.** Dilute with 63–133 mL/100 kg water. A colourant MUST be added to this product to colour seed in accordance with the *PCP Act* and the *Seeds Act* regulations. A blue colourant must be added when this product is applied to oilseed. Toxic to bees. Bees can be exposed to product residues in flowers, leaves, pollen and/or nectar resulting from seed treatments. Toxic to birds, wildlife and aquatic invertebrates. Any spilled or exposed seeds must be incorporated into the soil or otherwise cleaned-up from the soil surface. Left-over treated seed may be double-sown around the headlands or buried away from water sources in accordance with local requirements. Keep out of lakes, streams, ponds and other aquatic habitats.
	imidacloprid + carbathiin + thiram	Gaucho CS FL	1.4 L/ 100 kg seed	N/A	**For use in commercial seed treatment facilities only.** Not for use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment application. Do not graze livestock on treated areas for 4 weeks after planting. Do not use mustard greens that have had Gaucho CS FL seed treatment for human consumption. Follow resistance management instructions as stated on label. Toxic to bees. Bees can be exposed to product residues in flowers, leaves, pollen and/or nectar resulting from seed treatments. Toxic to birds, wildlife and aquatic invertebrates. Any spilled or exposed seeds must be incorporated into the soil or otherwise cleaned-up from the soil surface. Left-over treated seed may be double-sown around the headlands or buried away from water sources in accordance with local requirements. Keep out of lakes, streams, ponds and other aquatic habitats.
	thiamethoxam + difenoconazole + metalaxyl-m + fludioxonil + sedaxane	Helix Vibrance	1.5 L/ 100 kg seed	N/A	**For use in commercial seed treatment facilities only.** Apply Helix Vibrance using standard commercial seed treatment equipment that provides uniform seed coverage. Do not make any subsequent application of a Group 4 insecticide (e.g. in-furrow or foliar application) following treatment with Helix Vibrance. Toxic to bees. Bees can be exposed to product residues in flowers, leaves, pollen and/or nectar resulting from seed treatments. Toxic to birds, wildlife and aquatic invertebrates. Any spilled or exposed seeds must be incorporated into the soil or otherwise cleaned-up from the soil surface. Left-over treated seed may be double-sown around the headlands or buried away from water sources in accordance with local requirements. Keep out of lakes, streams, ponds and other aquatic habitats.

CANOLA AND MUSTARD INSECTS

Table 6–1. Control Options for Insects in Canola and Mustard — Flea Beetles

LEGEND: PHI = Pre-Harvest Interval (in days) — = no information on label N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
FLEA BEETLES (*Phyllotreta cruciferae* and *Phyllotreta striolata*) (continued)					
Foliar Treatment					
Honeybees and other pollinators regularly visit canola and mustard flowers. Keep insecticide application to a minimum while the crop is in bloom, to avoid bee-kills. Advise local beekeepers before you apply a pesticide, so that they may take precautions to protect their bees. For more information on preventing bee poisonings, see *Bee Poisoning*.	carbaryl	Sevin XLR Plus	500 mL/ha (200 mL/acre)	60	**Ground application only. Seedling stage only** (up to 4 weeks after plant emergence). 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. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site. DO NOT apply during the crop blooming period. Toxic to birds, mammals and aquatic organisms. Observe buffer zones specified on the label. To reduce runoff from treated areas into aquatic habitats, consider the characteristics and conditions of the site before treatment.
	cypermethrin	Mako	50 mL/ha (20 mL/acre)	30	**For use in canola only. Ground application only**. Apply when signs of insect damage appear. Repeat treatment if necessary. Use minimum 110 L/ha of water. Toxic to bees and other beneficial insects. Avoid spraying when bees are foraging. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site. DO NOT apply during the crop blooming period. Toxic to aquatic organisms. Observe buffer zones specified on the label. Avoid application to areas with moderate to steep slope, compacted soil or clay.
		Ripcord 400 EC	50 mL/ha (20 mL/acre)	30	**For use in canola only. Ground application only**. Apply when signs of insect damage appear. Repeat treatment if necessary. Use minimum 110 L/ha of water. Toxic to bees and other beneficial insects. Avoid spraying when bees are foraging. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site. DO NOT apply during the crop blooming period. Toxic to aquatic organisms. Observe buffer zones specified on the label. Avoid application to areas with moderate to steep slope, compacted soil or clay.
		Ship 250	140 mL/ha (57 mL/acre)	30	**For use in canola only.** Ground and aerial application. Apply when first signs of injury appear. Avoid application when temperatures are above 27°C.Toxic to fish and aquatic organisms. Toxic to predacious mites and other beneficial predacious arthropods. Do not apply when weather conditions favour drift from target area. Do not contaminate ponds, lakes, streams or rivers during sprayer filling operation or while spraying. This product is very toxic to bees; avoid spraying when bees are foraging. Spray deposit should be dry before bees commence foraging in treated crop. Observe buffer zones specified on the label.

CANOLA AND MUSTARD INSECTS

Table 6–1. Control Options for Insects in Canola and Mustard — Flea Beetles

LEGEND: PHI = Pre-Harvest Interval (in days) — = no information on label N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
FLEA BEETLES (*Phyllotreta cruciferae* and *Phyllotreta striolata*) (continued)					
Foliar Treatment (continued)					
(continued)	deltamethrin	Decis 5 EC	100–150 mL/ha (40–60 mL/acre)	14	Ground and aerial application. Use a minimum of 100 L/ha of water for ground application. Use a minimum of 11–22 L/ha of water for aerial application. 12-hr restricted entry interval. Toxic to bees for 1 day after application. DO NOT apply when crop or weeds are in bloom. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.
		Decis 100 EC	50–75 mL/ha (20–30 mL/acre)	7	Ground and aerial application. Application should be made when the beetles are actively feeding. Use 100 L water/ha for ground application, 20–45 L water/ha for aerial application. Maximum 3 applications/yr. If 3 applications are used, only the first or second application can be at 100 mL/ha. Do not apply more than 250 mL/ha per year. Minimum interval between applications: 5–7 days by ground application. Toxic to bees for 1 day after application. DO NOT apply when crop or weeds are in bloom. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.
	lambda-cyhalothrin	Labamba Matador 120 EC Silencer 120 EC	83 mL/ha (34 mL/acre)	7	Ground and aerial application. Maximum 3 applications/yr. Maximum 1 aerial application. 24-hr restricted entry interval. 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. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.
	lambda-cyhalothrin + chlorantraniliprole	Voliam Xpress	225 mL/ha (91 mL/acre)	7	Ground and aerial application. To prevent migration of overwintering beetles, ground spray a 15-m strip around the field at the first sign of flea beetle feeding. Maximum of 3 applications/yr by ground, 1 application/yr by air. Apply in a minimum of 100–200 L of water/ha for ground applications, 40 L of water/ha for aerial applications. Do not apply Voliam Xpress following a Group 28 insecticide (e.g. Lumiderm) seed treatment. 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. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.

CANOLA AND MUSTARD INSECTS

Table 6–1. Control Options for Insects in Canola and Mustard — Flea Beetles

LEGEND: PHI = Pre-Harvest Interval (in days) — = no information on label N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
FLEA BEETLES (*Phyllotreta cruciferae* and *Phyllotreta striolata*) (continued)					
Foliar Treatment (continued)					
(continued)	permethrin	Ambush 500EC	70–140 mL/ha (28–57 mL/acre)	30	Ground and aerial application. Use higher rate when infestations are severe. Restricted entry interval as soon as spray has dried. Maximum applications: 2 (ground), 1 (aerial) per season. Toxic to bees. Avoid spraying when bees are foraging. Spray deposit should be dry before bees commence foraging in treated crop. This product contains a petroleum distillate which is moderately to highly toxic to aquatic organisms. Avoid contamination of aquatic systems during application. Observe buffer zones specified on the label.
		Perm-UP	90–180 mL/ha (36–73 mL/acre)	30	**For use in canola only.** Ground and aerial application. Use higher rate when infestations are severe. Maximum aerial applications: 1 per season. Toxic to bees. Avoid spraying when bees are foraging. Toxic to aquatic organisms. Observe buffer zones specified under DIRECTIONS FOR USE. Toxic to birds. Toxic to bees. Bees may be exposed through direct spray, spray drift, and residues on leaves, pollen and nectar in flowering crops and weeds. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site. Avoid applications when bees are foraging in the treatment area in ground cover containing blooming weeds. Spray deposit should be dry before bees commence foraging in treated crop. Toxic to certain beneficial insects. Minimize spray drift to reduce harmful effects on beneficial insects in habitats next to the application site such as hedgerows and woodland.

CANOLA AND MUSTARD INSECTS

Table 6–2. Control Options for Insects in Canola and Mustard — Cutworm, Swede Midge, Cabbage Seedpod Weevil, Tarnished Plant Bug

LEGEND: PHI = Pre-Harvest Interval (in days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
CUTWORM (Various species)					
Seed Treatment					
Redbacked cutworms are most commonly found in Northern Ontario. Larvae hatch in the spring and feed on the seedling crop before pupating mid-summer. Adult moths emerge and lay eggs late in the summer or early fall near weedy plants within the field. Practice good weed management to reduce attractiveness of adult moths during egg laying (typically August).	cyantraniliprole	Fortenza	500 mL/ 100 kg seed	N/A	**For use in commercial seed treatment facilities only.** Apply Fortenza as a water-based slurry utilizing standard slurry seed treatment equipment that provides uniform seed coverage. This product contains no colourant. An appropriate colourant must be added when this product is applied. Follow resistance management instructions as stated on label. Toxic to bees. This product is systemic, however, bees are unlikely to be exposed to the product residues in pollen and/or nectar resulting from seed treatment applications. When this product is applied and used according to label directions, risk to bees is expected to be negligible. Toxic to aquatic organisms. Dispose of all excess treated seed. Left-over treated seed may be double-sown around the headlands or buried away from water sources in accordance with local requirements.
		Lumiderm	480–960 mL/ 100 kg seed	N/A	**For use in commercial seed treatment facilities only.** Do not make a subsequent foliar application of any Group 28 insecticide (e.g. Coragen and Voliam Xpress) for a minimum of 60 days after planting seed treated with Lumiderm. See label for tank-mix options. This product contains no colourant. An appropriate colourant must be added when this product is applied. Toxic to bees. This product is systemic, however, bees are unlikely to be exposed to the product residues in pollen and/or nectar resulting from seed treatment applications. When this product is applied and used according to label directions, risk to bees is expected to be negligible. Toxic to aquatic organisms. Dispose of all excess treated seed. Left-over treated seed may be double-sown around the headlands or buried away from water sources in accordance with local requirements.

CANOLA AND MUSTARD INSECTS

Table 6–2. Control Options for Insects in Canola and Mustard — Cutworm, Swede Midge, Cabbage Seedpod Weevil, Tarnished Plant Bug

LEGEND: PHI = Pre-Harvest Interval (in days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
CUTWORM (Various species) (continued)					
Foliar Treatment					
Control may be necessary if 25%–30% stand reduction has occurred. Spot treatments of areas where damage is noticed may be sufficient. Ensure that the larvae are still actively feeding before making a spray decision. Cutworms are active at night. Time applications for the evening when larvae are active.	cyantraniliprole	Coragen	250 mL/ha (101 mL/acre)	1	Ground and aerial application. Apply in a minimum of 100 L of water/ha for ground applications, 50 L of water/ha for aerial applications. For early season cutworm control, apply to foliage when rain is not expected in the next 24 hours. Do not make more than 3 applications per season. Do not make foliar application of any Group 28 insecticide (e.g. Coragen) for a minimum of 60 days after planting seed treated with Lumiderm. Toxic to aquatic organisms. Do not apply this product directly to freshwater, estuarine and marine habitats. Observe buffer zones specified. Toxic to certain beneficial insects. Minimize spray drift to reduce harmful effects to beneficialinsects in habitats adjacent to application site.
	chlorpyrifos	Citadel 480 EC Pyrinex 480 EC Sharphos Insecticide	875 mL–1.2 L/ha (354–486 mL/acre)	21	Ground and aerial application. Apply 50–200 L/ha water for ground application equipment, or 10–30 L/ha water for aerial application. Apply to soil or foliage when damage first appears. Use the higher rate of dilution when infestations are heavy and when the foliage is dense. Spray in the evening to reduce harm to pollinators. Do not apply more than once per season. Do not enter treated fields until 1 day after application. Toxic to bees exposed to direct treatment, drift or residues on blooming plants. DO NOT use on flowering crops or weeds. DO NOT apply this product or allow it to drift to flowering crops or weeds if bees are visiting the treatment area. Applicators should inform local beekeepers prior to application if hives are in adjacent fields. This product contains a petroleum distillate which is moderately to highly toxic to aquatic organisms. Avoid contamination of aquatic systems during application. Drift and runoff from treated areas may be hazardous to aquatic organisms in adjacent aquatic sites.
	lambda-cyhalothrin	Labamba Matador 120 EC	83 mL/ha (34 mL/acre)	7	Ground and aerial application. Applications should be made in the evening or night when cutworm activity is highest. Maximum 3 applications/yr. Maximum 1 aerial application. 24-hr restricted entry interval. 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. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.

CANOLA AND MUSTARD INSECTS

Table 6–2. Control Options for Insects in Canola and Mustard — Cutworm, Swede Midge, Cabbage Seedpod Weevil, Tarnished Plant Bug

LEGEND: PHI = Pre-Harvest Interval (in days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
SWEDE MIDGE (*Contarinia nasturtii*)					
Swede midge is a serious pest of spring canola, though winter canola can experience damage. Under heavy midge infestations, later-planted spring canola plants may experience stunting and malformed growth, with extremely reduced flower and pod formation. Fields planted later than the first week of June are at significantly increased risk of swede midge damage. Go to www.ontariocanolagrowers.ca for up-to-date management recommendations. Timing of insecticides is critical and is based on pheromone trapping results.	chlorantraniliprole	Coragen	250–375 mL/ha (101–151 mL/acre)	1	**Ground application only.** Do not apply this product for a minimum of 60 days following a seed treatment of a Group 28 insecticide (e.g. Fortenza and Lumiderm) within that season. For ground application, use a minimum water volume of 100 L/ha. Use high rate of Coragen under heavy pest pressure. Minimum of 3 days between applications. Maximum 3 applications/yr. 12-hr restricted entry interval. Toxic to aquatic organisms. Do not apply this product directly to freshwater, estuarine and marine habitats. Observe buffer zones specified. Toxic to certain beneficial insects. Minimize spray drift to reduce harmful effects to beneficial insects in habitats adjacent to application site.
	lambda-cyhalothrin	Labamba Matador 120 EC Silencer 120 EC	83 mL/ha (34 mL/acre)	7	Ground and aerial application. Use 100–200 L of water/ha for ground application; 10– 40 L of water per hectare for aerial Allow a 7-day interval between treatments. Maximum 3 applications/yr. Do not apply more than 2 applications by air. 24-hr restricted entry interval. 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. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.

CANOLA AND MUSTARD INSECTS

Table 6–2. Control Options for Insects in Canola and Mustard — Cutworm, Swede Midge, Cabbage Seedpod Weevil, Tarnished Plant Bug

LEGEND: PHI = Pre-Harvest Interval (in days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
CABBAGE SEEDPOD WEEVIL (*Ceutorhynchus obstrictus*)					
This is a serious pest in winter canola, though it can also impact early-planted spring canola. Adult weevils lay eggs directly into the seedpod. Pod feeding by the larvae can cause up to 35% yield loss. Apply insecticide to adults prior to egg-laying, as foliar insecticide will not control larvae within the canola pod. See the OMAFRA Publication 811, *Agronomy Guide for Field Crops*, for further information on pest biology and management options. Honeybees and other pollinators regularly visit canola and mustard flowers. Keep insecticide application to a minimum while the crop is in bloom to avoid bee-kills. Advise local beekeepers before you apply a pesticide, so that they may take precautions to protect their bees. For more information on preventing bee poisonings, see *Bee Poisoning*.	deltamethrin	Decis 5 EC	200 mL/ha (100 mL/acre)	7	Ground and aerial application**.** For adult control only. Apply when adults are seen on flower buds or developing pods. Apply in a minimum of 100 L of water/ha for ground applications, 20–45 L of water/ha for aerial applications. Maximum 3 applications/yr. DO NOT apply more than 500 mL/ha per season. If 3 applications are used, only the first and second application can be at 200 mL/ha. Toxic to bees for 1 day after application. DO NOT apply when crop or weeds are in bloom. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.
	deltamethrin	Decis 100 EC	100 mL/ha (40 mL/acre)	7	**For control of adult weevil only.** Apply when adults are seen on flower buds or developing pods. Must apply prior to egg laying. Consult extension experts for economic threshold. Use 100 L water/ha for ground application, 20–45 L water/ha for aerial application. Maximum 3 applications/yr. If 3 applications are used, only the first or second application can be at 100 mL/ha. Do not apply more than 250 mL/ha per year. Minimum interval between applications: 5–7 days by ground application. Toxic to bees for 1 day after application. DO NOT apply when crop or weeds are in bloom. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.
	lambda-cyhalothrin	Labamba Matador 120 EC Silencer 120 EC	83 mL/ha (34 mL/acre)	7	Ground and aerial application. For adult control only. Apply at bud-to-early-flowering stage. Maximum 1 application/yr. 24-hr restricted entry interval. 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. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.
	lambda-cyhalothrin + chlorantraniliprole	Voliam Xpress	225 mL/ha (91 mL/acre)	7	Apply at the bud-to-early-flowering stage. Make only 1 application per season by either ground or aerial. Apply in a minimum of 100–200 L of water/ha for ground applications, 40 L of water/ha for aerial applications. 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. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.

CANOLA AND MUSTARD INSECTS

Table 6–2. Control Options for Insects in Canola and Mustard — Cutworm, Swede Midge, Cabbage Seedpod Weevil, Tarnished Plant Bug

LEGEND: PHI = Pre-Harvest Interval (in days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
TARNISHED PLANT BUG (*Lygus lineolaris*) and LYGUS BUG (*Lygus* spp.)					
Foliar Treatment					
Tarnished plant bugs sting plant tissue, including pods and flowers. This causes scarring, malformation and dimpling or pitting on pods. They can also drill into the seed. If flowers are still present, they can prick the flower and cause it to abort. Spraying is warranted when 2 bugs per sweep are found after petal fall, prior to pod maturity. Honeybees and other pollinators regularly visit canola and mustard flowers. Keep insecticide application to a minimum while the crop is in bloom to avoid bee-kills. Advise local beekeepers before you apply a pesticide, so that they may take precautions to protect their bees. For more information on preventing bee poisonings, see *Bee Poisoning*.	chlorpyrifos	Citadel 480 EC Pyrinex 480 EC Sharphos Insecticide	0.5–1.0 L/ha (200–400 mL/acre)	21	Ground and aerial application. Apply 50–200 L/ha water for ground application equipment, or 10–30 L/ha water for aerial application. Use the higher rate of dilution when infestations are heavy and when the foliage is dense. Spray in the evening to reduce harm to pollinators. Do not apply more than once per season. Do not enter treated fields until 1 day after application. Toxic to bees exposed to direct treatment, drift or residues on blooming plants. DO NOT use on flowering crops or weeds. DO NOT apply this product or allow it to drift to flowering crops or weeds if bees are visiting the treatment area. Applicators should inform local beekeepers prior to application if hives are in adjacent fields. This product contains a petroleum distillate which is moderately to highly toxic to aquatic organisms. Avoid contamination of aquatic systems during application. Drift and runoff from treated areas may be hazardous to aquatic organisms in adjacent aquatic sites.
	lambda-cyhalothrin	Labamba Matador 120 EC Silencer 120 EC	83 mL/ha (34 mL/acre)	7	Ground and aerial application. Maximum 3 applications/yr. Maximum 1 aerial application. 24-hr restricted entry interval. 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. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.
	lambda-cyhalothrin + chlorantraniliprole	Voliam Xpress	225 mL/ha (91 mL/acre)	7	Apply at the bud-to-early-flowering stage. Make only 1 application per season by either ground or aerial. Apply in a minimum of 100–200 L of water/ha for ground applications, 40 L of water/ha for aerial applications. 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. Toxic to aquatic organisms. Observe buffer zones specified on the label. Overspray or drift into aquatic areas must be avoided. Toxic to small wild mammals.

CANOLA AND MUSTARD DISEASES

Table 6–3. Control Options for Seedling Diseases in Canola and Mustard — Seed Rot and Seedling Blight, Pythium Damping-Off

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
SEED ROT and SEEDLING BLIGHT (*Alternaria, Fusarium* and *Rhizoctonia* spp.)				
Seed Treatment				
Plant good-quality seed under conditions that promote rapid germination (warm temperatures). Using a fungicide seed treatment will increase stand establishment. Maintain a good fertility balance and avoid excess fertilizer, which promotes disease and phytotoxicity. Avoid deep planting of seed.	imidacloprid + carbathiin + thiram	Gaucho CS FL	1.4 L/ 100 kg seed	**For use in commercial seed treatment facilities only.** Not for use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment application. Do not graze livestock on treated areas for 4 weeks after planting. Do not use mustard greens that have had Gaucho CS FL seed treatment for human consumption. Follow resistance management instructions as stated on label.
	ipconazole + carbathiin	Rancona V RS	800 mL/ 100 kg seed	For commercial and on-farm treating. Do not graze or cut for forage within 4 weeks after planting. Read label for information regarding resistant strains of fungus.
	mandestrobin	S-2200 3.2FS	26 mL/ 100 kg seed	For commercial and on-farm treating. Regulations under the *Seeds Act* require that an appropriate colourant be added when this product is applied to seed. Ensure uniform seed coverage and do not apply this product in a hopper-box or planter-box at planting time. For resistance management, please note that S-2200 3.2 FS fungicide is a Group 11 fungicide. Any fungal population may contain individuals naturally resistant to S-2200 3.2 FS fungicide and other Group 11 fungicides.
	thiamethoxam + difenoconazole + metalaxyl-m + fludioxonil + sedaxane	Helix Vibrance	1.5 L/ 100 kg seed	**For use in commercial seed treatment facilities only.** Apply Helix Vibrance using standard commercial seed treatment equipment that provides uniform seed coverage. Do not make any subsequent application of a Group 4 insecticide (e.g. in-furrow or foliar application) following treatment with Helix Vibrance.
PYTHIUM DAMPING-OFF (*Pythium* spp.)				
Plant good-quality seed under conditions that promote rapid germination (warm temperatures). Using metalaxyl or metalaxyl-M seed treatment will increase stand establishment. Maintain a good fertility balance and avoid excess fertilizer, which promotes disease and phytotoxicity. Avoid deep planting of seed.	ethaboxam	INTEGO Solo	13–19.6 mL/ 100 kg seed	For commercial and on-farm treating. Regulations under the *Seeds Act* require that an appropriate colourant must be added when this product is applied to seed. A baby blue colourant must be added when this product is applied to canola/rapeseed. 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 *Rhizoctonia solani* and other fungal pathogens inciting seed and seedling disease.
	metalaxyl	Apron FL	32–110 mL/ 100 kg seed	**For use in canola only.** Do not graze or feed livestock on seeded area for 4 weeks after planting.
	metalaxyl-M	Apron XL LS	20–40 mL/ 100 kg seed	**For use in canola only. 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 label for information regarding resistant strains of fungus.
	thiamethoxam + difenoconazole + metalaxyl-m + fludioxonil + sedaxane	Helix Vibrance	1.5 L/ 100 kg seed	**For use in commercial seed treatment facilities only.** Apply Helix Vibrance using standard commercial seed treatment equipment that provides uniform seed coverage. Do not make any subsequent application of a Group 4 insecticide (e.g. in-furrow or foliar application) following treatment with Helix Vibrance.

