

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.healthcanada.gc.ca/pollinators, OMAFRA's web page on Pollinator Health Information for Crop Growers at www.omafra.gov.on.ca/english/pollinator/info-crops.htm, as well as *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.

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 (<i>Diabrotica virgifera</i> and <i>Diabrotica barberi</i>)				
Seed Treatment				
<p>In Ontario, the use of neonicotinoid seed treatments on corn and soybean seed is restricted. See OMAFRA's web page on Pollinator Health Information for Crop Growers at www.omafra.gov.on.ca/english/pollinator/info-crops.htm for further information on the requirements to use these products. Seed treatments are best suited for those fields at high risk of rootworm infestations, especially if planting corn after corn.</p>	<p>clothianidin (See NOTE.)</p>	NipsIt INSIDE 600	<p>166.7 mL/ 80,000 kernels</p>	<p>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 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.</p>
		Poncho 1250		
<p>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 <i>Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices</i> on the Health Canada website at www.healthcanada.gc.ca/pollinators. If treated seeds are spilled outdoors or in areas accessible to birds, promptly clean up or bury to prevent ingestion.</p>	<p>thiamethoxam (See NOTE.)</p>	Cruiser 5 FS	<p>166.7 mL/ 80,000 kernels</p>	<p>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.</p>

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 (<i>Diabrotica virgifera</i> and <i>Diabrotica barberi</i>) (continued)				
Soil-Applied at Planting Only				
<p>Avoid planting corn following corn. Crop rotation is the best strategy for control. Risk factors include heavier soil (clay), high beetle populations in corn of previous season and being the latest field planted in the previous season.</p> <p>If there is less than 1 beetle per corn plant on average throughout the month of August, then no insecticide is necessary in the following corn crop.</p> <p>In-furrow application is safer to the applicator and non-target mammals than T-band application.</p> <p>Granular insecticides are 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.</p>	chlorpyrifos	Lorsban 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.
	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.

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 (<i>Diabrotica virgifera</i> and <i>Diabrotica barberi</i>) (continued)				
Transgenic				
There are cases of western corn rootworm developing resistance to Bt. To reduce the risk of resistance, growers are encouraged to control rootworm through crop rotation and plant-appropriate refuge when using Bt corn traits. For more information regarding Bt corn and/or refuge options, see the Canadian Corn Pest Coalition website at www.cornpest.ca/ .	Bt corn	Agrisure 3000GT Agrisure 3122 Agrisure Viptera 3111 Genuity SmartStax Genuity VT Triple Pro Herculex XTRA Optimum AcreMax Xtra Optimum AcreMax XTreme Optimum Intrasect Xtra SmartStax	See Table 9–7. <i>Bt Corn Products/Traits Currently Available in Canada (as of April 2017)</i> , on page 219, for Bt corn options.	Use Bt hybrids in fields of continuous corn with moderate-to-high populations of rootworm. Keep careful and accurate records as to where Bt and non-Bt hybrids are planted or note if refuge in a bag was used.

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 (<i>Limonius</i> spp. and others)				
Seed Treatment				
<p>In Ontario, the use of neonicotinoid seed treatments on corn and soybean seed is restricted. See OMAFRA's web page on Pollinator Health Information for Crop Growers at www.omafra.gov.on.ca/english/pollinator/info-crops.htm for further information on the requirements to use these products.</p> <p>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.</p> <p>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 <i>Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices</i> on the Health Canada website at www.healthcanada.gc.ca/pollinators. If treated seeds are spilled outdoors or in areas accessible to birds, promptly clean up or bury to prevent ingestion.</p>	chlorantraniliprole	Lumivia	0.25–0.75 mg a.i./seed	<p>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.</p> <p>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.</p>
	clothianidin (See NOTE.)	NipsIt INSIDE 600 Poncho 250	33.3 mL/80,000 kernels	<p>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.</p>
	cyantraniliprole	Fortenza	167 mL/100 kg seed	<p>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.</p>
	imidacloprid (See NOTE.)	Gaucho 480 FL Sombbrero 600 FS	27 mL/80,000 kernels 21.3 mL/80,000 kernels	<p>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.</p>
	thiamethoxam (See NOTE.)	Cruiser 5 FS	16.7 mL/80,000 kernels	<p>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.</p>
Soil Applied at Planting Only				
In-furrow application is safer to the applicator and non-target animals than T-band application. Granular insecticides are 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.	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.
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

Integrated Pest Management Options		Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
LEGEND: PHI = Pre-Harvest Interval (days) N/A = not applicable						
BLACK CUTWORM (<i>Agrotis ipsilon</i>)						
Seed Treatment						
<p>In Ontario, the use of neonicotinoid seed treatments on corn and soybean seed is restricted. See OMAFRA's web page on Pollinator Health Information for Crop Growers at www.omafra.gov.on.ca/english/pollinator/info-crops.htm for further information on the requirements to use these products.</p> <p>Clothianidin may not be used as a corn seed treatment solely for protection from black cutworm.</p> <p>However, seed treatments used for the control of other soil insect pests may provide early-season protection from young black cutworm larvae.</p> <p>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.</p> <p>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 <i>Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices</i> on the Health Canada website at www.healthcanada.gc.ca/pollinators. If treated seeds are spilled outdoors or in areas accessible to birds, promptly clean up or bury to prevent ingestion.</p>	chlorantraniliprole	Lumivia	0.25 mg a.i./seed	N/A	<p>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.</p> <p>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.</p>	
	clothianidin (See NOTE.)	NipsIt INSIDE 600 Poncho 250	33.3 mL/ 80,000 kernels	N/A	<p>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.</p>	
	cyantraniliprole	Fortenza	167 mL/ 100 kg seed	N/A	<p>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.</p>	