CANOLA AND MUSTARD DISEASES

Table 6–4. Control Options for Seedling Diseases in Canola and Mustard — Blackleg

LEGEND: PHI = Pre-Harvest Interval (in days) N/A = not applicable

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
BLACKLEG (*Leptosphaeria maculans*)					
Seed Treatment					
There are differences in susceptibility to blackleg between cultivars. Consult with your seed company for variety information. Maintain at least 3 years between canola crops. Fungicide seed treatments will reduce seed-borne infection.	imidacloprid + carbathiin + thiram	Gaucho CS FL	1.4 L/ 100 kg seed	N/A	**For use in commercial seed treatment facilities only.** Not for use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment application. Do not graze livestock on treated areas for 4 weeks after planting. Do not use mustard greens that have had Gaucho CS FL seed treatment for human consumption. Follow resistance management instructions as stated on label.
	ipconazole + carbathiin	Rancona V RS	800 mL/ 100 kg seed	N/A	For commercial and on-farm treating. Do not graze or cut for forage within 4 weeks after planting. Read label for information regarding resistant strains of fungus.
	pydiflumetofen	Saltro	80 mL/ 100 kg seed 40 g a.i./ 100 kg seed	N/A	**Suppression of seed and air-borne blackleg caused by *Leptosphaeria maculans*.** This product contains no colourant. An appropriate colourant must be added when this product is applied. For control of air-borne blackleg caused by *Leptosphaeria maculans*, rotate this Group 7 fungicide with a different class within the same growing season before a second application of another Group 7.
	thiamethoxam + difenoconazole + metalaxyl-m + fludioxonil + sedaxane	Helix Vibrance	1.5 L/ 100 kg seed	N/A	**For use in commercial seed treatment facilities only.** Apply Helix Vibrance using standard commercial seed treatment equipment that provides uniform seed coverage. Do not make any subsequent application of a Group 4 insecticide (e.g., in-furrow or foliar application) following treatment with Helix Vibrance.
Foliar Treatment					
A foliar fungicide may be warranted if blackleg symptoms occur at the seedling and rosette stages or if a susceptible variety is being grown. Consult with your seed company for variety information.	azoxystrobin	Azoshy 250 SC Quadris	500 mL/ha (200 mL/acre)	30	**For use in canola only.** Apply at 2–6-leaf stage. See label for information regarding resistant strains of fungus. Plant-back interval of 30 days for broadleaf and root crops and 45 days for cereals required.
	azoxystrobin + propiconazole	Fungtion SC Quilt	1.0 L/ha (404 mL/acre)	30	**For use in canola only**. Ground and aerial application. Apply during the rosette stage between 2nd true leaf and bolting. Maximum 1 application/yr. 12-hr restricted entry interval. Apply a minimum of 100 L of water/ha for ground application and 45 L of water/ha for aerial application.
	propiconazole	Bumper 432 EC Nufarm Propiconazole Princeton	300 mL/ha (121 mL/acre)	60	**For use in canola only.** Ground and aerial application. Apply at rosette stage, between 2nd true leaf and bolting.
		Propi Super Tilt 250 E	500 mL/ha (200 mL/acre)		
	pyraclostrobin	Headline EC	300–400 mL/ha (120–160 mL/acre)	21	Apply at the 2–6-leaf stage for black leg and **20%–50% bloom-(suppression only)**-to-early-pod stage (90% bloom) in canola for alternaria black spot. Use the higher rate when 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 2 applications/yr. 12-hr restricted entry interval.
	pyraclostrobin + fluxapyroxad	Priaxor	0.225–0.3 L/ha (90–120 mL/acre)	21	Ground and aerial application. Apply at the 2–6-leaf (rosette) stage. Use the higher rate under high disease pressure. Maximum 2 applications/yr. 12-hr restricted entry interval.

CANOLA AND MUSTARD DISEASES

Table 6–5. Control Options for Stem and Foliar Diseases in Canola and Mustard — Sclerotinia Stem Rot

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
SCLEROTINIA STEM ROT (WHITE MOULD) (*Sclerotinia sclerotiorum*)					
Foliar Treatment					
This disease is often a problem when canola follows canola, dry edible beans, soybeans or sunflowers. Use clean seed and a 4–5-yr rotation with non-host crops such as corn, wheat, barley or oats. At present, no resistant varieties exist. Keep fields clean of broad-leaved weeds, since many are alternate hosts. The disease is very destructive during periods of prolonged, wet weather. Losses of up to 50% can occur under conditions ideal for the disease.	azoxystrobin	Azoshy 250 SC	500 mL/ha (200 mL/acre)	30	**For use in canola only.** Apply at early bloom (prior to 30% bloom). Use the higher rate if there is a history of infection in the area and when environmental conditions favour disease development. See label for information regarding resistant strains of fungus. Plant-back interval of 30 days for broadleaf and root crops and 45 days for cereals required.
		Quadris	700–1,000 mL/ha (283–405 mL/acre)		
	Bacillus subtilis QST 713 strain	Serenade OPTI	0.3–0.9 kg/ha (0.12–0.36 kg/acre)	0	**Provides suppression only.** Ground and aerial application. Begin application at 20%–30% bloom. A second application may be made 7–10 days later, at approximately 50% bloom and prior to significant petal fall, if conditions for disease development remain favourable. Use higher rates in fields with a history of heavy disease pressure. Aerial spray volume: minimum 50 L/ha.
	boscalid	Lance	350 g/ha (142 g/acre)	21	**Ground and aerial application.** Apply at 20%–50% flowering. Apply a second time, 7–10 days later, up to 50% flowering, if disease persists or weather conditions are favourable for disease development. Do not tank-mix with insecticide, as this fungicide could affect insecticide efficacy. 4-hr restricted entry interval.
	boscalid + prothioconazole	Cotegra	0.7 L/ha (280 mL/acre)	21	**Provides suppression only.** Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100–200 L/ha for ground application. Ensure thorough coverage of foliage. Apply a second time 7–14 days later if disease persists, or weather conditions are favourable for disease development. Use shorter interval when disease pressure is high. Maximum 2 applications/yr.
	Coniothyrium minitans	Contans WG	0.5–4 kg/ha (0.20–1.6 kg/acre)	0	**Provides suppression only.** Ground application only. This product should be applied at least 3 months prior to anticipated outbreak (e.g., prior to planting). Product should be incorporated as thoroughly as possible to a depth of 5–20 cm. Rate should be increased to 2–4 kg/ha (0.8–1.6 kg/acre) if incorporated to a depth greater than 5 cm. A post-harvest application may be applied in the fall to treat the soil prior to spring planting of a susceptible crop. Treated soils in the fall should not be disturbed to avoid bringing untreated sclerotia from lower soil layers to the top soil layer. Maximum 2 applications/yr.
	cyprodinil + fludioxonil	Astound	775–975 g/ha (314–395 g/acre)	35	Ground and aerial application. Apply 1 application at 20%–30% bloom stage. Use a minimum of 200 L/ha of water for ground application. Use a minimum of 45 L/ha of water for aerial application. Apply the higher rate under conditions of high disease pressures. Maximum 1 application/yr. 12-hr restricted entry interval.
	fluoxastrobin	Evito	146–292 mL/ha (59–118 mL/acre)	21	Apply preventively at 20%–50% bloom stage. For optimum results apply prior petals beginning to fall. A second application may be made 7–14 days later. Ground and aerial application. 12-hr restricted entry interval.

CANOLA AND MUSTARD DISEASES

Table 6–5. Control Options for Stem and Foliar Diseases in Canola and Mustard — Sclerotinia Stem Rot

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
SCLEROTINIA STEM ROT (WHITE MOULD) (*Sclerotinia sclerotiorum*) (continued)					
Foliar Treatment (continued)					
(continued)	iprodione	Overall 240 SC	2.1–3.1 L/ha (0.8–1.25 mL/acre)	14	**For use in canola only.** Ground and aerial application. Use a minimum of 100 L/ha of water for ground application. Use a minimum of 45 L/ha of water for aerial application. Apply at 20%–30% bloom. Maximum 2 applications/yr. 12-hr restricted entry interval.
		Rovral WP	1.0–1.5 kg/ha (0.4–0.6 kg/acre)	14	**For use in canola only.** Ground and aerial application. Use a minimum of 45 L/ha of water for aerial application. Apply at 20%–30% bloom. 12-hr restricted entry interval.
	mandestrobin	S-2200 4SC	439–877 mL/ha (178–355 mL/acre)	35	Ground and aerial application. Make application between 20% and 50% bloom. Do not use within 35 days of harvest. Under high pressure, use 877 mL/ha. Do not apply more than 1 application/yr. Do not apply more than 877 mL/ha/yr.
	metconazole	Quash	280 g/ha (113.3 g/acre)	45	Ground and aerial application. Apply prior to disease development. Make first application at 20%–50% bloom stage, before disease symptoms are visible. Make a second application at full bloom (minimum 7-day interval). Do not make more than 2 applications or apply more than 560 g/ha per season.
	penthiopyrad	Vertisan	1.25–1.5 L/ha (0.5–0.6 L/acre)	21	Ground and aerial application. Begin applications at 20%–25% bloom prior to disease development. Under high disease pressure, make a 2nd application 7–14 days later. Use higher rate and shorter interval when disease pressure is high. Do not apply more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 3 L/ha/yr. 12-hr restricted entry interval.
	picoxystrobin	Acapela	0.80–1.2 L/ha (320–490 mL/acre)	28	Ground and aerial application. Apply at 20%–50% bloom prior to disease development to control white mould. Use the higher rate or shorter interval when disease pressure is high. Under high disease pressure, make a second application of another fungicide, from a different fungicide group, 7–14 days later. A second application of Acapela fungicide can only be carried out if both applications are at the lowest rate and if sprays are not sequential. Use the high rate under heavy pest pressure. Maximum seasonal use rate is 1.75 L/ha. Maximum 2 applications/yr. 12-hr restricted entry interval.
	prothioconazole	Proline	315–368 mL/ha (128–149 mL/acre)	36	Ground and aerial application. Apply when the crop is in the 20%–50% bloom stage. Best protection will be achieved when applied prior to petals beginning to fall. Higher rate is recommended for fields with a history of heavy disease pressure or for dense plant stands. Good spray coverage is essential. The lowest label rate of a non-ionic surfactant, AgSurf or Agral 90, may be tank-mixed. Maximum 1 application/yr. 24-hr restricted entry interval.
	pyraclostrobin + fluxapyroxad	Priaxor	0.45 L/ha (180 mL/acre)	21	**Provides suppression only.** Ground and aerial application. Apply at 20%–50% flower. Maximum 2 applications/yr. 12-hr restricted entry interval.

CANOLA AND MUSTARD DISEASES

Table 6–6. Control Options for Stem and Foliar Diseases in Canola and Mustard — Alternaria Black Spot

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
ALTERNARIA BLACK SPOT (*Alternaria brassicae* and *A. raphani*)					
Foliar Treatment					
The disease is more prominent in other canola areas of Canada and is sporadic in Ontario. The fungus produces black lesions that can infect all parts of the plant but is especially problematic when it causes pod shatter. Crop rotation, tillage of residues, use of less susceptible variety and timely harvest can reduce impact. Fungicides are very effective.	pyraclostrobin + fluxapyroxad	Priaxor	0.225–0.3 L/ha (90–120 mL/acre)	21	Ground and aerial application. Use the high rate under high disease pressure. Applications at 20%–50% bloom will provide suppression of alternaria black spot, whereas applications at early pod stage will control alternaria black spot. Maximum 2 applications/yr. 12-hr restricted entry interval.

CANOLA AND MUSTARD DISEASES

Table 6–7. Control Options for Root Rot Diseases in Canola and Mustard — Clubroot

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
CLUBROOT (*Plasmodiophora brassicae*)					
In 2016, clubroot (*Plasmodiophora brassicae*) was first detected in Ontario and subsequent surveys have shown it is widespread in the province (Algoma, Temiskaming District, West Nipissing District, Simcoe County, Bruce Peninsula, Dufferin County, and at the Dufferin-Grey county border). Above-ground symptoms are similar to other diseases or nutrient deficiencies and include yellowing, wilting, stunting, premature ripening and plant death. It will appear in patches, and often near the field entrance or in wet areas. Therefore, dig up plants and examine the roots for the characteristic galling of the roots. There are no chemical seed treatments or foliar options available, and management is dependent on limiting soil movement, equipment cleaning, longer rotation 3–5 years and use of resistant varieties. Check with your seed dealer about availability of resistant varieties since there are different pathotypes of clubroot in Ontario. For more information, visit www.fieldcropnews.com.					

7. Stored Grain

STORED-GRAIN INSECTS

Table 7–1. Control Options for Insects in Stored Corn, Wheat and Soybeans — Rusty Grain Beetle

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
RUSTY GRAIN BEETLE (*Cryptolestes ferrugineus*) This beetle feeds on cracked or sound grain. Damage can be throughout the pile of grain. High infestations generate heat, causing grain to mould. The key to controlling stored-grain insects is prevention through good sanitation and storage practices. Grain below 12% moisture content, or relative humidity below 40%, will restrict development. Rusty grain beetles are one of the most cold tolerant stored product insects. See OMAFRA Publication 811, *Agronomy Guide for Field Crops*, for more information on stored-grain insect management.				
Protectant — Structural				
The key to controlling stored-grain insects is prevention through good sanitation and storage practices. See OMAFRA Publication 811, *Agronomy Guide for Field Crops,* for more information on stored-grain insect management. Additional Information can also be found within the Grain Quality Section of the Canadian Grain Commissions website at: www.grainscanada.gc.ca.	diatomaceous earth	Protect-It	Empty bin: 500 g/100 m^2 Stored grain: 500–1,000 g/metric tonne of grain	This product can be applied to dry containers where grain is transported or stored. The structure must remain empty for 1–2 weeks. For maximum effectiveness, the relative humidity must remain below 55% and the temperature above 15°C. See label for spot and crack treatment rates. For wheat grain treatment, 100 g/tonne of wheat can be used to control rusty grain beetle. Dust may be applied to grain as it enters the auger or conveyor feeder system during grain transfer into the storage facility.
Fumigant				
The key to controlling stored-grain insects is prevention through good sanitation and storage practices. See OMAFRA Publication 811, *Agronomy Guide for Field Crops*, for more information on stored-grain insect management. Additional Information can also be found within the Grain Quality Section of the Canadian Grain Commissions website at: www.grainscanada.gc.ca.	aluminum phosphide	Fumitoxin Phostoxin	350–2,560 pellets 70–500 tablets /100 m^3 grain bin	These products must be applied by a professional licensed applicator. Do not fumigate below 5°C. Exposure to moist air or liquids releases flammable and toxic phosphine gas. Ensure bin is tightly sealed. Not to be used for vacuum fumigations. See label for minimum length of pest exposure periods at various temperatures. Toxic to birds and mammals. Carefully inspect the outside and inside of the structure prior to application of the fumigant to ensure the absence of nesting or roosting birds. Avoid application if birds are present.
		Gastoxin	500–1,500 pellets 100–300 tablets /100 m^3 grain bin	

STORED-GRAIN INSECTS

Table 7–2. Control Options for Insects in Stored Corn, Wheat and Soybeans — Indian Meal Moth

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
INDIAN MEAL MOTH (*Plodia interpuctella*) This moth is resistant to malathion. Larvae spin webbing, high populations result in a mat of grain with silks up to 50 cm deep. Remove webbed layer of grain before fumigation. The key to controlling stored-grain insects is prevention through good sanitation and storage practices. See OMAFRA Publication 811, *Agronomy Guide for Field Crops*, for more information on stored-grain insect management.				
Protectant				
The key to controlling stored-grain insects is prevention through good sanitation and storage practices. See OMAFRA Publication 811, *Agronomy Guide for Field Crops*, for more information on stored-grain insect management. Additional Information can also be found within the Grain Quality Section of the Canadian Grain Commissions website at: www.grainscanada.gc.ca.	diatomaceous earth	Protect-It	Empty bin: 500 g/100 m^2 Stored grain: 500–1,000 g/metric tonne of grain	Apply at monthly intervals with the first appearance of moths and continue until early fall. In severe infestations, break up webbing with a rake before dusting and make second application 2 weeks later. Can be applied to dry containers where grain is transported or stored. The structure must remain empty for 1–2 weeks. For maximum effectiveness, the relative humidity must remain below 55% and the temperature above 15°C. See label for spot and crack treatment rates. Dust may be applied to grain as it enters the auger or conveyor feeder system during grain transfer into storage facility.
Fumigant				
The key to controlling stored-grain insects is prevention through good sanitation and storage practices. See OMAFRA Publication 811, *Agronomy Guide for Field Crops*, for more information on stored-grain insect management. Additional Information can also be found within the Grain Quality Section of the Canadian Grain Commissions website at: www.grainscanada.gc.ca.	aluminum phosphide	Fumitoxin Phostoxin	350–2,560 pellets 70–500 tablets /100 m^3 grain bin	These products must be applied by a professional licensed applicator. Do not fumigate below 5°C. Exposure to moist air or liquids releases flammable and toxic phosphine gas. Ensure bin is tightly sealed. Not to be used for vacuum fumigations. See label for minimum length of pest exposure periods at various temperatures. Toxic to birds and mammals. Carefully inspect the outside and inside of the structure prior to application of the fumigant to ensure the absence of nesting or roosting birds. Avoid application if birds are present.
		Gastoxin	500–1,500 pellets 100–300 tablets /100 m^3 grain bin	

STORED-GRAIN INSECTS

Table 7–3. Control Options for Insects in Stored Corn, Wheat and Soybeans — Granary Weevil, Lesser Grain Borer

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
GRANARY WEEVIL (*Sitophilus granarius*) Both adults and larvae feed on sound grain. Larvae spend their entire life in one kernel, feeding on the endosperm. The key to controlling stored-grain insects is prevention through good sanitation and storage practices. See OMAFRA Publication 811, *Agronomy Guide for Field Crops*, for more information on stored-grain insect management.				
Protectant				
The key to controlling stored-grain insects is prevention through good sanitation and storage practices. See OMAFRA Publication 811, *Agronomy Guide for Field Crops*, for more information on stored-grain insect management. Additional Information can also be found within the Grain Quality Section of the Canadian Grain Commissions website at: www.grainscanada.gc.ca.	diatomaceous earth	Protect-It	Empty bin: 500 g per 100 m^2 Stored grain: 500–1,000 g/metric tonne of grain	This product can be applied to dry containers where grain is transported or stored. The structure must remain empty for 1–2 weeks. For maximum effectiveness, the relative humidity must remain below 55% and the temperature above 15°C. See label for spot and crack treatment rates. Dust may be applied to grain as it enters the auger or conveyor feeder system during grain transfer into the storage facility.
Fumigant				
The key to controlling stored-grain insects is prevention through good sanitation and storage practices. See OMAFRA Publication 811, *Agronomy Guide for Field Crops*, for more information on stored-grain insect management. Additional Information can also be found within the Grain Quality Section of the Canadian Grain Commissions website at: www.grainscanada.gc.ca.	aluminum phosphide	Fumitoxin Phostoxin	350–2,560 pellets 70–500 tablets /100 m^3 grain bin	These products must be applied by a professional licensed applicator. Do not fumigate below 5°C. Exposure to moist air or liquids releases flammable and toxic phosphine gas. Ensure bin is tightly sealed. Not to be used for vacuum fumigations. See label for minimum length of pest exposure periods at various temperatures. Toxic to birds and mammals. Carefully inspect the outside and inside of the structure prior to application of the fumigant to ensure the absence of nesting or roosting birds. Avoid application if birds are present.
		Gastoxin	500–1,500 pellets 100–300 tablets /100 m^3 grain bin	
LESSER GRAIN BORER (*Rhyzopertha dominica*)				
Fumigant				
The key to controlling stored-grain insects is prevention through good sanitation and storage practices. See OMAFRA Publication 811, *Agronomy Guide for Field Crops*, for more information on stored-grain insect management. Additional Information can also be found within the Grain Quality Section of the Canadian Grain Commissions website at: www.grainscanada.gc.ca.	aluminum phosphide	Fumitoxin Phostoxin	350–2,560 pellets 70–500 tablets /100 m^3 grain bin	These products must be applied by a professional licensed applicator. Do not fumigate below 5°C. Exposure to moist air or liquids releases flammable and toxic phosphine gas. Ensure bin is tightly sealed. Not to be used for vacuum fumigations. See label for minimum length of pest exposure periods at various temperatures. Toxic to birds and mammals. Carefully inspect the outside and inside of the structure prior to application of the fumigant to ensure the absence of nesting or roosting birds. Avoid application if birds are present.
		Gastoxin	500–1,500 pellets 100–300 tablets /100 m^3 grain bin	

STORED-GRAIN INSECTS

Table 7–4. Control Options for Insects in Stored Corn, Wheat and Soybeans — Pea Weevils/Bean Weevils, European Grain Moth

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
PEA WEEVILS/BEAN WEEVILS (*Bruchus pisorum/Acanthoscelides obtectus*)				
Fumigant				
Adults lay their eggs in maturing beans in the field with no apparent visible damage. Heavily infested peas or beans can be fed to livestock. The key to controlling stored-grain insects is prevention through good sanitation and storage practices. See OMAFRA Publication 811, *Agronomy Guide for Field Crops*, for more information on stored-grain insect management. Additional Information can also be found within the Grain Quality Section of the Canadian Grain Commissions website at: www.grainscanada.gc.ca.	aluminum phosphide	Fumitoxin Phostoxin	350–2,560 pellets 70–500 tablets /100 m^3 grain bin	These products must be applied by a professional licensed applicator. Do not fumigate below 5°C. Exposure to moist air or liquids releases flammable and toxic phosphine gas. Ensure bin is tightly sealed. Not to be used for vacuum fumigations. See label for minimum length of pest exposure periods at various temperatures. Toxic to birds and mammals. Carefully inspect the outside and inside of the structure prior to application of the fumigant to ensure the absence of nesting or roosting birds. Avoid application if birds are present.
		Gastoxin	500–1,500 pellets 100–300 tablets /100 m^3 grain bin	
EUROPEAN GRAIN MOTH (*Nemapogon granella*)				
Fumigant				
Similar to Indian meal moth, the larvae of this pest spin webbing on the grain, which can typically be found within the top 50 cm. The key to controlling stored-grain insects is prevention through good sanitation and storage practices. See OMAFRA Publication 811, *Agronomy Guide for Field Crops*, for more information on stored-grain insect management. Additional Information can also be found within the Grain Quality Section of the Canadian Grain Commissions website at: www.grainscanada.gc.ca.	aluminum phosphide	Fumitoxin Phostoxin	350–2,560 pellets 70–500 tablets /100 m^3 grain bin	These products must be applied by a professional licensed applicator. Do not fumigate below 5°C. Exposure to moist air or liquids releases flammable and toxic phosphine gas. Ensure bin is tightly sealed. Not to be used for vacuum fumigations. See label for minimum length of pest exposure periods at various temperatures. Toxic to birds and mammals. Carefully inspect the outside and inside of the structure prior to application of the fumigant to ensure the absence of nesting or roosting birds. Avoid application if birds are present.
		Gastoxin	500–1,500 pellets 100–300 tablets /100 m^3 grain bin	

8. Using Pesticides in Ontario

Visit www.ontario.ca/usingpesticides for up-to-date information on provincial pesticide use requirements. Some of the information provided in this generic chapter may not apply to all crops.

Read the label before use.

Product labels may change.

Review the Grower Pesticide Safety Course Manual at www.opep.ca/courses/pick-up-a-gpsc-manual

Keep detailed spray records.

Federal Registration of Pesticides

Before a pesticide (pest control product) can be sold or used in Ontario, it must be registered under the federal *Pest Control Products Act* (PCP Act). The Pest Management Regulatory Agency (PMRA) of Health Canada registers pesticides for use in Canada following an evaluation of scientific data to ensure that any human health and environmental risks associated with its proposed uses are acceptable, and that the products have value.

The PMRA re-evaluates registered pesticides to determine whether today's health and environmental protection standards are still met when the pesticide is used according to the label. The PMRA also assesses whether the pesticide still has value. Re-evaluations are initiated every 15 years. Outcomes of a re-evaluation can be:

- no change to the registration
- amendments to the label (e.g., changes to personal protective equipment requirements, restricted entry intervals, buffer zones)
- modifications to existing Maximum Residue Limits (MRLs)
- elimination or phasing-out of certain uses or formulations
- discontinuation of the registration

A special review of a registered pesticide can be initiated at any time by the PMRA if the PMRA has reason to believe its use may pose unacceptable risk to human health or the environment or the pesticide no longer has value. Special reviews focus on a specific concern (e.g., neonicotinoid pesticides and impacts to pollinator health).

The pesticide label is a legal document. Follow all label directions. Labels for all registered pesticides are under "Search Pesticide Labels" on the PMRA website at www.healthcanada.gc.ca/pmra. Ensure you have the most current label and are aware of any re-evaluation decisions. Emergency registrations are temporary registrations (1 year or less) for pesticides needed by growers to manage a new invasive pest or pest outbreak. Know the expiration date for pesticides you are using under an emergency registration.

Maximum Residue Limit (MRL)

When you apply a pesticide to a crop, some residue may remain on the crop at harvest time. A Maximum Residue Limit (MRL) is the maximum amount of pesticide residue that may remain on food after a pesticide is applied as per label directions and which can safely be consumed. The PMRA sets the MRL well below a level that may cause harm to human health. The MRL is specific for every pesticide-crop combination.

The Canadian Food Inspection Agency (CFIA) is responsible for enforcing the MRLs established by the PMRA. OMAFRA's Food Inspection Branch conducts an annual Produce Food Safety Monitoring Program which involves collecting Ontario grown fresh fruits and vegetables and testing them for pesticide residues and pathogenic organisms (e.g., *Listeria monocytogenes*, *E. coli* O157:H7).

If you apply a pesticide at a higher rate, make too many applications or harvest a crop before the Pre- Harvest Interval has ended, there may be pesticide residues in excess of the MRLs set by PMRA.

When exporting your food product, it is important to confirm the importing country's MRLs because it may be different than ours. Processors or retailers may demand more restrictive limits. Growers should seek advice of their intended market to determine if more restrictive limitations apply. Keep accurate and up-to-date records on pesticide use in each crop.

For more information on MRLs, see:

- PMRA's MRL database at http://pr-rp.hc-sc.gc.ca/mrl-lrm/index-eng.php provides information on established Canadian MRLs. This database includes importing MRLs that may have pesticide- crop combinations that are not registered for use in Canada. Always check the current Canadian pesticide label for registered uses.
- Global MRL Database at www.globalmrl.com provides free access to U.S. MRL information.
- Agricultural Chemical Companies can provide MRL information for their products. Companies' contact information are found on the pesticide labels, company websites and in OMAFRA's crop protection publications.
- Summaries of OMAFRA's Food Safety Monitoring Program results can be found at www.ontario.ca/producesafety.
- CFIA's Chemical Residue Surveillance Program at CFIA's Chemical Residue Surveillance Program at https://www.inspection.gc.ca/food-safety-for-industry/food-chemistry-and-microbiology/food-safety-testing-bulletin-and-reports/eng/1453324778043/1453327843364

Regulation of Pesticides in Ontario

The Ontario Ministry of the Environment, Conservation and Parks (MECP) is responsible for regulating the sale, use, transportation, storage and disposal of pesticides in Ontario. Ontario regulates pesticides by placing appropriate education, licensing and/or permit requirements on their use, under the *Pesticides Act* and Regulation 63/09. All pesticides must be used in accordance with requirements under the *Pesticides Act* and Regulation 63/09, which are available on the e-laws website at ontario.ca/laws or by calling Service Ontario at 1-800-668-9938 or 416-326-5300.

Classification of Pesticides

The PMRA classifies a pesticide into one of four classes – manufacturing, restricted, commercial and domestic. As of May 1, 2020, Ontario's pesticides classes have been aligned with the federal government's pesticide categories to remove duplication and reduce complexity for the sale and use of pesticides in Ontario, while ensuring continued protection of human health and the environment.

The MECP automatically classifies pesticides in Ontario as Class A, B, C or D based on the federal classification system plus one additional class (Class E) for regulating the sale and use of neonicotinoid-treated corn and soybean seed.

Table 8–1. Federal and Provincial Classification

Federal Product Class	Federal Class Description	Provincial Class
Manufacturing	The pesticide is only used to manufacture a pest control product.	Class A
Restricted	The pesticide is restricted by the federal government out of concern of environmental risk or human health. Additional information must be shown on the label regarding essential conditions for display, distribution and limitations on use. Specific qualifications may be required for a person to use this product.	Class B
Commercial	The pesticide can only be used in commercial activities that are specified on the label.	Class C
Domestic	The pesticide is primarily used by the general public for personal use and in and around their homes.	Class D
N/A		Class E* Corn and soybean seeds that are treated with imidacloprid, clothianidin or thiamethoxam neonicotinoids

* Class E pesticides do not apply to:
- popping corn
- sweet corn
- corn used for the production of seed
- soybean seed planted for the purpose of producing a soybean seed crop of certified status under contract
- corn seed and soybean seed treated only with fungicide.

Each Ontario Class has specific certification, licensing and/or permit requirements and restriction on its use and sale.

Certification and Licensing

Certified Farmers and Their Assistants

Farmers must be certified through the Grower Pesticide Safety Course (GPSC) in order to buy and use Class B and C pesticides on their farms. Certification is not required to buy and use Class D pesticides for agricultural purposes.

Farmers become certified by successfully completing one of the following certification options:

- one-day in-person course and pass an open book certification test with a mark of at least 75%, or
- online course and successfully complete quizzes and case studies to become certified.

Farmer assistants and supervised farmers using Class B or C pesticides must complete training and assist or be supervised by a certified farmer. Farmer assistants and supervised farmers must complete one of the two training options:

- participate in a GPSC (assessment is not required) or
- participate in an On-Farm training session given by an On-Farm Instructor.

For information about farmer training and certification requirements visit the MECP website at ontario.ca/pesticides and for information on courses visit the University of Guelph's Ontario Pesticide Education Program website at www.opep.ca or call 1-800-652-8573.

To buy and use Class E pesticides, farmers are required to:

1. Complete the Integrated Pest Management (IPM) Course for Corn and Soybean
2. Complete a pest risk assessment and a pest risk assessment report
3. Sign an IPM Written Declaration Form stating that you considered IPM principles to decrease the risk of early season insect damage.

Farmers must provide these pieces of information to a vendor sales representative or custom-seed treater in order to purchase Class E pesticides. They must retain these records for at least two years.

Farmers must also carry with them or have readily available at the field when they are planting a copy of their certificate of completion of the Integrated Pest Management (IPM) Course for Corn and Soybean and pest risk assessment report.

For information on the requirements for Class E pesticides visit the MECP website ontario.ca/pesticides. For information on the IPM Course visit the University of Guelph's website at IPMCertified.ca.

Pesticide Commercial Applicators (Exterminators) and Their Assisting Technicians

All applicants for a pesticide exterminator licence must first become certified by passing an examination. Once certified, you can apply to the MECP for an exterminator licence.

For more information on how to become certified, refer to Ontario Pesticide Training and Certification

University of Guelph, Ridgetown Campus
1-888-620-9999
Email: rcoptc@uoguelph.ca
Website: www.ontariopesticide.com

For further information on pesticide licensing please refer to the document *Guide to Pesticide Licensing* available at ontario.ca/pesticides.

For information on technician training, visit:

- the Ontario Pesticide Training and Certification website at www.ontariopesticide.com or call 1-888-620-9999 or 519-674-1575
- the Pesticide Industry Council's Pesticide Technician Program website at www.horttrades. com/pesticide-technician or call 1-800-265-5656 or email pic@hort-trades.com
- the Pesticide Industry Regulatory Council (PIRC) at www.oipma.ca

Ontario's Cosmetic Pesticide Ban and Excepted Uses

Ontario prohibits the use of certain pesticides for cosmetic (non-essential) purposes.

Only low risk pesticides and biopesticides may be used for cosmetic purposes such as in lawns and gardens, and these are listed in the publication "List of Active Ingredients Authorized for Cosmetic Uses (Allowable List.)"

Under the ban, the use of an active ingredient that is not on the Allowable List is permitted for appropriately licensed individuals if the use falls under one of the exceptions to the ban. There are exceptions for public health and safety (including for public works, buildings and other structures that are not

a public work, and to control poisonous plants), golf courses, specialty turf, specified sports fields, arboriculture and the protection of natural resources, if certain conditions are met. There are also exceptions for agriculture, forestry, research and scientific purposes, uses of pesticides for structural exterminations (e.g., in and around homes to control insects), and uses of pesticides required by other legislation.

To locate your local MECP District Office:
https://www.ontario.ca/environment-and-energy/ministry-environment-district-locator

To speak with your local MECP Pesticide Specialist:

South West Region	— 519-668-9292
West Central Region	— 905-512-0981
Central Region	— 416-990-1694
Eastern Region	— 613-540-6874
Northern Region	— 705-562-0853

Pesticide Application Information

When you decide to use a pesticide, choose the least toxic and least volatile option for your situation. Use an appropriate application method and ensure equipment is properly maintained and calibrated. Take all possible precautions to prevent the exposure of people and non-target organisms to the pesticide, before, during and after the application. Read the most current pesticide label thoroughly before application. The pesticide label is a legal document and must be followed. Pesticides may only be used in accordance with label instructions. The label provides important information, such as:

- directions for use (e.g., rates of application, crops/ sites it can be used on, target pests, crop rotation restrictions, total number of applications, droplet size, application equipment, timing, appropriate weather conditions)
- required personal protective equipment (PPE)
- hazard symbols and warnings
- restricted entry intervals
- pre-harvest intervals
- buffer zones / vegetative strips
- precautionary statements
- steps to be taken in case of an accident
- disposal
- equipment sanitation

For more information on hazards, consult the Safety Data Sheet (SDS) or contact the manufacturer.

For more information on pesticide application, see:

- Sprayers 101 at www.sprayers101.com
- OMAFRA Factsheet *Pesticide Drift from Ground Applications*
- Ontario Pesticide Education Program (University of Guelph, Ridgetown Campus) videos at www.opep.ca/resources
- OMAFRA Agriculture and Agri-Food Canada booklet *Best Management Practices — Pesticide Storage, Handling and Application*, Order No. BMP13
- OMAFRA Factsheet *Pesticide Contamination of Farm Water Supplies*
- PMRA's Factsheet *Understanding Restricted Entry Intervals for Pesticides* (English, French and Spanish): www.healthcanada.gc.ca/pmra, search for Restricted Entry Interval

Restricted Entry Intervals

Restricted Entry Interval (REI) is the minimum period of time that must elapse before hand labour tasks can be performed in an area treated with pesticide. The REI allows the pesticide residues and vapours to dissipate to safe levels to protect agricultural workers.

Hand labour tasks involve substantial worker contact with treated surfaces such as plants, plant parts or soil. Examples of these activities include planting, harvesting, pruning, detasseling, thinning, weeding, scouting, topping, sucker removal, mowing, roguing and packing produce into containers in the field or greenhouse. You can only perform these tasks after the REI has passed. Hand labour generally does not include operating, moving or repairing irrigation or water equipment, except for hand-set irrigation.

An REI can range from 12 hours to several days depending on the crop and the task (e.g., scouting, harvesting). A minimum 12-hour REI must be observed in agricultural crops, even if no REI is indicated on the label. However, REIs do not apply to biopesticides (e.g., microbials, pheromones) unless specified on the label. For golf courses and residential turf applications, the spray solution must be dry before re-entry can occur. When tank mixing pesticides that have different REIs, you must observe the longest REI.

A Certified Farmer or Licensed Commercial Applicator (i.e., a holder of the appropriate Exterminator License, such as an Agriculture Exterminator License or a Greenhouse/Interior Plant Exterminator License) may need to enter a treated area early to do short-term tasks before the end of the REI. In these cases, the Certified Farmer or Licensed Commercial Applicator may enter between 4–12 hr after the application wearing a NIOSH-approved respirator and any other protective clothing (PC) and personal protective equipment stated on the label for mixing and loading. This Certified Farmer or Licensed Commercial Applicator (exterminator) must not be in the treated area during the REI for more than a total of 1 hr in any 24-hr period.

See Figure 8–1 for an example of a 24-hr REI on a pesticide label.

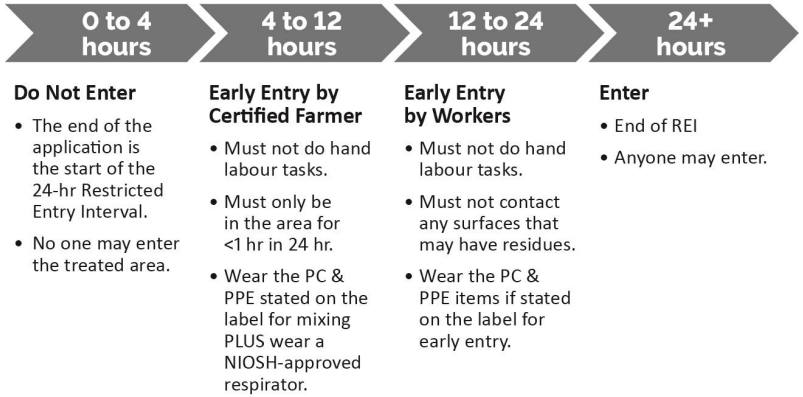

Figure 8–1. Example of a 24-hr REI on a pesticide label.

Certified Farmers and Licensed Commercial Applicators should plan pesticide applications around work tasks so that no one needs to enter treated areas before the restricted entry interval has passed.

Days to Harvest Intervals for Food Crops (Pre-harvest, Pre-grazing and Feeding Intervals)

These intervals state the minimum time that must pass between the last pesticide application and the harvesting of the crop or the grazing and cutting of the crop for livestock feed. If you harvest a crop before the pre-harvest interval (PHI) has ended, there may be pesticide residues in excess of the maximum residue limits (MRLs) set by PMRA.

"Up to the day of harvest" means the same as 0 days PHI; however, the REI may be more restrictive (e.g., a 12-hr restricted entry interval) and must be observed for harvesting that occurs on the day of pesticide application.

To avoid exceeding the maximum residue limits, always follow the directions on the label.

Spray Buffer Zones

Spray buffer zones are no-spray areas required at the time of application between the area being treated and the closest downwind edge of a sensitive aquatic or terrestrial habitat. Spray buffer zones reduce the amount of spray drift that enters non-target areas.

Sensitive terrestrial habitats include hedgerows, grasslands, shelterbelts, windbreaks, forested areas and woodlots.

Sensitive freshwater habitats include lakes, rivers, streams, creeks, reservoirs, marshes, wetlands and ponds.

The pesticide label indicates the size of the spray buffer zone, which depends on the product used, the method of application, and the crop being sprayed.

Unless forbidden by the pesticide label, Health Canada's online Buffer Zone Calculator may allow applicators to reduce the spray buffer zones based on weather conditions, the category of the spray equipment and the droplet size. For more information, search for "Buffer Zone Calculator" at www.canada.ca.

For soil fumigation, a buffer zone is an area established around the perimeter of each application block.

Vegetative Filter Strips

A vegetative filter strip is:

- a permanently vegetated strip of land.
- sits between an agricultural field and downslope surface waters.
- must be at least 10 m wide from edge of field to the surface water body.
- must be composed of grasses, but may also contain other vegetation (shrubs, trees, etc.).

Vegetative filter strips reduce the amount of pesticide entering surface waters from runoff by slowing runoff water and filtering out pesticides carried with the runoff. Certain pesticide labels will require a vegetative filter strip. Other labels will recommend a vegetative filter strip as a best management practice.

Protect the Environment

Protect Water Sources

According to the British Crop Protection Council (BCPC), 40%–70% of surface water pesticide contamination comes from mixing and filling areas.

Where possible, load or mix pesticides on impermeable surfaces located safely away from watercourses or environmentally sensitive areas. Collect drainage and run-off and dispose of it safely (*Your Guide to Using Pesticides*, BCPC 2007).

Clean your spray equipment away from wells, ponds, streams and ditches. Apply the diluted rinse water (usually at a ratio of 10:1) to the treatment area (crop), but do not exceed the pesticide rate recommended on the label.

Do not make a direct connection between any water supply (e.g., public supply, wells, watercourse or pond) and a spray tank. Use an anti-backflow device or intermediate system to prevent back-siphoning that could contaminate the water supply.

Immediately contain and clean up any spills to prevent contamination to water sources.

Check the pesticide label for specific instructions on protection of water sources.

For more information on protecting water sources, see ontario.ca/crops:

- OMAFRA Factsheet *Pesticide Contamination of Farm Water Supplies*
- OMAFRA Factsheet *Groundwater — An Important Rural Resource: Protecting the Quality of Groundwater Supplies*
- OMAFRA Agriculture and Agri-Food Canada booklet *Best Management Practices — Pesticide Storage, Handling and Application*, Order No. BMP13

Bee Poisoning

Honey bees, native bee species (e.g., bumble bees, squash bees) and other pollinating insects are important pollinators for many Ontario crops. Insecticides, some of which may negatively affect bees, require careful management to achieve both pollination and insect control of pest species. Growers and licensed commercial applicators can protect bees by following these suggestions:

- Time insecticide applications to minimize bee exposure (e.g., apply post bloom). Daytime treatments, when bees are foraging, are most hazardous. Insecticide applications in the evening are the safest, unless there is evidence of a strong temperature inversion or high humidity. Under normal circumstances, spraying after 8 p.m. allows the spray to dry before the bees are exposed to it the next day. Spraying during early morning is the next best time, when fewer bees are foraging, but pesticide residues may still be present. Spraying should be completed well before 7 a.m. While honey bees and most other pollinating insects do not usually forage at temperatures below 13°C, bumblebees do. If you plan to spray in the morning, contact beekeepers who have bees within 5 km of your crop and spray site. The beekeepers may then have the option of taking any possible protective action.
- Do not apply insecticides while fruit trees are in bloom. The *Bees Act* makes it an offence to do so in Ontario. Do not spray any flowering crop on which bees are foraging.
- To prevent drift toward nearby hives, do not apply insecticides on windy days or when there is evidence of a strong temperature inversion.
- Bees and other pollinators may be poisoned by visiting flowering weeds, trees and cover crops that have come into contact with an insecticide via spray drift or drift of insecticide-contaminated dust during planting. Avoid spray drift to flowering weeds that are adjacent to or within the target field. Where possible, mow down flowering cover crops or flowering weeds in and bordering target fields prior to spraying to help safeguard the bees. Control dandelions and other flowering weeds within fields before spraying or planting seeds treated with an insecticide. Take measures to reduce movement of dust from insecticide seed treatments to flowering trees, weeds and water sources that are in or adjacent to the target field. For more information on reducing dust movement, search for “Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices” at www.canada.ca.
- Systemic insecticides may also pose a high risk to bees and other insect pollinators. Bees can be exposed to insecticide residues in or on flowers, leaves, pollen, nectar and/or surface water. Do not apply insecticide or allow it to drift onto blooming crops or off-site habitat if bees are foraging in or adjacent to the treatment area.

- In crop settings where pesticide use is highly likely, beekeepers should remove honey bee colonies as soon as pollination and bloom are complete in the crop and before any insecticides are applied post bloom. In emergency situations, if the colonies cannot be removed in time, beekeepers can place burlap or cloth soaked in water at the entrance of the hive to disrupt the flight of the bees for up to 12 hr and provide more time for spray to dry. To help prevent overheating of the hive during this time, keep an opening of 2.5 cm on each side of the hive entrance so bees can still get out and ventilate the hive. Also, the water on the burlap or cloth will help cool the colony.
- Not all pesticides are equally toxic to bees. If there is a risk of honey bee poisoning, try to choose an insecticide that is not highly toxic to bees. When there is a choice, choose a product formulation that is less hazardous to bees.
- Always read the most current pesticide label for guidance. Some pesticides cannot be used when bees are active in the crop.

For more information on ways to reduce bee poisoning, see:

- *Practices to Reduce Bee Poisoning from Agricultural Pesticides in Canada*, available at honeycouncil.ca. Select "Bee Health Roundtable."

Manage Drift

Pesticide drift is the aerial movement and unintentional deposit of pesticide outside the target area. Drift results in wasted product, may compromise crop protection and can adversely affect nearby sensitive environmental areas, crops and wildlife. The following strategies can help reduce the risk of pesticide drift:

- Do not spray when wind direction is changeable, or wind speeds are high or gusty. These conditions increase the potential for off-target drift. While most pesticide labels indicate allowable wind speeds, some do not.
- Regularly monitor wind conditions during spraying, preferably in the field with a handheld wind meter at nozzle height or elevated to the top of the target canopy from within the planted area. Record the wind speed and direction. As conditions change, make adjustments to manage drift potential. Adjustments may include a coarser droplet size, minimizing nozzle-to-target distance, adjusting air energy or vector on air-assisted sprayers, slowing travel speed, using a drift reducing adjuvant or discontinuing spraying until conditions improve.
- Do not spray during periods of dead calm. Periods of dead calm may occur between late evening and early morning and can result in the vapour or fine spray droplets remaining aloft, like fog. Spray-filled air can move unpredictably over great distances several hours after the spray event is completed.

Temperature inversions create problems for spray applicators because pesticide spray can:

- remain suspended and active in the air above the target for long periods of time
- move with light breezes in changeable and unpredictable directions
- move down slopes and concentrate in low-lying regions

Field air temperatures are often very different from local or regional forecasts, so the most reliable method of detecting inversion conditions is to measure temperatures at, and several metres above, the ground. Commercial hand-held inversion detectors are now available. Spray applicators can also recognize a temperature inversion from environmental cues, such as when:

- there is a big drop from daytime to nighttime temperature
- wind dies down by early evening and night
- far away sounds can be heard clearly
- odours seem more intense
- daytime cumulus clouds collapse toward evening
- overnight cloud cover is 25% or less
- smoke or dust hangs in the air and/or moves laterally in a sheet

Temperature inversions start to form about 3 hr prior to sunset, become stronger as the sun sets and continue until sunrise when the surface warms and air mixing begins. If you suspect there's an inversion, don't spray. Often, warnings for the risk of inversions are stated right on the product label.

- If specified, use the sprayer output indicated on the pesticide label.
- Use a nozzle at a pressure that will produce the droplet size specified on the pesticide label or delivers droplets appropriate for the job.
- Coarser droplets reduce drift significantly. Air induction nozzles used above 2bar (30psi) will produce Coarse to Ultra Coarse droplets. They can be used in the top nozzle positions on air-assist sprayers in specialty crops, or along conventional horizontal booms. Ensure the droplet size and volume are appropriate for the application being performed.
- Minimize the distance between nozzle and target as much as possible while still maintaining spray uniformity.

- Establish buffer zones for the protection of adjacent sensitive areas. Some pesticide labels will state buffer zone setbacks; follow these carefully.
- Use drift reduction technology, such as hoods, shrouds, screens or air curtains.
- If appropriate, use drift-reducing adjuvants in the spray tank. The intense agitation in air-assist sprayers for specialty crops has been shown to reduce the effectiveness of drift-reducing adjuvants. Certain combinations of drift-reducing adjuvants and air-induction nozzles have been shown to increase the incidence of fine droplets. Consult with the adjuvant manufacturer.
- When possible, use non-volatile pesticide formulations or products.

For more information about spray drift, see:

- Sprayers 101: www.sprayers101.com
- OMAFRA website: ontario.ca/spraydrift
- OMAFRA Factsheet *Pesticide Drift from Ground Applications*
- OMAFRA Agriculture and Agri-Food Canada booklet *Best Management Practices — Pesticide Storage, Handling and Application*, Order No. BMP13
- Ontario Pesticide Education Program (University of Guelph, Ridgetown Campus) *Drift of Pesticides* video series, available at www.opep.ca/resources (click the "YouTube" icon)

Waste Management

Empty Pesticide and Fertilizer Containers up to 23 L

Never re-use empty pesticide containers.

The Ontario Empty Pesticide and Fertilizer Container Recycling Program, an industry-led program, is available free of charge to growers and commercial applicators. Through this program, you can return triple-rinsed or pressure-rinsed plastic pesticide and fertilizer containers up to 23 L to container collection depots located throughout the province. Remove the cap and booklet from the pesticide container and metal handle from the fertilizer pail before recycling. To locate the closest container collection depot, visit www.cleanfarms.ca, call your local dealer or contact Cleanfarms at 416-622-4460 (toll-free at 877-622-4460) or info@cleanfarms.ca.

Empty Pesticide Containers Greater than 23 L (Totes and Drums)

Growers and commercial applicators should return pesticide containers that are greater than 23 L in size to the point of sale or local collection site for disposal. Contact your local dealer for details on disposal of these containers, or contact Cleanfarms at 416-622-4460 (toll-free at 877-622-4460) or info@cleanfarms.ca.

Empty Seed and Pesticide Bags

Growers can return their empty seed and pesticide bags to select retail locations. Contact your local dealer for details on disposal of these empty seed and pesticide bags, or contact Cleanfarms at 416-622-4460 (toll-free at 877-622-4460) or info@cleanfarms.ca.

Surplus Spray Mix

The best approach is to plan the spray job accurately to avoid creating a surplus.

When this is unavoidable, dispose of excess spray mix by spraying it on other crops that require an application of this pesticide. Before spraying, check the label to make sure the pesticide is registered for use on that other crop.

If you cannot find another allowable crop to spray, then dilute the remaining spray mix by adding 10 parts of water for each 1 part of spray mix.

The diluted solution can be safely applied to the original treated area as long as you do not exceed the pesticide rate recommended on the label. Be sure to check the label for any restrictions about crop rotation, days to harvest or disposal of surplus spray mix.

Never re-spray the treated field with undiluted spray mix. Spraying an area twice at the same pesticide rate will double the labeled pesticide rate. This may cause illegal pesticide residues in the harvested crop or harmful residues in the soil that can cause crop damage.

Surplus Pesticide Disposal

Be sure to safely dispose of pesticides that you do not need or cannot use. Options for proper disposal include:

- Contact the supplier. It is sometimes possible to return unused pesticide if it is still in its original, unopened container.
- Hire a licensed waste hauler who is licensed under Part V of the *Environmental Protection Act* to carry hazardous wastes.

- Cleanfarms operates a free Obsolete Pesticide and Animal Health Product Collection Program throughout the province every 3 years. To locate the closest collection point and date, visit the Cleanfarms website (www.cleanfarms.ca), contact Cleanfarms at 416-622-4460 (toll-free at 877-622- 4460) or info@cleanfarms.ca or contact your local dealer for program details.
- Contact your municipality to see if any hazardous waste collection days are scheduled and verify whether quantities of agricultural pesticides will be accepted.

Storing Pesticides

Ontario's *Pesticides Act* and Regulation 63/09 provide details on storage requirements for pesticide storage facilities. As shown in Table 8–2, the storage requirements that must be followed are dependent on which classes of pesticides you store.

Table 8–2. Requirements for Pesticide Storage Facilities

	Pesticide Classes		
Storage requirements	**Class B******	**Class C**	**Class D**
No contact with food or drink	**YES**	**YES**	**YES**
Not an impairment to health and safety	**YES**	**YES**	**YES**
Clean and orderly	**YES**	**YES**	**YES**
Warning sign G posted*	**YES**	**YES**	**YES**
Emergency telephone numbers posted**	**YES**	**YES**	**YES**
Vented to outside	**YES**	**YES**	NO
Limited access (locked)	**YES**	**YES**	NO
No floor drain	**YES**	**YES**	NO
Respiratory protection and protective clothing kept readily available	**YES**	**YES**	NO
Area used primarily for pesticides	**YES**	**YES*****	NO

Note: Sufficient precautions are needed in your storage area to prevent the pesticide from entering the natural environment. Ensure your floor drain does not enter the natural environment.

* See ontario.ca for requirements for warning sign G (Search for sample warning signs for pesticide use). These signs can be purchased from your pesticide dealer/vendor.

** Emergency contact numbers must include telephone numbers for the local fire department, hospital and poison control centre. The number for the MECP Spills Action Centre (1-800-268-6060) should also be readily available.

*** Only applies to Class C pesticides that are fumigants

**** Does not apply to animal repellent products that only contain the active ingredient Capsaicin or Capsaicin and related capsaicinoids.

For more information about storing pesticides, see:

- OMAFRA Factsheet *Farm Pesticide Storage Facility*
- OMAFRA Agriculture and Agri-Food Canada booklet *Best Management Practices — Pesticide Storage, Handling and Application*, Order No. BMP13
- Ontario Pesticide Education Program (University of Guelph, Ridgetown Campus) *Grower Pesticide Safety Course Manual*, available at www.opep.ca. Select "Learn."

Pesticide Spills

Part X of the *Environmental Protection Act* defines a spill as a discharge of pollutant (including pesticides) that is abnormal in quality or quantity, from or out of a structure, vehicle or other container into the environment. An overturned pesticide sprayer that results in the release of the pesticide spray solution to the environment is an example of a spill. A pesticide container that ruptures and leaks its contents is another example of a spill. The discharge or spraying of a pesticide in an unapproved area is also considered a spill.

Part X of the *Environmental Protection Act* requires every person having control of a pollutant that is spilled or who spills, causes or permits a spill of a pesticide shall immediately notify:

- the Ministry (through the Spills Action Centre)
- the municipality within the boundaries of the spill, and
- the owner of the pesticide or the person having charge, management or control of the pesticide.

Ontario's Spills Action Centre receives calls 24 hours a day (1-800-268-6060). Your local municipality may have additional reporting numbers such as fire department and Medical Officer of Health.

Where a spill causes or is likely to cause an adverse effect as defined by the Act, Part X of the *Environmental Protection Act* requires the owner of the pesticide and the person having control of the pesticide to:

- immediately do everything practicable to prevent, eliminate and ameliorate any harm, and
- restore the natural environment or other property to the state it was in prior to the spill.

Additionally, Ontario Regulation 63/09 under the *Pesticides Act* requires the person responsible for a pesticide to immediately notify the Ministry's Spills Action Centre in the event of a fire or other occurrence that may result in the pesticide being discharged into the environment out of the normal course of events if the discharge would be likely to:

- cause impairment of the quality of the environment for any use that can be made of it;
- cause injury or damage to property or to plant or animal life;
- cause harm or material discomfort to any person;
- adversely affect the health of any person;
- impair the safety of any person; or
- render directly or indirectly any property or plant or animal life unfit for use by humans.

Before you begin to clean up a spill of any nature, remember to protect yourself against pesticide exposure. Wear the proper protective clothing and personal protective equipment. If the spill occurs inside an enclosed area (e.g., a pesticide storage area or a vehicle during transport), ventilate the area first. Once you have protected yourself and removed other persons or animals from the spill site, take additional measures to stop the spill at the source and prevent it from spreading and/or contaminating watercourses. Specific precautions, emergency contact information and first aid procedures may be found on the label.

For minor spills, it may be possible to rectify the problem:

- **For a liquid spill** — Cover the spill with a thick layer of absorbent material such as kitty litter, vermiculite or dry soil. Sweep or shovel the material into a waste drum and dispose of the contents as you would a hazardous waste.
- **For a dust, granular or powder spill** — Sweep or shovel the material into a waste drum and dispose of the contents as you would a hazardous waste.

For major spills, it is essential to stop the spill from spreading.

The clean-up guidelines above may not be appropriate for all spill situations. Once you have contained the spill, follow directions from the manufacturer and regulatory authorities on cleaning the contaminated area.

Some of the information contained in this chapter is not authoritative. It is derived from the *Pesticides Act*, Ontario Regulation 63/09, *Environmental Protection Act* and the federal *Pest Control Products Act*, *Fisheries Act* and *Species at Risk Act* and is for informational purposes only. Efforts have been made to make it as accurate as possible, but in the event of a conflict, inconsistency or error, the requirements set out in the referenced legislation take precedence. For specific legal details, please visit ontario.ca/laws (for Ontario legislation) and www.laws-lois.justice.gc.ca (for federal legislation) and consult your lawyer if you have questions about your legal obligations.

For information on preventing spills, see:

- OMAFRA Factsheet *Ways to Avoid Pesticide Spills*
- OMAFRA Agriculture and Agri-Food Canada booklet *Best Management Practices — Pesticide Storage, Handling and Application*, Order No. BMP13
- Ontario Pesticide Education Program (University of Guelph, Ridgetown Campus) *Grower Pesticide Safety Course Manual*, available at www.opep.ca. Select "Learn."

For pesticide poisonings and pesticide injuries, call:

Ontario Poison Centre:
1-800-268-9017
(TTY) 1-877-750-2233

For more information, see Emergency and First Aid Procedures for Pesticide Poisoning on inside back cover.

9. Pesticides Used on Field Crops in Ontario

Table 9–1. Seed Treatments Used on Field Crops — Fungicides

LEGEND: BD = Drill Box F = Flowable FS = Flowable Concentrate LS = Liquid Suspension LOS = Live Organism Suspension P = Powder SC = Suspension Concentrate

TRADE NAME	Active Ingredient	Chemical Group (FRAC Group)[1]	Risk of Resistance Developing[2]	Formulation	Crops	Manufacturer
Fungicides						
Allegiance FL	metalaxyl	acylamine (4)	medium	F	canola, cereals, corn, forages, soybeans	Bayer CropScience Inc.
Apron FL	metalaxyl	acylamine (4)	medium	F	canola, cereals, corn, forages, soybeans	Syngenta Canada Inc.
Apron Maxx RFC	fludioxonil + metalaxyl-M	phenylpyrrole (12) + acylamine (4)	low to medium	F	dry edible beans, soybeans	Syngenta Canada Inc.
Apron Maxx RTA	fludioxonil + metalaxyl-M	phenylpyrrole (12) + acylamine (4)	low to medium	F	dry edible beans, soybeans	Syngenta Canada Inc.
Apron XL LS	metalaxyl-M	acylamine (4)	medium	LS	canola, corn, dry edible beans, forages, soybeans, wheat	Syngenta Canada Inc.
Dividend XL RTA	difenoconazole + metalaxyl-M	triazole (3) + acylamine (4)	low to medium	F	wheat, barley, rye, oats	Syngenta Canada Inc.
Dynasty 100FS	azoxystrobin	strobilurin (11)	medium	F	corn, dry edible beans	Syngenta Canada Inc.
EverGol Energy	penflufen + prothioconazole + metalaxyl	anilide (7) + triazole (3) + acylamine (4)	low to medium	FS	wheat, barley, oats, rye, soybeans, dry beans, corn	Bayer CropScience Inc.
Heads Up Plant Protectant	saponins of *Chenopodium quinoa*	plant based (not classified)	low	P	soybeans, dry beans	Heads Up Plant Protectants Inc.
ILeVO	fluopyram	ethylbenzimides (7)	low to medium	LS	soybeans	BASF Canada Inc.
INTEGO Solo	ethaboxam	benzamides (22)	low to medium	F	barley, buckwheat, pearl millet, proso millet, oats, rye, teosinte, triticale, wheat, corn (sweet and field), popcorn. **Crop Group 6:** legume vegetables (succulent or dried except cowpea and field pea) **Crop Group 20a:** (rapeseed subgroup)	Valent Canada Inc.
Lumisena	oxathiapiprolin	piperidinyl-thiazole-isooxazoline (49)	moderate-high	FS	soybeans	Corteva Agriscience
Maxim 480 FS	fludioxonil	phenylpyrrole (12)	low to medium	F	corn, soybeans	Syngenta Canada Inc.
Maxim Quattro	thiabendazole + fludioxonil + metalaxyl-M + azoxystrobin	benzimidazole (1) + phenylpyrrole (12) + acylamine (4) + strobilurin (11)	low to medium	F	corn	Syngenta Canada Inc.

[1] Fungicide Resistance Action Committee: www.frac.info.
[2] Risk of resistance based on continuous use of product.

Table 9–1. Seed Treatments Used on Field Crops — Fungicides

LEGEND: BD = Drill Box F = Flowable FS = Flowable Concentrate LS = Liquid Suspension LOS = Live Organism Suspension P = Powder SC = Suspension Concentrate

TRADE NAME	Active Ingredient	Chemical Group (FRAC Group)[1]	Risk of Resistance Developing[2]	Formulation	Crops	Manufacturer
MERTECT SC	thiabendazole	benzimidazole (1)	medium	SC	soybeans	Syngenta Canada Inc.
Rancona Pinnacle	ipconazole + metalaxyl	benzimidazole (1) + acylamine (4)	low to medium	F	barley, oat, rye, wheat, triticale	UPL AgroSolutions Canada Inc.
Rancona Trio	ipconazole + carbathiin + metalaxyl	triazole (3) + anilide (7) + acylamine (4)	low to medium	LS	barley, oat, rye, wheat, triticale	UPL AgroSolutions Canada Inc.
Rancona V RS	ipconazole + carbathiin	triazole (3) + anilide (7)	low to medium	LS	canola, mustard	UPL AgroSolutions Canada Inc.
Raxil MD	tebuconazole + metalaxyl	triazole (3) + acylamine (4)	low to medium	F	barley, oat, wheat	Bayer CropScience Inc.
Raxil Pro MD	tebuconazole + prothioconazole + metalaxyl	triazole (3) + triazole (3) + acylamine (4)	medium	LS	wheat, barley, oats	Bayer CropScience Inc.
Raxil T	tebuconazole	triazole (3)	low to medium	F	barley, oat, wheat	Bayer CropScience Inc.
S-2200 3.2 FS	mandestrobin	strobilurin (11)	high	FS	corn, soybean, dry edible beans, canola	Valent Canada Inc.
Saltro	pydiflumetofen	pyrazole-carboximide (7)	low to medium	LS	soybeans, canola	Syngenta Canada Inc.
Stamina Corn	pyraclostrobin	strobilurin (11)	high	LS	corn	BASF Canada Inc.
Trilex FL	trifloxystrobin	strobilurin (11)	high	F	corn, dry edible beans, soybeans	Bayer CropScience Inc.
Vibrance Maxx RFC	metalaxyl-M + sedaxane + fludioxonil	acylamine (4) + pyrazole-carboxamide (7) + phenylpyrrole (12)	low to medium	FS	soybeans, dry beans	Syngenta Canada Inc.
Vibrance Quattro	difenoconazole + metalaxyl-m + sedaxane + fludioxonil	triazole (3) + acylamine (4) + pyrazole-carboxamide (7) + phenylpyrrole (12)	low to medium	FS	spring wheat, winter wheat, barley, oats, rye, triticale	Syngenta Canada Inc.
Vibrance Trio	metalaxyl-M + sedaxane + fludioxonil	benzenoid pyrazole-carboxamide benzodioxoles	low to medium	LS	soybeans, dry edible beans	Syngenta Canada Inc.
Vibrance XL	difenconazole + metalaxyl-M + sedaxane	triazole (3) + acylamine (4) + pyrazole-carboxamide (12)	low to medium	FS	barley, wheat, oats, rye	Syngenta Canada Inc.
Vitaflo 280	carbathiin + thiram	anilide (7) + dithiocarbamates (M3)	low	F	barley, corn, dry edible beans, flax, oat, rye, soybeans, wheat	UPL AgroSolutions Canada Inc.
Vortex FL	ipconazole	triazole (3)	medium	F	corn	Bayer CropScience Inc.

[1] Fungicide Resistance Action Committee: www.frac.info.
[2] Risk of resistance based on continuous use of product.

Table 9–2. Nematicides Used on Field Crops

LEGEND: LOS = Live Organism Suspension

TRADE NAME	Active Ingredient	Chemical Group (FRAC Group)[1]	Risk of Resistance Developing	Formulation	Crops	Manufacturer
Nematocides						
Clariva pn	*Pasteuria nishizawae*	biological (44)	low	LOS	soybean	Syngenta Canada Inc.
ILeVO	fluopyram	ethylbenzimides (7)	low to medium	LS	soybean	BASF Canada Inc.
Votivo 240 FS	*Bacillus firmus* strain I-1582	biological (44)	low	LOS	corn	BASF Canada Inc.

[1] Fungicide Resistance Action Committee: www.frac.info.

Table 9–3. Seed Treatments Used on Field Crops — Fungicides with Insecticides

LEGEND: DB = Drill Box Application F = Flowable FS = Flowable Concentrate

TRADE NAME	Active Ingredient	Chemical Group (FRAC)[1] (IRAC)[2]	Risk of Resistance Developing[3]	Formulation	Crops	Manufacturer
Fungicides with Insecticides						
Cruiser Maxx Vibrance Beans	thiamethoxam + metalaxyl-M + fludioxonil + sedaxane	neonicotinoid (4A)[2] + acylamine (4)[1] + phenylpyrrole (12)[1] + pyrazole-carboxamide (7)[1]	low to medium	FS	soybean	Syngenta Canada Inc.
Gaucho CS	imidacloprid + carbathiin + thiram	neonicotinoid (4A)[2] + anilide (7)[1] + dithiocarbamates (M3)[1]	low to medium	F	canola, mustard, rapeseed	Bayer CropScience Inc.
Helix Vibrance	thiamethoxam + difenconazole + metalaxyl-M + fludioxonil + sedaxane	neonicotinoid (4A)[2] + triazole (3)[1] + acylamine (4)[1] + phenylpyrrole (12)[1] + pyrazole-carboxamide (7)[1]	low to medium	FS	canola, rapeseed, mustard seed (condiment and oilseed)	Syngenta Canada Inc.
NipsIt SUITE Cereals	clothianidin + metalaxyl + metconazole	neonicotinoid (4A)[2] + acylamine (4)[1] + triazole (3)[1]	low to medium	F	wheat	Valent Canada Inc.
NipsIt SUITE Canola Seed Protection	clothianidin + metalaxyl + metconazole	neonicotinoid (4A)[2] + acylamine (4)[1] + triazole (3)[1]	low to medium	F	canola	Valent Canada Inc.
Prosper	clothianidin + carbathiin + thiram + metalaxyl	neonicotinoid (4A)[2] + anilide (7)[1] + dithiocarbamates (M3)[1] + acylamine (4)[1]	low to medium	F	canola, rapeseed	Bayer CropScience Inc.

[1] Fungicide Resistance Action Committee: www.frac.info.
[2] Insecticide Resistance Action Committee: www.irac-online.org.
[3] Risk of resistance based on continuous use of product.

Table 9–4. Seed Treatments Used on Field Crops — Insecticides

LEGEND: F = Flowable FS = Flowable Concentrate

TRADE NAME	Active Ingredient	Chemical Group (IRAC)[1]	Risk of Resistance Developing[2]	Formulation	Crops	Manufacturer
Insecticides						
Acceleron IX-409[3]	imidacloprid	neonicotinoid (4A)	medium to high	F	soybean	Bayer CropScience Inc.
Alias 240 SC	imidacloprid	neonicotinoid (4A)	medium to high	F	wheat (durum, spring, winter), barley, oats Use higher rates for fields with history of moderate-to-high wireworm pressure.	ADAMA Canada Ltd.
Cruiser 5FS	thiamethoxam	neonicotinoid (4A)	medium to high	F	barley, corn, dry edible beans, soybeans, wheat	Syngenta Canada Inc.
Cruiser 350FS	thiamethoxam	neonicotinoid (4A)	medium to high	F	barley, dry edible beans, wheat	Syngenta Canada Inc.
Fortenza	cyantraniliprole	diamide (28)	low to medium	FS	canola, mustard seed, rapeseed, oilseed mustard, including *B. carinata,* corn, soybeans	Syngenta Canada Inc.
Gaucho 480FL	imidacloprid	neonicotinoid (4A)	medium to high	F	canola, seed corn only, mustard, soybeans	Bayer CropScience Inc.
Lumiderm	cyantraniliprole	diamide (28)	low to medium	F	canola, rapeseed, oilseed mustard, soybeans	Corteva Agriscience Inc.
Lumivia	chlorantraniliprole	diamide (28)	low to medium	FS	corn	Corteva Agriscience Inc.
Nipslt INSIDE 600	clothianidin	neonicotinoid (4A)	medium to high	FS	canola, rapeseed, carinata, wheat	Valent Canada Inc.
Poncho 600FS	clothianidin	neonicotinoid (4A)	medium to high	FS	canola, corn	BASF Canada Inc.
Sombrero 600 FS	imidacloprid	neonicotinoid (4A)	medium to high	FS	canola, mustard, rapeseed, corn, cereals, soybeans	ADAMA Canada Ltd.
Stress Shield 600	Imidacloprid	neonicotinoid (4A)	medium to high	FS	soybean, wheat, barley, oats, dry beans	Bayer CropScience Inc.

[1] Insecticide Resistance Action Committee: www.irac-online.org.
[2] Risk of resistance based on continuous use of product.
[3] Acceleron and other branded seed treatments may contain more than one insecticide and/or fungicide, therefore refer to product label or contact distributor for more information.

Table 9–5. Foliar Fungicides Used on Field Crops

LEGEND: Relative Acute Toxicities: High = Danger Poison Symbol Moderate = Warning Poison Symbol Low = Caution Poison Symbol

TRADE NAME	Active Ingredient	Chemical Group (FRAC)[1]	Pre-Harvest Interval (days)	Relative Acute Toxicities	Aerial Application	Manufacturer	Restricted Entry Interval	Use and Notes
Acapela	picoxystrobin	strobilurin (11)	corn: 7 soybeans: 14 wheat: **See Note** oat: **See Note** barley: **See Note** rye: **See Note** forage: **See Note** hay: **See Note** alfalfa: 14 dry edible beans: 14 canola: 28	low	yes, for all crops listed	Corteva Agriscience Inc.	12 hr	barley, corn, dry edible beans, oats, rye, soybeans, wheat, canola, alfalfa **Note:** Do not apply to cereals after the boot stage (Zadok's 47 and beyond). Pre-Harvest Interval for grain is 45 days, forage is 7 days and hay is 14 days.
Allegro 500F	fluazinam	phenylpyridinylamine (29)	soybeans: 30 dry beans: 30	moderate	yes, for all crops listed	Syngenta Canada Inc.	24 hr	soybeans and dry beans
Astound	cyprodinil + fludioxonil	aniline-pyrimidines (9) + phenylpyrrole (12)	canola: 35	low	yes, for all crops listed	Syngenta Canada Inc.	12 hr	canola
Azoshy 250SC	azoxystrobin	strobilurin (11)	canola: 30 dry edible beans: 15 seed corn: 7 soybeans: 15	low	yes, for all crops listed	Sharda CropChem Ltd.	When dry	canola, seed corn, dry edible beans, soybeans **Note:** Toxic to aquatic organisms
Blanket AP	azoxystrobin + propiconazole	strobilurin (11) + triazole (3)	cereal: **See Note** barley: **See Note**	moderate	yes, for all crops listed	ADAMA Canada Ltd.	12 hr	wheat, barley **Note**: Do not apply to cereals after the boot stage (Zadok's 47 and beyond).
Bumper 432 EC	propiconazole	triazole (3)	canola: 60 cereals: 45 corn: 14 dry edible beans: 28 soybeans: 50	moderate	yes, for all crops listed	ADAMA Canada Ltd.	12 hr	barley, canola, corn, dry edible beans, oat, soybeans (for seed production only), wheat **Note:** For soybean seed production only. Harvested soybean seed should not be used for human food or animal feed. **Note:** Moderately to highly toxic to aquatic organisms.
Caramba	metconazole	triazole (3)	corn: 20 cereals: 30	low	yes, for all crops listed	BASF Canada Inc.	12 hr	barley, corn, oats, rye, soybeans, wheat
Cercobin	thiophanate methyl	benzimidazole (1)	white beans: 21	low	yes, for all crops listed	Belchim Crop Protection Canada	when dry	white beans **Note:** Very toxic to aquatic life.
Contans WG	*Coniothyrium minitans*	biological fungicide (44)	canola: 0 dry edible beans: 0 soybeans: 0	low	ground	Bayer CropScience Inc.	0 hr	canola, dry edible beans, soybeans

[1] Fungicide Resistance Action Committee: www.frac.info.

Table 9–5. Foliar Fungicides Used on Field Crops

LEGEND: Relative Acute Toxicities: High = Danger Poison Symbol Moderate = Warning Poison Symbol Low = Caution Poison Symbol

TRADE NAME	Active Ingredient	Chemical Group (FRAC)[1]	Pre-Harvest Interval (days)	Relative Acute Toxicities	Aerial Application	Manufacturer	Restricted Entry Interval	Use and Notes
Cotegra	boscalid + prothioconazole	carboxamide (7) + triazole (3)	canola and mustard: 36 dry bean: 21 soybeans: 21	moderate to high	yes, for all crops listed	BASF Canada Inc.	24 hr	dried beans, dried peas, chickpeas, lentils, soybeans, canola, rapeseed and oriental mustard
Cueva	copper octanoate	multi-site contact (inorganic) (M1)	dry edible beans: 1 soybeans: 1	low	no	Neudorff North America	4 hr	dry edible beans, soybeans
Custodia	tebuconazole + azoxystrobin	triazole (3) + strobilurin (11)	wheat and barley: **See Note** forage, hay: 6	moderate to high	yes, for all crops listed	ADAMA Canada	12 hr	wheat, barley. **Note:** Do not apply to cereals after the boot stage (Zadok's 47 and beyond).
Dithane DG Rainshield	mancozeb	dithiocarbamate (M3)	wheat: 40	low	yes, for all crops listed	Corteva Agriscience Inc.	12 hr	alfalfa (for seed only), spring and winter wheat **Note:** Toxic to fish.
Evito 480SC	fluoxastrobin	strobilurin (11)	wheat (hay/forage): 7 wheat (grain): **See Note** barley (hay/forage): 7 barley (grain): **See Note** corn (grain): 30 corn (sweet): 7 rye: **See Note** canola: 21 soybeans: **See Note***	low	yes, for wheat, barley, corn, soybean, rye and canola	UPL AgroSolutions Canada Inc.	12 hr	wheat, barley, corn, soybean, rye, corn **Note:** Wheat (grain), barley (grain) and rye: do not apply after boot stage (Zadok's 47 and beyond). **Note*:** Soybean: do not apply later than R6.
Excalia	inpyrfluxam	SDHI (7)	soybean: **See Note**	low	no, ground only	Valent Canada	12 hr	soybean **Note:** Do not apply after R5.
Folicur 250 EW	tebuconazole	triazole (3)	barley: 36 oat: 36 soybeans: 20 wheat: 36	low to moderate	yes, for all crops listed	Bayer CropScience Inc.	12 hr	barley, oat, soybeans, wheat **Note:** Toxic to birds, small wild mammals, aquatic organisms and non-target plants.
Fontelis	penthiopyrad	carboxamide (7)	alfalfa: 14	low	yes, for all crops listed	Corteva Agriscience Inc.	12 hr	soybeans, alfalfa **Note:** Toxic to aquatic organisms.
Fullback 125 SC	flutriafol	piperazine (3)	soybeans: 21	low	no	FMC Corporation	12 hr	soybeans **Note:** Apply only to soybeans harvested for dry seed. **Note:** Toxic to aquatic organisms and non-target plans.

[1] Fungicide Resistance Action Committee: www.frac.info.

Table 9–5. Foliar Fungicides Used on Field Crops

LEGEND: Relative Acute Toxicities: High = Danger Poison Symbol Moderate = Warning Poison Symbol Low = Caution Poison Symbol

TRADE NAME	Active Ingredient	Chemical Group (FRAC)[1]	Pre-Harvest Interval (days)	Relative Acute Toxicities	Aerial Application	Manufacturer	Restricted Entry Interval	Use and Notes
Fungtion SC	azoxystrobin + propiconazole	strobilurin (11) + triazole (3)	barley: **See Note*** corn: 14 corn for silage: 30 dry edible beans: 30 soybeans: 30 wheat: **See Note***	moderate	yes, for all crops listed	Sharda CropChem Ltd.	12 hr	**Note*:** Do not apply to cereals after the boot stage (Zadok's 47 and beyond). **Note:** Toxic to aquatic organisms and non-target terrestrial plants.
Headline EC	pyraclostrobin	strobilurin (11)	corn: 7 dry edible beans: 7 oat: **See Note** soybeans: 21 wheat: **See Note**	high	yes, for all crops listed except corn	BASF Canada Inc.	12 hr	barley, corn, dry edible beans, oat, rye, soybeans, wheat **Note:** Do not apply to cereals after the boot stage (Zadok's 47 and beyond).
Headline AMP	pyraclostrobin + metconazole	strobilurin (11) + triazole (3)	corn: **See Exception** cereals: **See Note**	high	yes, for all crops listed	BASF Canada Inc.	12 hr	corn: (field, sweet, seed, pop), wheat (all types), oats, barley, rye, triticale. **EXCEPTION:** 18 days for hand harvesting. Pre-harvest interval is 20 days for field corn grain and popcorn grain. Pre-harvest interval for sweet corn cobs is 7 days for mechanical harvesting and 18 days for hand harvesting. **Note**: Do not apply to cereals after the boot stage (Zadok's 47 and beyond).
Kenja	isofetamid	carboxamide (7)	dry beans: 30	low	no	ISK Biosciences	12 hr	dry beans **Note:** Toxic to aquatic life.
Lance WDG	boscalid	carboxamide (7)	canola: 21 dry beans: 21	high	yes, for all crops listed	BASF Canada Inc.	4 hr	canola, dry edible beans
Manzate Max	mancozeb	dithiocarbamate (M3)	wheat: 40	low	yes, for all crops listed	UPL AgroSolutions Canada Inc.	24 hr	alfalfa (for seed only), spring and winter wheat **Note:** Toxic to fish.
Manzate Pro-Stick	mancozeb	dithiocarbamate (M3)	wheat : 40	low	yes, for all crops listed	UPL AgroSolutions Canada Inc.	24 hr	alfalfa (for seed only), spring and winter wheat **Note:** Toxic to fish.
Miravis Ace	pydiflumetofen + piconazole	pyrazole-carboxamide (7) triazole (3)	wheat: 7	low	yes, for all crops listed	Syngenta Canada Inc.	12 hr	wheat

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Table 9–5. Foliar Fungicides Used on Field Crops

LEGEND: Relative Acute Toxicities: High = Danger Poison Symbol Moderate = Warning Poison Symbol Low = Caution Poison Symbol

TRADE NAME	Active Ingredient	Chemical Group (FRAC)[1]	Pre-Harvest Interval (days)	Relative Acute Toxicities	Aerial Application	Manufacturer	Restricted Entry Interval	Use and Notes
Miravis Neo	pydiflumetofen + azoxystrobin + propiconazole	N-methoxy-(phenyl-ethyl)-pyrazole-carboxamide (7) + strobilurin (11) + triazole (3)	corn: 30	low	yes, for all crops listed	Syngenta Canada Inc.	12 hr	corn
Nova	myclobutanil	trizole (3)	dry bean: 30	low	no	Corteva Agriscience	12 hr*	dry beans ***Note:** DO NOT enter or allow worker entry into treated areas during the restricted entry interval (REI) of 2 days for scouting and 12 hr for all other activities.
Nufarm Propiconazole	propiconazole	triazole (3)	canola: 60 cereals: 45 corn: 14 dry edible beans: 28 soybeans: 50	moderate	yes, for all crops listed	Nufarm Agriculture Inc.	12 hr	barley, canola, corn, dry edible beans, oat, soybeans (for seed production only), wheat **Note:** For soybean seed production only. Harvested soybean seed should not be used for human food or animal feed. **Note:** Moderately to highly toxic to aquatic organisms.
Overall 240 SC	iprodione	dicarboximide (2)	canola: 14	low	yes, for all crops listed	ADAMA Canada Ltd.	12 hr	canola
Orius 430 SC	tebuconazole	triazole (3)	wheat, barley, oats: 36	low to moderate	yes for all crops listed	ADAMA Canada Ltd.	12 hr	wheat, barley, oats. Recommended to be used with a registered non-ionic surfactant at 0.125% v/v. **Note:** Toxic to birds, small wild mammals, aquatic organisms and non-target plants.
Priaxor	pyraclostrobin + fluxapyroxad	strobilurin (11) + carboxamide (7)	alfalfa: 14 sweet corn: 7 corn (field, seed, pop): 21 soybeans: 21 grasses: 14 canola: 21 dry bean: 30 cereals: **See Note**	moderate	yes, for all crops listed	BASF Canada Inc.	12 hr	alfalfa, barley, corn, rye, soybeans, wheat, bluegrasses, fescues, ryegrasses grown for seed, canola, dry beans, mustard **Note:** Do not apply to cereals after the boot stage (Zadok's 47 and beyond).

[1] Fungicide Resistance Action Committee: www.frac.info.

Table 9–5. Foliar Fungicides Used on Field Crops

LEGEND: Relative Acute Toxicities: High = Danger Poison Symbol Moderate = Warning Poison Symbol Low = Caution Poison Symbol

TRADE NAME	Active Ingredient	Chemical Group (FRAC)[1]	Pre-Harvest Interval (days)	Relative Acute Toxicities	Aerial Application	Manufacturer	Restricted Entry Interval	Use and Notes
Princeton	propiconazole	triazole (3)	canola: 60 corn: 14 cereals: 45 dry bean: 28 soybeans: 50	moderate	yes, for all crops listed	Sharda CropChem Ltd.	12 hr	barley, canola, corn, dry edible beans, oat, soybeans (seed production only), wheat **Note:** For soybean seed production only. Harvested soybean seed should not be used for human food or animal feed. **Note:** Toxic to aquatic organisms and non-target terrestrial plants. Toxic to fish.
Proline 480 SC	prothioconazole	triazole (3)	barley: 30 canola: 36 corn: 14 oat: 30 soybeans: 20 wheat: 30	low	yes, for all crops listed	Bayer CropScience Inc.	24 hr	barley, canola, corn (field and seed), oat, soybeans, wheat **Note:** Toxic to aquatic organisms and non-target terrestrial plants.
Propi Super 25 EC	propiconazole	triazole (3)	canola: 60 cereals: 45 corn: 14 dry edible beans: 28 soybeans: 50	moderate	yes, for all crops listed	Sharda CropChem Ltd.	12 hr	barley, canola, corn, dry edible beans, oat, soybeans, wheat **Note:** Toxic to aquatic organisms and non-target terrestrial plants. Toxic to fish.
Propulse	fluopyram + prothioconazole	benzamide-pyridine (7) + triazole (3)	dry edible beans: 14	low	ground	Bayer CropScience Inc.	24 hr	dry edible beans **Note:** Toxic to birds. Toxic to aquatic organisms.
Prosaro XTR	prothioconazole + tebuconazole	triazole (3)	barley: 36 wheat: 36 oats: 36	low	yes, for all crops listed	Bayer CropScience Inc.	12 hr	barley, wheat, oats, rye, triticale, canary seeds **Note:** Toxic to birds, small wild mammals, aquatic organisms and non-target plants.
Quadris	azoxystrobin	strobilurin (11)	canola: 30 dry edible beans: 15 seed corn: 7 soybeans: 15	low	yes, for all crops listed	Syngenta Canada Inc.	12 hr	canola, seed corn, dry edible beans, soybeans **Note:** Toxic to aquatic organisms.
Quash	metconazole	triazole (3)	canola: 45 dry edible beans: 21	low	yes, for all crops listed	Valent Canada Inc.	12 hr	canola, dry beans

[1] Fungicide Resistance Action Committee: www.frac.info.

Table 9–5. Foliar Fungicides Used on Field Crops

LEGEND: Relative Acute Toxicities: High = Danger Poison Symbol Moderate = Warning Poison Symbol Low = Caution Poison Symbol

TRADE NAME	Active Ingredient	Chemical Group (FRAC)[1]	Pre-Harvest Interval (days)	Relative Acute Toxicities	Aerial Application	Manufacturer	Restricted Entry Interval	Use and Notes
Quilt	azoxystrobin + propiconazole	strobilurin (11) + triazole (3)	barley: **See Note** corn: 14 corn for silage: 30 dry edible beans: 30 soybeans: 30 wheat: **See Note** rye: **See Note**	moderate	yes, for all crops listed	Syngenta Canada Inc.	12 hr	barley, corn, dry edible beans, oat, soybean wheat, rye **Note:** Do not apply to cereals after the boot stage (Zadok's 47 and beyond). Toxic to aquatic organisms and non-target terrestrial plants .
Rovral WP	iprodione	dicarboximide (2)	canola: 14 dry edible beans: 14	low	yes, for all crops listed	FMC Corporation	12 hr	canola, dry edible beans
S-2200 4 SC	mandestrobin	strobilurin (11)	canola: 35	low	yes, for all crops listed	Valent Canada Inc.	12 hr	**Note:** Do not apply more than 1 application per year.
Serenade OPTI	*Bacillus subtilis* QST 713 strain	biological fungicide (44)	canola: 0 dry edible beans: 0 soybeans: 0	low	yes, for canola	Bayer CropScience Inc.	4 hr	canola/mustard, dry edible beans, soybeans
Stratego PRO	prothioconazole + trifloxystrobin	strobilurin (11) + triazole (3)	cereals: **See Note** corn: 30 soybeans: 20	low	yes, for all crops listed	Bayer CropScience Inc.	24 hr	wheat, barley, oats, rye, triticale, millet, soybeans, corn **Note:** Do not apply to cereals after the boot stage (Zadok's 47 and beyond).
Tebbie	tebuconazole	triazole (3)	soybeans: 20 oats: 36 barley: 36 wheat: 36	low to moderate	yes, for all crops listed	Sharda Cropchem Ltd.	12 hr	barley, oat, soybeans, wheat **Note:** Toxic to birds, small wild mammals, aquatic organisms and non-target plants.
Tilt 250 E	propiconazole	triazole (3)	canola: 60 cereals: 45 corn: 14 dry edible beans: 28 soybeans: 30	low	yes, for all crops listed	Syngenta Canada Inc.	12 hr	barley, canola, corn, dry edible beans, oat, soybeans, wheat **Note:** Toxic to aquatic organisms and non-target terrestrial plants. Toxic to fish.
Topnotch	azoxystrobin + propiconazole	strobilurin (11) + triazole (3)	barley: **See Note** corn: 14 corn for silage: 30 dry edible beans: 30 soybeans: 30 wheat: **See Note**	moderate	yes, for all crops listed	ADAMA Ltd.	12 hr	barley, oat, soybeans, wheat, dry beans **Note:** Do not apply to cereals after the boot stage (Zadok's 47 and beyond). Toxic to aquatic organisms and non-target terrestrial plants.

[1] Fungicide Resistance Action Committee: www.frac.info.

Table 9–5. Foliar Fungicides Used on Field Crops

LEGEND: Relative Acute Toxicities: High = Danger Poison Symbol Moderate = Warning Poison Symbol Low = Caution Poison Symbol

TRADE NAME	Active Ingredient	Chemical Group (FRAC)[1]	Pre-Harvest Interval (days)	Relative Acute Toxicities	Aerial Application	Manufacturer	Restricted Entry Interval	Use and Notes
Trivapro A + Trivapro B	azoxystrobin + propiconazole + benzovindiflupyr	strobilurin (11) + triazole (3) + pyrazole-carboxamide (7)	corn: 14 soybeans: 30 wheat: **See Note** oats: **See Note** barley: **See Note** rye: **See Note**	low	yes, for all crops listed	Syngenta Canada Inc.	12 hr	corn, soybeans, wheat, oats, barley, rye **Note:** Do not apply to cereals after the boot stage (Zadok's 47 and beyond).
Twinline	pyraclostrobin + metconazole	strobilurin (11) + triazole (3)	wheat: **See Note** oats: **See Note** rye: **See Note** barley **See Note**	high	yes, for all crops listed	BASF Canada Inc.	6 days	barley, rye, oats, wheat **Note:** Do not apply to cereals after the boot stage (Zadok's 47 and beyond). Do not enter or allow worker entry into treated areas during the restricted-entry interval (REI) of 6 days. Toxic to aquatic organisms, non-target terrestrial plants and small wild mammals.
Vertisan	penthiopyrad	carboxamide (7)	corn: 7 soybeans: 14 wheat: **See Note** barley: **See Note** oat: **See Note** dry edible beans: 21 canola: 21	low	yes, for all crops listed	Belchim Crop Protection Canada	12 hr	**Note:** Do not apply to cereals after the boot stage (Zadok's 47 and beyond). Toxic to aquatic organisms.
Zolera FX	fluoxastrobin + tetraconazole	strobilurin (11) + demethylation inhibitors (3)	corn: 30 dry edible beans: 14	low	yes, for all crops listed	UPL AgroSolutions Canada Inc.	12 hr	Do not apply within 7 days of harvest for hay or forage.

[1] Fungicide Resistance Action Committee: www.frac.info.

Table 9–6. Foliar Insecticides Used on Field Crops

LEGEND: Relative Acute Toxicities: High = Danger Poison Symbol Moderate = Warning Poison Symbol Low = Caution Poison Symbol N/A = Not Applicable

TRADE NAME	Active ingredient	Chemical Group (IRAC)[1]	Pre-Harvest Interval (days)	Relative Acute Toxicities	Aerial Application	Manufacturer	Restricted Entry Interval	Use and Notes
Ambush 500EC	permethrin	pyrethroid (3A)	canola: ***Note** corn: 30	low	yes, for all crops listed	Amvac Chemical Corporation	12 hr	***Note:** Do not apply after 5-leaf stage. **Note:** Low mammalian toxicity. Very toxic to fish and bees.
Bioprotec CAF	*Bacillus thuringiensis*	bacterial toxin (11A)	corn: 1	low	ground	UPL AgroSolutions Canada Inc.	4 hr	field corn
Citadel 480 EC	chlorpyrifos	organophosphorus (1B)	canola: 21 cereals: 60 corn: 70	low	yes, for all crops listed except corn	IPCO	24 hr	**Note:** Toxic to bees, beneficial insects, birds and wildlife and extremely toxic to fish and aquatic organisms.
Closer	sulfoxaflor	sulfoximines (4C)	corn: 14	low	yes	Corteva Agriscience Inc.	12 hr	corn
Concept	imidacloprid + deltamethrin	neonicotinoid (4A) + pyrethroid (3A)	soybeans: 20	low	yes, for all crops listed	Bayer CropScience Inc.	24 hr	soybeans **Note:** Toxic to bees and fish.
Coragen	chlorantraniliprole	diamide (28)	alfalfa: 0 dry edible beans: 1 field corn: 14 seed corn: 1 grass forages: 0 canola and mustard: 1 soybeans: 1	low	yes, **see Note**	FMC Corporation	12 hr	alfalfa, dry edible beans, field and seed corn, grass forages (seed production only) **Note:** aerial application for field and seed corn, soybeans and dry edible beans; ground application for canola, alfalfa and grass forages Toxic to certain beneficial insects. Toxic to aquatic organisms.
Cygon 480 EC	dimethoate	organophosphorus (1B)	alfalfa: 28 canola: 21 dry edible beans: 7 forages: 2 soybeans: 30	moderate	yes, for all crops listed	FMC Corporation	48 hr	alfalfa, canola, dry edible beans, forages, soybeans **Note:** Toxic to bees. Moderately to highly toxic to aquatic organisms.
Decis 5.0 EC	deltamethrin	pyrethroid (3A)	canola: 14 corn: 5	high	yes, for all crops listed except corn	Bayer CropScience Inc.	12 hr	barley, canola, corn, mustard, oat, wheat **Note:** Toxic to bees for 1 day after application. Toxic to fish, aquatic organisms and beneficial insects.

[1] Insecticide Resistance Action Committee: www.irac-online.org.

Table 9–6. Foliar Insecticides Used on Field Crops

LEGEND: Relative Acute Toxicities: High = Danger Poison Symbol Moderate = Warning Poison Symbol Low = Caution Poison Symbol N/A = Not Applicable

TRADE NAME	Active ingredient	Chemical Group (IRAC)[1]	Pre-Harvest Interval (days)	Relative Acute Toxicities	Aerial Application	Manufacturer	Restricted Entry Interval	Use and Notes
Decis 100 EC	deltamethrin	pyrethroid (3A)	canola: 7 field corn: 1 sweet corn: 5 wheat, barley: 40 oats: 31	high	yes, for all listed except field and seed corn	Bayer CropScience Inc.	12 hr	barley, canola, corn, mustard, oat, wheat **Note**: Toxic to bees for 1 day after application. Toxic to fish, aquatic organisms and beneficial insects.
Delegate	spinetoram	spinosyn (5)	cereals: 21 soybeans: 28 corn: 28	low	yes	Corteva Agriscience Inc.	12 hr	corn, barley, oat, rye, soybeans, wheat **Note:** Toxic to bees and certain beneficial insects.
Dipel 2X DF	*Bacillus thuringiensis*	bacterial toxin (11A)	corn: 1	low	no	Valent Canada Inc.	4 hr	corn, timothy
Endigo	thiamethoxam + lambda-cyhalothrin	neonicotinoid (4A) + pyrethroid (3A)	soybeans: 30	high	yes, for all crops listed	Syngenta Canada Inc.	12 hr	soybeans **Note:** Toxic to bees and certain beneficial insects.
Force 3.0G	tefluthrin	pyrethroid (3A)	Planting time only.	moderate	no	Syngenta Canada Inc.	12 hr	corn **Note:** Toxic to birds and small wild mammals. Toxic to aquatic organisms.
Imidan 50 WP	phosmet	organophosphorus (1B)	alfalfa: 7	high	no	Gowan Company	5 days	alfalfa **Note:** Toxic to bees. Toxic to birds and small wild mammals. Toxic to aquatic organisms.
Intrepid	methoxyfenozide	diacylhydrazines (18)	corn: 21 dry beans: 7	low	no	Corteva Agriscience Inc.	12 hr	corn, dry edible beans **Note:** Toxic to aquatic organisms.
Labamba	lambda + cyhalothrin	pyrethroid (3A)	canola: 7 cereals: 28 soybean: 21 dry edible beans: 14 corn: 21	high	yes, for all crops listed	Sharda CropChem Ltd.	24 hr	**Note:** Toxic to bees and certain beneficial insects. Less effective below 20°C.
Lagon 480 EC	dimethoate	organophosphorus (1B)	alfalfa: 28 canola: 21 cereal: 2 dry edible beans: 7 soybeans: 30	moderate	yes, for all crops listed	Loveland Products Canada Inc.	48 hr	alfalfa, canola, cereals, dry edible beans, soybeans **Note:** Toxic to bees. Moderately to highly toxic to aquatic organisms.

[1] Insecticide Resistance Action Committee: www.irac-online.org.

Table 9–6. Foliar Insecticides Used on Field Crops

LEGEND: Relative Acute Toxicities: High = Danger Poison Symbol Moderate = Warning Poison Symbol Low = Caution Poison Symbol N/A = Not Applicable

TRADE NAME	Active ingredient	Chemical Group (IRAC)[1]	Pre-Harvest Interval (days)	Relative Acute Toxicities	Aerial Application	Manufacturer	Restricted Entry Interval	Use and Notes
Lorsban 4 E	chlorpyrifos	organophosphorus (1B)	canola: 21 corn: 70 wheat: 60 barley: 60 oats: 60	high	yes, for all crops listed except corn	Corteva Agriscience Inc.	24 hr	canola, cereals, corn **Note:** Toxic to bees, beneficial insects, birds and wildlife and extremely toxic to fish and aquatic organisms.
Lorsban 15 G	chlorpyrifos	organophosphorus (1B)	corn: 70	high	no	Corteva Agriscience Inc.	24 hr	corn **Note:** Toxic to bees, beneficial insects, birds and wildlife and extremely toxic to fish and aquatic organisms.
Mako	cypermethrin	pyrethroid (3A)	barley: 45 canola: 30 corn: 5 wheat: 30	low	yes, for corn and bertha armyworm in canola no, for wheat, barley and all other canola uses	Belchim Crop Protection Canada	12 hr	barley, canola, corn, wheat **Note:** Toxic to bees and other beneficial insects. Very toxic to fish and aquatic organisms.
Malathion 500 EC	malathion	organophosphorus (1B)	alfalfa: 7 cereals: 7 corn: 7 dry edible beans: 3	low	no	UPL AgroSolutions Canada Inc.	12 hr	alfalfa, cereals, corn, dry edible beans, soybeans **Note:** Toxic to bees and certain beneficial insects. Less effective below 20°C.
Matador 120 EC	lambda-cyhalothrin	pyrethroid (3A)	canola: 7 field and seed corn: 21 silage corn: 14 dry edible beans: 14 soybeans: 14 wheat: 28	high	yes, for all crops listed	Syngenta Canada Inc.	24 hr	alfalfa, barley, canola, corn, dry edible beans, oat, soybeans, wheat **Note:** Toxic to bees.
Movento	spirotetramat	tetronic and tetramic acid derivatives (23)	soybean: 21	low	yes, for all crops listed	Bayer CropScience Inc.	12 hr	soybean **Note:** Toxic to bee brood. Toxic to certain beneficial insects. Toxic to aquatic organisms.
Oberon	spiromesifen	tetronic acids (23)	field corn: 30 silage corn: 5	low	yes, for all crops listed	Bayer CropScience Inc.	12 hr	corn (field and silage) **Note:** Toxic to bee brood. Toxic to certain beneficial insects.

[1] Insecticide Resistance Action Committee: www.irac-online.org.

Table 9–6. Foliar Insecticides Used on Field Crops

LEGEND: Relative Acute Toxicities: High = Danger Poison Symbol Moderate = Warning Poison Symbol Low = Caution Poison Symbol N/A = Not Applicable

TRADE NAME	Active ingredient	Chemical Group (IRAC)[1]	Pre-Harvest Interval (days)	Relative Acute Toxicities	Aerial Application	Manufacturer	Restricted Entry Interval	Use and Notes
Orthene	acephate	organophosphorus (1B)	corn: 21	low	no	UPL AgroSolutions Canada Inc.	5 days	corn (seed and sweet) **Note:** Toxic to bees, aquatic organisms, birds and wild mammals.
Perm-UP	permethrin	pyrethroid (3A)	canola: **Note*** corn: 30	low	yes	UPL AgroSolutions Canada Inc.	12 hr	corn, canola ***Note:** Do not apply after 5-leaf stage. **Note:** Very toxic to bees.
Pounce 384 EC	permethrin	pyrethroid (3A)	canola: **Note*** corn: 30 cereals: 7	low	ground only, unless noted in label	FMC Corporation	12 hr	canola, cereals, corn, flax, sunflowers ***Note:** Do not apply after 5-leaf stage. **Note:** Very toxic to bees.
Pyrifos 15G	chlorpyrifos	organophosphorus (1B)	Planting time only.	low	no	UPL AgroSolutions Canada Inc.	24 hr	corn **Note:** Toxic to bees, beneficial insects, birds and wildlife and extremely toxic to fish and aquatic organisms.
Pyrinex 480 EC	chlorpyrifos	organophosphorus (1B)	canola: 21 cereals: 60 corn: 70	low	yes, for all crops listed except corn	UPL AgroSolutions Canada Inc.	24 hr	canola, cereals, corn **Note:** Toxic to bees, beneficial insects, birds and wildlife and extremely toxic to fish and aquatic organisms.
Sevin XLR Plus	carbaryl	carbamate (1A)	seedling application only	moderate	yes, for all crops listed except beans and canola	Tessenderlo Kerney Inc.	12 hr	canola **Note:** Toxic to bees.
Sharphos Insecticide	chlorpyrifos	organophosphorus (1B)	canola: 21 cereals: 60 corn: 70	low	yes, for all crops listed except corn	Sharda Cropchem Ltd	24 hr	**Note:** Toxic to bees, beneficial insects, birds and wildlife and extremely toxic to fish and aquatic organisms.
Ship 250 EC	cypermethrin	pyrethroid (3A)	corn: 5 canola: 30	medium	yes, for all crops listed	Sharda CropChem Ltd.	12 hr	**Note:** Toxic to bees and other beneficial insects. Very toxic to fish and aquatic organisms.

[1] Insecticide Resistance Action Committee: www.irac-online.org.

Table 9–6. Foliar Insecticides Used on Field Crops

LEGEND: Relative Acute Toxicities: High = Danger Poison Symbol Moderate = Warning Poison Symbol Low = Caution Poison Symbol N/A = Not Applicable

TRADE NAME	Active ingredient	Chemical Group (IRAC)[1]	Pre-Harvest Interval (days)	Relative Acute Toxicities	Aerial Application	Manufacturer	Restricted Entry Interval	Use and Notes
Silencer 120 EC	lambda-cyhalothrin	pyrethroid (3A)	barley: 28 canola: 7 corn: 14 dry edible beans: 14 oat: 28 soybeans: 21	high	yes, for all crops listed except soybeans and beans	ADAMA Canada Ltd.	24 hr	pyrethroid **Note:** Toxic to bees.
Sivanto Prime	flupyradifurone	butenolides (4D)	soybean: 21 dry edible beans: 7 corn: 21	low	yes, for all crops listed	Bayer CropScience Inc.	12 hr	soybean, dry edible beans, corn **Note:** Toxic to bees and certain beneficial insects. Toxic to aquatic organisms.
Sluggo Professional	iron (present as ferric phosphate)	N/A	N/A	low	no	Belchim Crop Protection Canada	N/A	soybean **Note:** Use broadcast or granular spreader to apply evenly around or over the plants to be protected. At the seedling and later stages, apply the bait between the rows and around the perimeter of the field.
Thuricide HPC	*Bacillus thuringiensis*	bacterial toxin (11A)	timothy: 0	low	yes, for all crops listed	Valent Canada Inc.	4 hr	timothy
Transform WG	sulfoxaflor	sulfoximines (4C)	barley: 14 canola: 14 wheat: 14	low	yes, for all crops listed	Corteva Agriscience Inc.	12 hr	barley, wheat, canola **Note:** Toxic to bees and certain beneficial insects.
Voliam Xpress	lambda-cyhalothrin + chlorantraniliprole	pyrethroid (3A) + diamide (28)	silage corn: 14 field and seed corn: 21 soybeans: 21 dry edible beans: 14	high	yes, for all crops listed	Syngenta Canada Inc.	24 hr	field, seed and silage corn, soybeans, dry edible beans **Note:** Toxic to bees and certain beneficial insects. Toxic to aquatic organisms.

[1] Insecticide Resistance Action Committee: www.irac-online.org.

Table 9–7. Bt Corn Products/Traits Currently Available in Canada — as of October 2020

LEGEND: **Target Pests:** BCW = black cutworm CEW = corn earworm CRW = corn rootworm ECB = European corn borer FAW = fall armyworm WBC = western bean cutworm TAW = True armyworm — = does not provide control
Herbicide Tolerance: GT = glyphosate tolerant LL = Liberty Link/glufosinate tolerant RR2 = Roundup Ready/glyphosate tolerant EN = Enlist
Refuge: IR = Integrated Refuge, where refuge hybrid seed has been pre-mixed with Bt hybrid seed in the bag

Trade Name	Transgenic Component	Transgenic Events	Target Pests		Herbicide Tolerance[1]	Refuge %	Refuge Location
			Above Ground	In Soil			
Agrisure® CB/LL	Cry1Ab	Bt,11	ECB	—	LL	20%	400 m
Agrisure® GT/CB/LL	Cry1Ab	Bt11, GA21	ECB	—	GT LL	20%	400 m
Agrisure® 3000GT	Cry1Ab, mCry3A	Bt11, GA21, MIR604	ECB	CRW[2]	GT LL	20%	adjacent
Agrisure® 3120 E-Z Refuge	Cry1Ab, Cry1F	Bt11, GA21, TC1507	BCW, ECB, FAW	—	GT	5%	IR
Agrisure® 3122 E-Z Refuge	Cry1Ab, mCry3A, Cry1F, Cry34Ab1/Cry35Ab1	Bt11, GA21, DAS-59122-7, MIR604, TC1507	BCW, ECB, FAW	CRW[2]	GT	5%	IR
Agrisure 3110 Viptera®	Vip3A, Cry1Ab	Bt11, GA21, MIR162	BCW, CEW, ECB, FAW, TAW, WBC	—	GT LL	20%	400 m
Agrisure 3111 Viptera®	Vip3A, Cry1Ab, mCry3A	Bt11, GA21, MIR604, MIR162	BCW, CEW, ECB, FAW, TAW, WBC	CRW[2]	GT LL	20%	adjacent
Agrisure Viptera® 3220 E-Z Refuge	Cry1Ab, Vip3A, Cry1F	Bt11, GA21, TC1507, MIR162	BCW, CEW, ECB, FAW, TAW, WBC	—	GT	5%	IR
Agrisure Viptera® 3330 E-Z Refuge	Cry1Ab, Vip3A, Cry1A.105, Cry2Ab2	Bt11, GA21, MIR162, MON89034	BCW, CEW, ECB, FAW, TAW, WBC	—	GT LL	5%	IR
Agrisure Duracade® 5122 E-Z Refuge®	Cry1Ab, Cry1F mCry3A, eCry3.1Ab	Bt11, GA21, TC1507, MIR604, 5307	BCW, CEW, ECB, FAW, TAW	CRW[2]	GT LL	5%	IR
Agrisure Duracade® 5222 E-Z Refuge®	Cry1Ab, Cry1F, Vip3A mCry3A, eCry3.1Ab	Bt11, GA21, TC1507, MIR162, MIR604, 5307	BCW, CEW, ECB, FAW, TAW, WBC	CRW[2]	GT LL	5%	IR
Genuity® VT Triple PRO®	Cry1A.105, Cry2Ab2, Cry3Bb1	MON88017, MON89034	CEW, ECB, FAW	CRW[2]	RR2	10%	IR
Optimum® AcreMax®	Cry1F, Cry1Ab	NK603, TC1507, MON810	BCW, ECB, FAW	—	LL RR2	5%	IR
Optimum® AcreMax Leptra	Vip3A, Cry 1F, Cry1Ab	NK603, TC1507, MON 810, MIR162	BCW, CEW, ECB, FAW, TAW, WBC	—	LL RR2	5%	IR
Optimum® AcreMax® XTreme	Cry1F, Cry1Ab, Cry34Ab1/Cry35Ab1, mCry3A	NK603, TC1507, MON810, DAS59122-7, MIR604	BCW, ECB, FAW	CRW[2]	LL RR2	5%	IR
Optimum® Intrasect®	Cry1F, Cry1Ab	NK603, TC1507, MON810	BCW, ECB, FAW	—	LL RR2	5%	400 m
PowerCore®	Cry1A.105 Cry2Ab2 Cry1F	MON89034, TC1507	BCW, CEW, ECB, FAW	—	LL RR2	5%	IR
PowerCore Enlist®	Cry1A.105 Cry2Ab2 Cry1F	MON89034, TC1507	BCW, CEW, ECB, FAW	—	LL RR2 EN	5%	IR
Qrome®	Cry1Ab, Cry1F Cry34/35Ab1, mCry3A	MON810, NK603, DP4114, MIR604	BCW, CEW, ECB, FAW	CRW[2]	LL RR2	5%	IR

[1] Herbicide tolerances listed are for the non-Integrated Refuge products. Integrated Refuge products may have different herbicide tolerances, and herbicide selection should be based on the properties of the refuge hybrid.
[2] Cross resistance to multiple proteins is suspected in some Ontario populations. Pyramid hybrids may experience injury. Use with best management practices, esp. rotate to non-host crop where high pest pressure is observed.
Any edits or updates required on this table can be directed to: Tracey Baute, Field Crop Entomologist, OMAFRA.

Table 9–7. Bt Corn Products/Traits Currently Available in Canada — as of October 2020

LEGEND: **Target Pests:** BCW = black cutworm CEW = corn earworm CRW = corn rootworm ECB = European corn borer FAW = fall armyworm WBC = western bean cutworm TAW = True armyworm — = does not provide control
Herbicide Tolerance: GT = glyphosate tolerant LL = Liberty Link/glufosinate tolerant RR2 = Roundup Ready/glyphosate tolerant EN = Enlist
Refuge: IR = Integrated Refuge, where refuge hybrid seed has been pre-mixed with Bt hybrid seed in the bag

Trade Name	Transgenic Component	Transgenic Events	Target Pests		Herbicide Tolerance[1]	Refuge %	Refuge Location
			Above Ground	In Soil			
SmartStax® (Bayer)	Cry1F, Cry1A.105/Cry2Ab2 Cry3Bb1, Cry34/ 35Ab1	MON88017, MON89034, TC1507, DAS59122-7	BCW, CEW, ECB, FAW	CRW[2]	LL RR2	5%	adjacent (2-row minimum) or IR
SmartStax® (Enlist)	Cry1F, Cry1A.105/Cry2Ab2 Cry3Bb1, Cry34/ 35Ab1	MON88017, MON89034, TC1507, DAS59122-7, DAS40278	BCW, CEW, ECB, FAW	CRW[2]	LL RR2 EN	5%	IR
SmartStax® Refuge Advanced (Corteva)	Cry1F, Cry1A.105/Cry2Ab2 Cry3Bb1, Cry34/ 35Ab1	MON88017, MON89034, TC1507, DAS59122-7	BCW, CEW, ECB, FAW	CRW[2]	LL RR2	5%	adjacent (2-row minimum) or IR
Trecepta®	Vip3A Cry1A.105/Cry2Ab2	MON89034, MIR162, NK603	BCW, CEW, ECB, FAW, TAW, WBC	—	GT	5%	IR
VT Double PRO® (GENVT2P)	Cry1A.105, Cry2Ab2	MON89034, NK603	CEW, ECB, FAW	—	RR2	5%	IR
SWEET CORN PRODUCTS							
Attribute II Series	Cry1Ab, Vip3A	Bt11, MIR162	BCW, CEW, ECB, FAW, TAW, WBC	—	LL	No refuge required if stubble destroyed within 30 days	
Performance Series	Cry1A.105, Cry2Ab2, Cry3Bb1	MON88017, MON89034	CEW, ECB, FAW	CRW[2]	RR2	No refuge required if stubble destroyed within 30 days	

[1] Herbicide tolerances listed are for the non-Integrated Refuge products. Integrated Refuge products may have different herbicide tolerances, and herbicide selection should be based on the properties of the refuge hybrid.
[2] Cross resistance to multiple proteins is suspected in some Ontario populations. Pyramid hybrids may experience injury. Use with best management practices, esp. rotate to non-host crop where high pest pressure is observed.
Any edits or updates required on this table can be directed to: Tracey Baute, Field Crop Entomologist, OMAFRA.

Table 9–8. Pesticides Used in Field Crops That Affect Cholinesterase Levels in Blood

Active Ingredient	Trade Name
carbaryl	Sevin XLR
chlorpyrifos	Citadel 480 EC Lorsban 15 G Lorsban 4E Pyrinex 480 EC Pyrifos 15G Sharphos Insecticide
dimethoate	Cygon 480 Lagon 480
malathion	Malathion 500 EC
phosmet	Imidan 50 WP

Table 9–9. High Toxicity of Insecticides to Honeybees

Active Ingredient	Trade Name
Group 1 – Very toxic. Do not apply to flowering crops or weeds.	
permethrin	Ambush 500EC Perm-UP Pounce 384 EC
chlorpyrifos	Citadel 480 EC Lorsban 15 G Lorsban 4E Pyrifos 15G Pyrinex 480 EC Sharphos Insecticide
imidacloprid + deltamethrin	Concept
dimethoate	Cygon 480 EC Lagon 480 EC
deltamethrin	Decis 5.0 EC
deltamethrin	Decis 100 EC
spinetoram	Delegate
thiamethoxam + lambda-cyhalothrin	Endigo
phosmet	Imidan 50 WP
lambda-cyhalothrin	Labamba Matador 120 EC Silencer 120 EC
cypermethrin	Mako Ship 250 EC
malathion	Malathion 500 EC
spirotetramat	Movento 240 EC
acephate	Orthene
carbaryl	Sevin XLR
sulfoxaflor	Transform WG
lambda-cyhalothrin + chlorantraniliprole	Voliam Xpress
Group 3 – Low toxicity	
chlorantraniliprole	Coragen
Bacillus thuringiensis	Dipel 2X DF
methoxyfenozide	Intrepid
cyantraniliprole	Lumiderm
spiromesifen	Oberon
Bacillus thuringiensis	Thuricide HPC

[1] Unusually low temperatures at time of application may cause insecticides to remain toxic up to 20 times longer than during warm weather. High temperatures in the early morning or late evening may extend active foraging by bees.

Appendices

Appendix A.
Manufacturers of Pesticides Listed in Publication 812

ADAMA Agricultural Solutions Limited
300-191 Lombard Avenue
Winnipeg, Manitoba R3B 0X1
Tel 1-855-264-6262
www.adama.com/canada

Amvac Chemical Corporation
4695 MacArthur Court, Suite 1200
Newport Beach, CA US 92660
Tel 323-264-3910
www.amvac-chemical.com/

BASF Canada Inc.
100 Milverton Dr., 5th Floor
Mississauga, ON L5R 4H1
Tel 1-866-485-BASF (2273)
Fax 289-360-6000
www.agsolutions.ca

Bayer CropScience Inc.
679 Southgate Drive
2nd Floor
Guelph, ON N1G 4S2
Tel 1-888-283-6847
Fax 403-723-7488
www.bayercropscience.ca

Belchim Crop Protection Canada
104 Cooper Dr, Unit 3
Guelph, ON N1C 0A4
Tel 1-866-613-3336
Fax 519-826-7675
www.belchimcanada.com

Corteva Agriscience (Dow AgroSciences)
Suite 2400
215-2nd Street SW
Calgary, AB, T2P 1M4
Tel 1-800-667-3852
www.corteva.ca

Corteva Agriscience (Production Agriscience\DuPont Canada)
P.O. Box 730
7398 Queen's Line
Chatham, ON N7M 5L1
Tel 1-800-667-3852
www.corteva.ca

FMC Canada
6755 Mississauga Rd, Suite 204
Mississauga, ON L5N 7Y2
Tel 1-833-362-7722
www.fmccrop.ca/

Gowan Company
100-135 Innovation Dr.
Winnipeg, Manitoba R3T 6A8
Tel 1-800-960-4318
https://ca.gowanco.com

HeadsUp Plant Protectants Ltd.
3002 Millar Ave
Saskatoon, Saskatchewan S7K 5X9
Tel 1-866-368-9306
www.sar-headsup.ca

Interprovincial Cooperative Ltd. (IPCO)
945 Marion St.
Winnipeg, MB R2J 0K7
Tel 204-233-3461
Fax 204-233-8462
www.ipco.ca

Neudorff North America
P.O. Box 178
Brentwood Bay, BC V8M 1R3
Tel 250-652-5888
www.neudorffpro.com

NuFarm Agriculture Inc.
5101, 333 – 96th Ave NE
Calgary, AB, T3K 0S3
Tel 1-800-868-5444
Fax 403-219-2092
www.nufarm.com

Sharda Crop Chem Ltd.
63 Kingsview Blvd
Etobicoke, ON, M9R1V1
Tel 1-844-810-5720
www.shardacanada.ca/

Syngenta Canada Inc.
140 Research Lane
Guelph, ON N1G 4Z3
Tel 1-877-964-3682
Fax 1-877-214-5405
www.syngenta.ca

UPL AgroSolutions Canada Inc.
138 Dovercliffe Rd.
Guelph, ON, N1G 3A6
Tel 1-866-761-9397
www.upl-ltd.com/canada

Valent Canada, Ltd.
130 Research Lane, Unit 6
Guelph, ON N1G 5G3
Tel 519-767-9262
Fax 925-817-5026
www.valent.ca

Appendix B.
Ontario Ministry of Agriculture, Food and Rural Affairs Field Crop Advisory Staff List by Location

Location/role	Crop Advisory Staff	Tel		E-mail
Brighton Resource Centre 95 Dundas St. E., RR#3, Brighton, ON K0K 1H0		Tel	613-475-1630	
Guelph OMAFRA 1 Stone Rd. W., Guelph, ON N1G 4Y2				
Crop Protection Program Lead	Denise Beaton	Tel	519-400-3636	denise.beaton@ontario.ca
Minor Use Coordinator	Jim Chaput	Tel	519-546-2482	jim.chaput@ontario.ca
Harrow Greenhouse and Processing Crops Research Centre, 2585 County Road 20, Harrow, ON N0R 1G0		Tel	519-738-2251	
Kemptville Resource Centre P.O. Box 2004, Concession Road, Kemptville, ON K0G 1J0		Tel	613-258-8295	
Cropping Systems Specialist	Vacant			
Soil Management Specialist	Sebastian Belliard	Tel	613-301-0897	sebastian.belliard@ontario.ca
Lindsay Resource Centre 322 Kent St. W., Lindsay, ON K9V 2Z9		Tel	705-324-6125	
Forage & Grazier Specialist	Christine O'Reilly	Tel	705-341-4899	christine.oreilly@ontario.ca
New Liskeard 280 Armstrong St., P.O. Box 4070, New Liskeard, ON P0J 1P0		Tel	800-461-6132	
Ridgetown Resource Centre Agronomy Building, Ridgetown College, P.O. Box 400, Main St. E, Ridgetown, ON N0P 2C0		Tel	519-674-1690	
Entomologist, Field Crops Program Lead	Tracey Baute	Tel	519-360-7817	tracey.baute@ontario.ca
Pathologist, Field Crops Program Lead	Albert Tenuta	Tel	519-360-8307	albert.tenuta@ontario.ca
Soil Management Specialist, Horticulture Crops	Anne Verhallen	Tel	519-359-6707	anne.verhallen@ontario.ca
Simcoe Resource Centre P.O. Box 587, Blueline Rd. & Hwy #3, Simcoe, ON N3Y 4N5		Tel	519-426-7120	
Application Technology Specialist	Jason Deveau	Tel	519-209-1883	jason.deveau@ontario.ca
Stratford Resource Centre 63 Lorne Ave. E., Suite 2B, Stratford, ON N5A 6S4		Tel	519-271-0280	
Canola & Edible Beans Specialist	Meghan Moran	Tel	519-546-1725	meghan.moran@ontario.ca
Cereals Specialist	Joanna Follings	Tel	519-400-7124	joanna.follings@ontario.ca
Soil Fertility Specialist, Field Crops	Vacant			

Appendix B.
Ontario Ministry of Agriculture, Food and Rural Affairs Field Crop Advisory Staff List by Location

Location/role	Crop Advisory Staff	Tel		E-mail
University of Guelph 50 Stone Rd. E., Guelph, ON N1G 2W1		Tel	519-824-4120	
Crop Innovations Specialist Crop Science Building	Ian McDonald	Tel	519-824-4120, ext. 56707	ian.mcdonald@ontario.ca
Corn Specialist Crop Science Building	Ben Rosser	Tel	519-824-4120, ext. 54865	ben.rosser@ontario.ca
Weed Management Specialist, Field Crops Crop Science Building, Room 303	Mike Cowbrough	Tel	519-824-4120, ext. 52580	mike.cowbrough@ontario.ca
Vineland – University of Guelph 4890 Victoria Ave. N., P.O. Box 7000, Vineland Station, ON L0R 2E0		Tel	905-562-4141	
Vineland Resource Centre Adv. Serv. Building, P.O. Box 8000, 4890 Victoria Ave. N., Vineland Station, ON L0R 2E0		Tel	905-562-4147	
Woodstock Resource Centre P.O. Box 666, Hwy. #59 N, Woodstock, ON N4S 7Z5		Tel	519-537-6621	
Field Crops Sustainability Specialist	Christine Brown	Tel	519-533-3358	christine.brown1@ontario.ca
Soil Management Specialist, Field Crops	Jake Munroe	Tel	519-301-0548	jake.munroe@ontario.ca

Agricultural Information Contact Centre
Provides province-wide, toll-free technical and business information to commercial farms, agri-businesses and rural businesses.

1 Stone Rd. West.
Guelph, ON N1G 4Y2
Tel 519-826-4047
Toll-free 877-424-1300
E-mail ag.info.omafra@ontario.ca

A complete list of Agriculture Development Branch staff can be found on the OMAFRA website at ontario.ca/omafra.

Appendix C.
Ontario Ministry of the Environment, Conservation and Parks Regional Contact Information

Please contact the Ministry's local District or Area office. The local District Office contact information can be found from the Government of Ontario Employee and Organization Directory at www.infogo.gov.on.ca/infogo/home.html#orgProfile/-270/en.

After business hours, please contact the Pollution Hotline at 1-866-MOE-TIPS (1-866-663-8477).

REGION **County**	**Address**	**Telephone/Fax**
Central Region Toronto, Halton, Peel York, Durham, Muskoka, Simcoe	5775 Yonge St., 8th Floor Toronto, ON M2M 4J1	Tel 416-326-6700 Toll-free 1-800-810-8048
West-Central Region Haldimand, Norfolk, Niagara, Hamilton-Wentworth, Dufferin, Wellington, Waterloo, Brant	Ontario Government Building 119 King St. W., 12th Floor Hamilton, ON L8P 4Y7	Tel 905-521-7640 Toll-free 1-800-668-4557
Eastern Region Frontenac, Hastings, Lennox & Addington, Prince Edward, Leeds & Grenville, Prescott & Russell, Stormont/Dundas & Glengarry, Haliburton, Peterborough, City of Kawartha Lakes, Northumberland, Renfrew, Ottawa, Lanark (Township of South Algonquin)	1259 Gardiners Rd., Unit 3 P.O. Box 22032 Kingston, ON K7P 3J6	Tel 613-549-4000 Toll-free 1-800-267-0974
Southwestern Region Elgin, Middlesex, Oxford, Essex, Kent, Lambton, Bruce, Grey, Huron, Perth	733 Exeter Rd., 2nd Floor London, ON N6E 1L3	Tel 519-873-5000 Toll-free 1-800-265-7672
Northern Region (West) Manitoulin, Nipissing, Parry Sound, Sudbury, Algoma (East), Timiskaming, Sault Ste. Marie, Algoma (West), Cochrane, Kenora, Rainy River, Timmins, Thunder Bay	435 James St. S., Ste. 331 Thunder Bay, ON P7E 6S7	Tel: 807-475-1205 Toll-free: 1-800-875-7772
Standards Development Branch	Pesticides Section 40 St. Clair Ave. W., 9th Floor Toronto, ON M4V 1M2	Tel 416-327-5519
Environmental Approvals Branch	Pesticides Licensing 135 St. Clair Ave. W. 1st Floor Toronto, ON M4V 1P5	Tel 416-314-8001 Toll-free 1-800-461-6290

Appendix D.
Other Contacts

AGRICULTURE & AGRI-FOOD CANADA RESEARCH CENTRES

www.agr.gc.ca/index_e.php

Eastern Cereals and Oilseeds Research Centre
960 Carling Ave.
Ottawa, ON K1A 0C6
Tel 613-759-1858

Greenhouse and Processing Crops Centre
2585 County Road 20
Harrow, ON N0R 1G0
Tel 519-738-2251

Southern Crop Protection and Food Research Centre
1391 Sandford St.
London, ON N5V 4T3
Tel 519-457-1470

Vineland Research Farm
4902 Victoria Ave. N.
Vineland, ON L0R 2E0
Tel 905-562-4113

Guelph Research and Development Centre
93 Stone Rd. W.
Guelph, ON N1G 5C9
Tel 519-829-2400

UNIVERSITY OF GUELPH

Main Campus
50 Stone Rd E
Guelph, ON N1G 2W1
Tel 519-824-4120
www.uoguelph.ca

Ridgetown Campus
120 Main St E
Ridgetown, ON N0P 2C0
Tel 519-674-1500
www.ridgetownc.uoguelph.ca

Department of Plant Agriculture

www.plant.uoguelph.ca

Department of Plant Agriculture, Guelph
50 Stone Rd. E.
Guelph, ON N1G 2W1
Tel 519-824-4120, ext. 56083 or 52693

Department of Plant Agriculture, Simcoe
1283 Blueline Rd., Box 587
Simcoe, ON N3Y 4N5
Tel 519-426-7127, ext 344

Department of Plant Agriculture, Vineland
Box 7000, 4890 Victoria Ave. N.
Vineland Station, ON L0R 2E0
Tel 905-562-4141

Lab Services Division

95 Stone Rd. W.
Guelph, ON N1H 8J7
Tel 519-767-6299
www.uoguelph.ca/labserv/

Trace Organic and Pesticide Contaminants
Tel 519-823-1268

Pest Diagnostic Clinic
Tel 877-863-4235 or 519-823-1268, ext 57256

VINELAND RESEARCH AND INNOVATION CENTRE

4890 Victoria Ave. N.
Vineland Station, ON L0R 2E0
Tel 905-562-0320
www.vinelandresearch.com

Appendix E.
Diagnostic Service

Samples for disease diagnosis, insect or weed identification, nematode counts and verticillium testing can be sent to:

University of Guelph
Laboratory Services Division
Pest Diagnostic Clinic
95 Stone Rd. W.
Guelph, ON N1H 8J7

Tel 519-767-6299
Fax 519-767-6240
E-mail aflinfo@uoguelph.ca

www.guelphlabservices.com

Payment must accompany samples at the time of submission. Submission forms are available at: https://afl.uoguelph.ca/submitting-samples.

How to Sample for Nematodes

Soil

When to sample

Soil and root samples can be taken at any time of the year that the soil is not frozen. In Ontario, nematode soil population levels are generally at their highest in May and June and again in September and October.

How to sample soil

Use a soil sampling tube, trowel or narrow-bladed shovel to take samples. Sample soil to a depth of 20–25 cm (8–10 in.). If the soil is bare, remove the top 2 cm (1 in.) prior to sampling. A sample should consist of 10 or more subsamples combined. Mix well. Then take a sample of 0.5–1 L (1 pint–1 quart) from this. No single sample should represent more than 2.5 ha (6.25 acres). Mix subsamples in a clean pail or plastic bag.

Sampling pattern

If living crop plants are present in the sample area, take samples within the row and from the area of the feeder root zone (with trees, this is the drip line).

Number of subsamples

Based on the total area sampled:

500 m^2 (5,400 ft^2)	10 subsamples
500 m^2–0.5 ha (5,400 ft^2–1.25 acres)	25 subsamples
0.5 ha–2.5 ha (1.25–6.25 acres)	50 subsamples

Roots

For small plants, sample the entire root system plus adhering soil. For large plants, 10–20 g (½–1 oz.), dig fresh weight from the feeder root zone and submit.

Problem areas

Take soil and root samples from the margins of the problem area where the plants are still living. If possible, also take samples from healthy areas in the same field. If possible, take both soil and root samples from problem and healthy areas in the same field.

Sample Handling

Soil samples

Place in plastic bags as soon as possible after collecting.

Root samples

Place in plastic bags and cover with moist soil from the sample area.

Storage

Store samples at 5°C–10°C and do not expose them to direct sunlight or extreme heat or cold (freezing). Only living nematodes can be counted. Accurate counts depend on proper handling of samples.

Submitting Plant for Disease Diagnosis or Identification

Sample submission forms

Sample submission forms can be found online at the University of Guelph Agriculture & Food Laboratory at: afl.uoguelph.ca/submitting-samples. Carefully fill in all the categories on the form. In the space provided, draw the most obvious symptom and the pattern of the disease in the field. It is important to include the cropping history of the area for the past 3 years and pesticide use records from this year.

Choose a complete, representative sample showing early symptoms. Submit as much of the plant as is practical, including the root system, or several plants showing a range of symptoms. If symptoms are general, collect the sample from an area where they are of intermediate severity. Completely dead material is usually inadequate for diagnosis.

With plant specimens submitted for identification, include at least a 20–25-cm sample of the top portion of the stem with lateral buds, leaves, flowers or fruits in identifiable condition. Wrap plants in newspaper and put in a plastic bag. Tie the root system off in a separate plastic bag to avoid the soil drying out and contaminating the leaves. Do not add moisture, as this encourages decay in transit. Cushion specimens and pack in a sturdy box to avoid damage during shipping. Avoid leaving specimens to bake or freeze in a vehicle or in a location where they could deteriorate.

Delivery

Deliver to the Pest Diagnostic Clinic as soon as possible by first class mail or courier at the beginning of the week.

Submitting Insect Specimens for Identification

Collecting samples

Place dead, hard-bodied insects in vials or boxes and cushion with tissues or cotton. Place soft-bodied insects and caterpillars in vials containing alcohol. Do not use water, as this results in rot. Do not tape insects to paper or send them loose in an envelope.

Place live insects in a container with enough plant “food” to support them during transit. Be sure to write “live” on the outside of the container.

Appendix F.
Pesticide Groups Based on Sites of Action — Insecticides

The classification scheme listed below is adapted from the Insecticide Action Committee Mode of Action Classification (IRAC) V8, December 2015.

Group #	Primary Site of Action	Group Name	Product name(s)[1]
1A	acetylcholine esterase (AChE) inhibitors	carbamates	Sevin XLR Plus
1B	acetylcholine esterase (AChE) inhibitors	organophosphate	Counter 15 G, Cygon 480, Imidan 50 WP, Lagon 480 EC, Lorsban 4E, Lorsban 15 G, Malathion 500 E, Monitor 480, Pyrifos 15 G, Pyrinex 480 EC
3A	sodium channel modulators	pyrethroid	Ambush 500EC, Concep, Decis 5 EC, Decis 100 EC, Endigo, Force 3.0G, Matador 120 EC, Pounce 384 EC, Silencer 120 EC, Voliam Xpress
4A	nicotinic acetylcholine receptor competitive modulators	neonicotinoids	Acceleron IX-409, Alias 240 SC, Concept, Cruiser 350FS, Cruiser 5FS, Cruiser Maxx Vibrance Beans, Endigo, Gaucho 480 FL, Gaucho GS, Helix Vibrance, NipsIt INSIDE 600, NipsIt SUITE, Poncho 600FS, Prosper, Sombrero 600FS, Stress Shield 600
4C	nicotinic acetylcholine receptor competitive modulators	sulfoximines	Closer, Transform WG
4D	nicotinic acetylcholine receptor competitive modulators	butenolides	Sivanto Prime
5	nicotinic acetylcholine alloxteric modulators	naturalyte/spinosyns	Delegate, Success 480 SC
11A	microbial disruptors of insect midgut membranes	biologicals	Bioprotec CAF, Dipel 2X DF, Thuricide HPS
18	ecdysone receptor agonists	diacylhydrazines	Intrepid
23	inhibitors of acetyl CoA carboxylase	tetronic and tetramic acid derivatives	Movento, Oberon
24	mitochondrial complex IV electron transport inhibitors	inorganics (aluminum phosphide)	Fumitoxin, Gastoxin, Phostoxin
28	ryanodine receptor modulators	diamides	Coragen, Fortenza, Lumiderm, Lumivia, Voliam Xpress

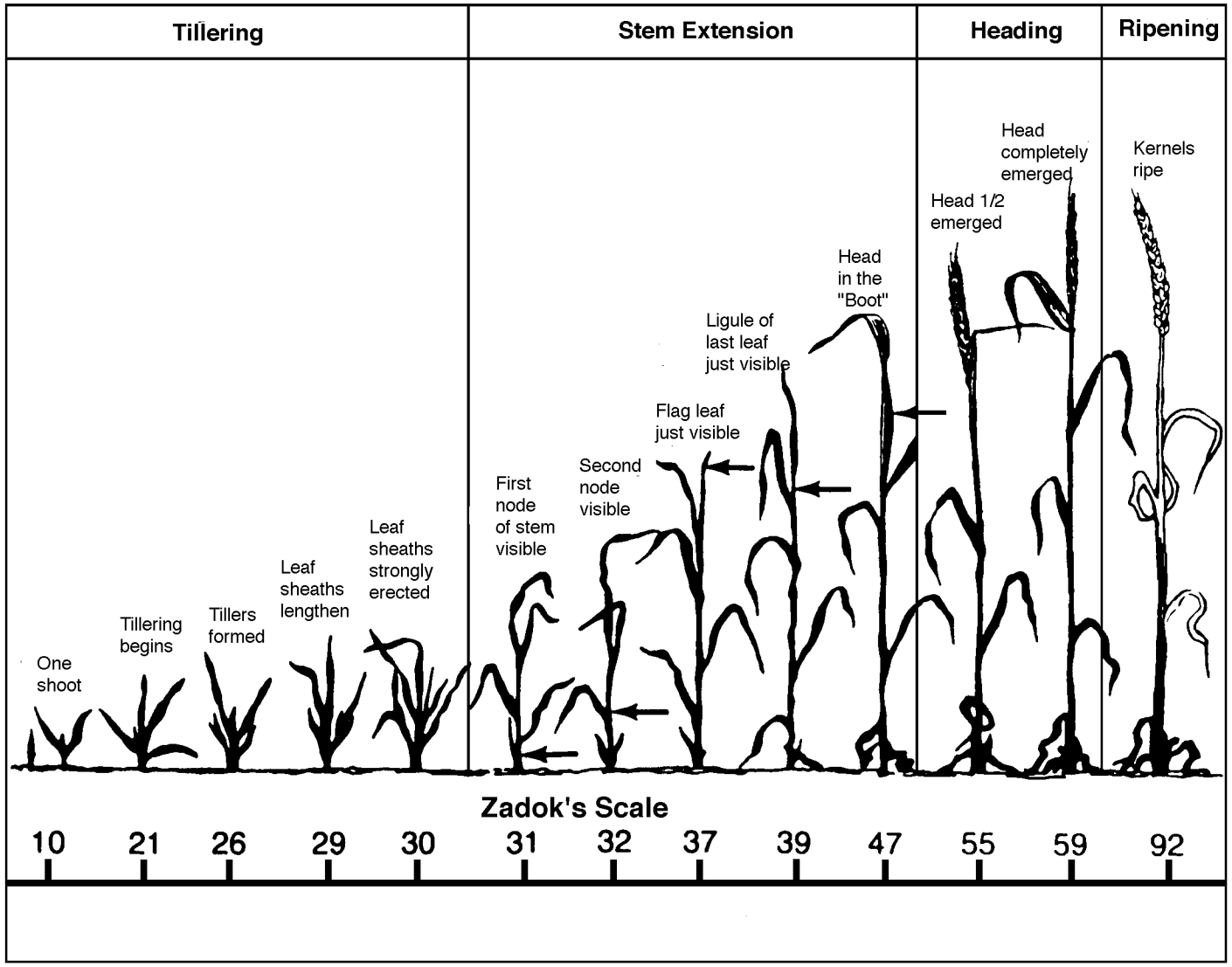
[1] Some products are listed in more than one group because they contain more than one active ingredient from different groups.

Appendix G.
Pesticide Groups Based on Sites of Action — Fungicides

This classification scheme is based on the Fungicide Resistance Action Committee (FRAC) Code List, 2015.

Group #	Primary Site of Action	Group Name	Product name(s)	Risk of Developing Resistance
1	mitosis and cell division (ß-tubulin assembly)	MBC (methyl-benzimidazole carbamates)	DCT, Maxim Quattro, MERTECT SC, Senator 70 WP	high
2	dignal transduction (MAP/Histidine-kinase)	dicarboximide	Overall 240 SC, Ronilan EG, Rovral WP	medium to high
3	C14 — demethylation in sterol biosynthesis	DMI (demethylation inhibitors) sometimes referred to as sterol inhibitors (SI)	Blanket AP, Bumper 432 EC, Caramba, Cotegra, Dividend XL RTA, EverGol Energy, Folicur 250 EW, Fullback 125 SC, Headline AMP, Helix Vibrance, Nufarm Propiconazole, NipsIt SUITE, Orius 430 SC, Princeton, Proline 480 SC, Propulse, Prosaro XTR, Quash, Quilt, Rancona Pinnacle, Rancona Trio, Raxil MD, Raxil Pro MD, Raxil T, Stratego PRO, Tilt 250 E, Topas 250 E, Topnotch, Trivapro A + Trivapro B, Twinline, Vibrance Quattro, Vibrance XL, Vortex FL	medium
4	RNA polymerase 1	PA (phenylamides)	Allegiance FL, Apron FL, Apron Maxx RFC, Apron Maxx RTA, Apron XL LS, Cruiser Maxx Vibrance Beans, Dividend XL RTA, EverGol Energy, Helix Vibrance, Maxim Quattro, NipsIt SUITE, Prosper, Rancona Pinnacle, Rancona Trio, Raxil MD, Raxil Pro MD, Vibrance Maxx RFC, Vibrance Quattro, Vibrance Trio, Vibrance XL	high
7	respiration (complex II: succinate-dehydrogenase)	SDHI (succinate dehyrogenase inhibitors)	Anchor, Cotegra, Cruiser Maxx Vibrance Beans, EverGol Energy, Fontelis, Gaucho CS, ILeVO, Lance WDG, Priaxor, Propulse, Prosper, Rancona Trio, Trivapro A + Trivapro B, Vertisan, Vibrance Maxx RFC, Vibrance Quattro, Vibrance Trio, Vitaflo 280	medium
9	amino acid and protein synthesis (methionine biosysthesis)	AP (aniline-pyrimidines)	Astound	medium
11	respiration (complex III: cytochrome bc1, Qo site)	Qol (quinone outside inhibitors)	Acapela, Blanket AP, Cabrio EG, Dynasty 100FS, Evito 480SC, Headline AMP, Headline EC, Maxim Quattro, Priaxor, Quadris, Quilt, Reason 500 SC, S-2200 3.2 FS, S-2200 4SC, Stamina Corn, Stratego PRO, Tanos 50 DF, Trilex FL,Topnotch, Trivapro A + Trivapro B, Twinline	high
12	signal transduction (MAP/Histidine-kinase)	PP (phenyl pyrroles)	Apron Maxx RFC, Apron Maxx RTA, Astound, Cruiser Maxx Vibrance Beans, Helix Vibrance, Maxim 480 FS, Maxim Quattro, Proseed, Vibrance Maxx RFC, Vibrance Quattro, Vibrance Trio, Vibrance XL	low to medium
14	lipid synthesis and membrane integrity (lipid peroxidation (proposed))	AH (aromatic hydrocarbon)	Botran 75 W, Quintozene 75 WP	low to medium
22	mitosis (ß-tubulin assembly)	bensamides	INTEGO Solo	low to medium
29	respiration (uncoupler of oxidative phosphorylation)	2,6-dinitro-anilines	Allegro 500F	low
44	lipid synthesis and membrane integrity (microbial disrupters of pathogen cell membranes)	microbial	Clariva pn, Contans WG, Serenade OPTI, Votivo 240 FS	resistance not known
M1	multi-site, contact	inorganic	Copper 53 W, Copper Spray, Cueva, Kocide 101 WP, Kocide DF, Microscopic Sulphur, Oxidate, Parasol WP	low
M3	multi-site, contact	dithiocarbamates and relatives	Acrobat MZ, Anchor, Dithane DG Rainshield, Ferbam 76 WDG, Gaucho CS, Gavel 75 DF, Manzate DF, Penncozeb 80, Polyram DF, Prosper, Ridomil Gold, Thiram 75 WP, Vitaflo 280, Zineb 80 W	low
M4	multi-site, contact	phthalimide	Captan, DCT, Maestro 75 DF, Supra Captan 80 WDG	low
M5	multi-site, contact	chloronitriles	Bravo 500, Tatoo C	low

Appendix H.
Cereal Growth Stages



Appendix I.
The Metric System

Metric units

Linear measures (length)
10 millimetres (mm) = 1 centimetre (cm)
100 centimetres (cm) = 1 metre (m)
1,000 metres = 1 kilometre (km)
Square measures (area)
100 m × 100 m = 10,000 m^2 = 1 hectare (ha)
100 ha = 1 square kilometre (km^2)
Cubic measures (volume)
Dry measure
1,000 cubic millimetres (mm^3) = 1 cubic centimetre (cm^3)
1,000,000 cm^3 = 1 cubic metre (m^3)
Liquid measure
1,000 millilitres (mL) = 1 litre (L)
100 L = 1 hectolitre (hL)
Weight-volume equivalents (for water)
(1.00 kg) 1,000 grams = 1 litre (1.00 L)
(0.50 kg) 500 g = 500 mL (0.50 L)
(0.10 kg) 100 g = 100 mL (0.10 L)
(0.01 kg) 10 g = 10 mL (0.01 L)
(0.001 kg) 1 g = 1 mL (0.001 L)
Weight measures
1,000 milligrams (mg) = 1 gram (g)
1,000 g = 1 kilogram (kg)
1,000 kg = 1 tonne (t)
1 mg/kg = 1 part per million (ppm)
Dry–liquid equivalents
1 cm^3 = 1 mL
1 m^3 = 1,000 L

Dry weight conversions (approximate)

Metric	Imperial
grams or kilograms/hectare	**ounces or pounds/acre**
100 g/ha =	1½ oz/acre
200 g/ha =	3 oz/acre
300 g/ha =	4¼ oz/acre
500 g/ha =	7 oz/acre
700 g/ha =	10 oz/acre
1.10 kg/ha =	1 lb/acre
1.50 kg/ha =	1¼ lb/acre
2.00 kg/ha =	1¾ lb/acre
2.50 kg/ha =	2¼ lb/acre
3.25 kg/ha =	3 lb/acre
4.00 kg/ha =	3½ lb/acre
5.00 kg/ha =	4½ lb/acre
6.00 kg/ha =	5¼ lb/acre
7.50 kg/ha =	6¾ lb/acre
9.00 kg/ha =	8 lb/acre
11.00 kg/ha =	10 lb/acre
13.00 kg/ha =	11½ lb/acre
15.00 kg/ha =	13½ lb/acre

Liquid equivalents (approximate)

50 L/ha	=	4.45 gal/acre (5.35 US gal/acre)
100 L/ha	=	8.90 gal/acre (10.70 US gal/acre)
150 L/ha	=	13.35 gal/acre (16.05 US gal/acre)
200 L/ha	=	17.80 gal/acre (21.40 US gal/acre)
250 L/ha	=	22.25 gal/acre (26.75 US gal/acre)
300 L/ha	=	26.70 gal/acre (32.10 US gal/acre)

Application rate conversions

Metric to imperial or U.S. (approximate)
litres per hectare × 0.09 = Imp. gallons per acre
litres per hectare × 0.11 = U.S. gallons per acre
litres per hectare × 0.36 = Imp. quarts per acre
litres per hectare × 0.43 = U.S. quarts per acre
litres per hectare × 0.71 = Imp. pints per acre
litres per hectare × 0.86 = U.S. pints per acre
millilitres per hectare × 0.014 = U.S. fluid ounces per acre
grams per hectare × 0.014 = ounces per acre
kilograms per hectare × 0.89 = pounds per acre
tonnes per hectare × 0.45 = tons per acre
Imperial or U.S. to metric (approximate)
Imp. gallons per acre × 11.23 = litres per hectare (L/ha)
U.S. gallons per acre × 9.35 = litres per hectare (L/ha)
Imp. quarts per acre × 2.8 = litres per hectare (L/ha)
U.S. quarts per acre × 2.34 = litres per hectare (L/ha)
Imp. pints per acre × 1.4 = litres per hectare (L/ha)
U.S. pints per acre × 1.17 = litres per hectare (L/ha)
Imp. fluid ounces per acre × 70 = millilitres per hectare (mL/ha)
U.S. fluid ounces per acre × 73 = millilitres per hectare (mL/ha)
tons per acre × 2.24 = tonnes per hectare (t/ha)
pounds per acre × 1.12 = kilograms per hectare (kg/ha)
pounds per acre × 0.45 = kilograms per acre (kg/acre)
ounces per acre × 70 = grams per hectare (g/ha)

Metric conversions

5 mL = 1 tsp
15 mL = 1 tbsp
28.5 mL = 1 imp. fl. oz.

Conversion tables – metric to imperial (approximate)

Length		
1 millimetre (mm)	=	0.04 inches
1 centimetre (cm)	=	0.40 inches
1 metre (m)	=	39.40 inches
1 metre (m)	=	3.28 feet
1 metre (m)	=	1.09 yards
1 kilometre (km)	=	0.62 miles
Area		
1 square centimetre (cm^2)	=	0.16 square inches
1 square metre (m^2)	=	10.77 square feet
1 square metre (m^2)	=	1.20 square yards
1 square kilometre (km^2)	=	0.39 square miles
1 hectare (ha)	=	107,636 square feet
1 hectare (ha)	=	2.5 acres
Volume (dry)		
1 cubic centimetre (cm^3)	=	0.061 cubic inches
1 cubic metre (m^3)	=	1.31 cubic yards
1 cubic metre (m^3)	=	35.31 cubic feet
1,000 cubic metres (m^3)	=	0.81 acre-feet
1 hectolitre (hL)	=	2.8 bushels
Volume (liquid)		
1 millilitre (mL)	=	0.035 fluid ounces (Imp.)
1 litre (L)	=	1.76 pints (Imp.)
1 litre (L)	=	0.88 quarts (Imp.)
1 litre (L)	=	0.22 gallons (Imp.)
1 litre (L)	=	0.26 gallons (U.S.)
Weight		
1 gram (g)	=	0.035 ounces
1 kilogram (kg)	=	2.21 pounds
1 tonne (t)	=	1.10 short tons
1 tonne (t)	=	2,205 pounds
Pressure		
1 kilopascal (kPa)	=	0.15 pounds/$in.^2$
Speed		
1 metre per second	=	3.28 feet per second
1 metre per second	=	2.24 miles per hour
1 kilometre per hour	=	0.62 miles per hour
Temperature		
°F	=	(°C × 1.8) + 32

Conversion tables – imperial to metric (approximate)

Length		
1 inch	=	2.54 cm
1 foot	=	0.30 m
1 yard	=	0.91 m
1 mile	=	1.61 km
Area		
1 square foot	=	0.09 m^2
1 square yard	=	0.84 m^2
1 acre	=	0.40 ha
Volume (dry)		
1 cubic yard	=	0.76 m^3
1 bushel	=	36.37 L
Volume (liquid)		
1 fluid ounce (Imp.)	=	28.41 mL
1 pint (Imp.)	=	0.57 L
1 gallon (Imp.)	=	4.55 L
1 gallon (U.S.)	=	3.79 L
Weight		
1 ounce	=	28.35 g
1 pound	=	453.6 g
1 ton	=	0.91 tonne
Pressure		
1 pound per square inch	=	6.90 kPa
Temperature		
°C	=	(°F – 32) × .5556

Abbreviations

%	=	per cent
ai	=	active ingredient
AP	=	agricultural powder
cm	=	centimetre
cm^2	=	square centimetre
CS	=	capsule suspension
DF	=	dry flowable
DG	=	dispersible granular
DP	=	dispersible powder
E	=	emulsifiable
EC	=	electrical conductivity
e.g.	=	for example
F	=	flowable
g	=	gram
Gr	=	granules, granular
ha	=	hectare
kg	=	kilogram
km/h	=	kilometres per hour
kPa	=	kilopascal
L	=	litre
m	=	metre
m^2	=	square metre
mL	=	millilitre
mm	=	millimetre
m/s	=	metres per second
SC	=	sprayable concentrate
SP	=	soluble powder
t	=	tonne
W	=	wettable (powder)
WDG	=	water dispersible granular
WG	=	wettable granule
WP	=	wettable powder

Appendix J.
Field Record Form

YEAR																
	Field I.D.				Field I.D.				Field I.D.				Field I.D.			
Acreage																
Soil Type																
Soil Fertility	pH	N	P	K	pH	N	P	K	pH	N	P	K	pH	N	P	K
Tillage																
Variety/Hybrid																
Seeding Rate																
Seeding Date																
Seed Treatment																
Fertilizer/Lime product, rate, timing																
Manure Application																
Herbicides																
Rate																
Crop Stage																
Date																
Yield																
Harvest Date																
Moisture																
Test Wt/Grade																
Notes																

Appendix K.
Field Scouting Report

Farm: _____ Scout: _____ Date: _____ Time: _____

Field: _____ Acreage: _____ Crop: _____Plant Population: _____

Crop Growth Stage, Height and Condition: _____

_____

_____

Soil Condition:_____

Weeds	Growth Stage	Pressure/Density
Insects	**Stage**	**Pressure/Density**
Diseases	**Stage**	**Pressure/Density**

Field Map: Use the blank area below to sketch in the location of weeds, insects, disease patches, crop condition, including GPS coordinates.

Field Scout's Comments: _____

_____

_____

_____

Action Recommended: _____

_____

_____

Appendix L. Production Insurance

Production Insurance (PI) covers production losses and yield reductions caused by insured perils. This includes adverse weather, disease, wildlife and insect infestations. Depending on the plan, coverage is available on a total-yield, dollar-value or acreage-loss basis. Producers can choose the type and level of coverage that best meets their needs. When enrolled in PI, producers are guaranteed a level of production, based on their yield history and their chosen coverage level. Claims are paid when an insured peril causes a yield to fall below the guaranteed production.

In Ontario, Agricorp administers PI on behalf of the Government of Ontario and Agriculture and Agri-Food Canada. More than 15,000 producers and 2 million hectares (5 million acres) of Ontario farmland are insured each year.

PI is available to all Ontario farmers, landlords and sharecroppers who grow or manage eligible agricultural products.

For more information, contact Agricorp.

Agricorp
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Box 3660, Stn. Central
Guelph, ON N1H 8M4

Open weekdays, 7 AM–5 PM

Tel: 1-888-247-4999
TTY: 1-877-275-1380
Fax: 519-826-4118
Email: contact@agricorp.com
Web: www.agricorp.com

Emergency and First-Aid Procedures for Pesticide Poisoning

For pesticide poisonings and pesticide injuries, call the Ontario Poison Centre: Toronto 1-800-268-9017

PREVENT ACCIDENTS

- **Read the label.** Follow all the precautions the label recommends. Read the First Aid section of the label BEFORE you begin to handle any pesticide.
- **Make sure that someone knows** what pesticides you are working with and where you are.
- **Keep a file of labels and product Safety Data Sheets (SDS) for the pesticides you use.** Make sure everyone knows where to find this in case of an emergency.
- **Post emergency numbers near all telephones.**
- **Keep clean water, paper towels, extra gloves and clean coveralls close by** in case you spill pesticide on yourself.

If someone has been working with pesticides and you see any possible symptoms of pesticide poisoning or injury, take emergency action immediately.

IF AN ACCIDENT OR POISONING HAPPENS

- Protect yourself from injury first.
- Stop the exposure to the pesticide. Move the victim away from the contaminated area.
- Check the four basic facts — identify the pesticide, the quantity, the route of entry and time of exposure.
- Call an ambulance or the Ontario Poison Centre.
- Start first aid. This is not a substitute for professional medical help.
- **Provide the label, SDS sheet, container or a clear photo of the container to emergency personnel** at the scene — or take it with you to the hospital. Do not transport pesticide containers in the passenger compartment of the vehicle.

FIRST AID

If a pesticide comes in contact with skin:

- remove all contaminated clothing; wash skin thoroughly with lots of soap and warm water.
- dry skin well and cover with clean clothing or other clean material.

If pesticide comes in contact with eyes:

- hold eyelids open; wash the eyes with clean running water for 15 minutes or more.

If pesticide was inhaled:

- move the victim to fresh air and loosen tight clothing.
- give artificial respiration if the victim is not breathing.

Do not breathe in the exhaled air from the victim — you could also be poisoned.

If a pesticide was swallowed:

- call the Ontario Poison Centre IMMEDIATELY.

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Published by the Ministry of Agriculture, Food and Rural Affairs

Toronto, Canada

ISSN 1496-662X (Print)
ISSN 2561-4991 (Online)
03-21

Cette publication est aussi disponible en français.

Agricultural Information Contact Centre
1-877-424-1300
1-855-696-2811 (TTY)
email: ag.info.omafra@ontario.ca
ontario.ca/omafra

For a major spill, a theft or a fire involving a pesticide:

Call the Ontario Ministry of the Environment, Conservation and Parks **Spills Action Centre** at **1-800-268-6060** (24 hr a day, 7 days a week).
Notify your municipality.

ontario.ca/crops