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 (<i>Agrotis ipsilon</i>) (continued)					
Soil-Applied at Planting Only					
<p>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.</p> <p>Granular insecticides are 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.</p>	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.
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 3122 Agrisure Viptera 3110 Agrisure Viptera 3111 Agrisure Viptera 3120 Agrisure Viptera 3220 Genuity SmartStax Herculex I Herculex XTRA Optimum AcreMax Optimum AcreMax Xtra Optimum AcreMax XTreme Optimum Intrasect Optimum Intrasect Xtra SmartStax	See Table 9–7. <i>Bt Corn Products/Traits Currently Available in Canada (as of April 2017)</i> , on page 219, for Bt corn options.	N/A	<p>Use Bt hybrids containing Cry1F or Vip3A only. May only control young larvae.</p> <p>Keep careful and accurate records as to where Bt and non-Bt hybrids are planted or note if refuge in a bag is used.</p>

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 (<i>Agrotis ipsilon</i>) (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.	chlorantraniliprole	Coragen	250 mL/ha (101 mL/acre)	field corn: 14 seed corn: 1	Apply to foliage when rain is not expected in the next 24 hr. 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).
	chlorpyrifos	Lorsban 4E	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.
		Pyrinex 480 EC			
	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.
	lambda-cyhalothrin	Matador 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. This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. DO NOT apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.
		Silencer 120 EC			
	permethrin	Ambush 500 EC	140 mL/ha (60 mL/acre)	1	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.
chlorantraniliprole	Pounce 384 EC	180 mL/ha (73 mL/acre)	1	Apply to foliage when rain is not expected in the next 24 hr. Use a minimum of 100 L/ha of water. Maximum 4 applications/yr. 12-hr restricted entry interval.	

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 (<i>Delia platura</i>)					
Seed Treatment For all seed treatments, use full rate and ensure good coverage of seed.					
<p>In Ontario, the use of neonicotinoid seed treatments on corn and soybean seed is restricted. See OMAFRA's web page on Pollinator Health Information for Crop Growers at www.omafra.gov.on.ca/english/pollinator/info-crops.htm for further information on the requirements to use these products.</p> <p>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.</p> <p>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 <i>Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices</i> on the Health Canada website at www.healthcanada.gc.ca/pollinators.</p>	chlorantraniliprole	Lumivia	0.25 mg a.i./seed	<p>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.</p> <p>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.</p> <p>This product contains no colourant. An appropriate colourant must be added when this product is applied.</p>	
	<p>(See NOTE.)</p>	clothianidin	NipsIt	33.3 mL/ 80,000 kernels	<p>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.</p>
			INSIDE 600		
	thiamethoxam	Cruiser 5 FS	16.7–33.3 mL/ 80,000 kernels	<p>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.</p>	
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.	
SEEDCORN BEETLE (<i>Agonoderus lecontei</i> and <i>Clivina impressifrons</i>)					
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, Corn Flea Beetle

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
GRUB — EUROPEAN CHAFER (<i>Rhizotrogus majalis</i>)				
Some products are also able to protect against other grub species. Refer to product labels for other grub species.				
Seed Treatment				
<p>In Ontario, the use of neonicotinoid seed treatments on corn and soybean seed is restricted. See OMAFRA's web page on Pollinator Health Information for Crop Growers at www.omafra.gov.on.ca/english/pollinator/info-crops.htm for further information on the requirements to use these products.</p> <p>See OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i>, for further information on insect biology and management options.</p> <p>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 <i>Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices</i> on the Health Canada website at www.healthcanada.gc.ca/pollinators.</p> <p>If treated seeds are spilled outdoors or in areas accessible to birds, promptly clean up or bury to prevent ingestion.</p>	chlorantraniliprole	Lumivia	0.25 mg a.i./seed	<p>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.</p> <p>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.</p> <p>This product contains no colourant. An appropriate colourant must be added when this product is applied.</p>
	clothianidin (See NOTE.)	Poncho 250 NipsIt INSIDE 600	33.3 mL/ 80,000 kernels	<p>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.</p>
	cyantraniliprole	Fortenza	167 mL/ 100 kg seed	<p>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.</p>
	thiamethoxam (See NOTE.)	Cruiser 5 FS	16.7 mL/ 80,000 kernels	<p>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.</p>

CORN INSECTS

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (label precautions, restricted entry intervals, etc.)
CORN FLEA BEETLE (<i>Chaetocnema pulicaria</i>)				
Seed Treatment				
<p>In Ontario, the use of neonicotinoid seed treatments on corn and soybean seed is restricted. See OMAFRA's web page on Pollinator Health Information for Crop Growers at www.omafra.gov.on.ca/english/pollinator/info-crops.htm for further information on the requirements to use these products.</p> <p>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.</p> <p>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 <i>Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices on the Health Canada website at www.healthcanada.gc.ca/pollinators.</i></p> <p>If treated seeds are spilled outdoors or in areas accessible to birds, promptly clean up or bury to prevent ingestion.</p>	clothianidin (See NOTE.)	NipsIt INSIDE 600	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.
		Poncho 250		
	imidacloprid (See NOTE.)	Gaicho 480 FL	21.3 mL/ 80,000 kernels	
		Sombrero 600 FS		
	thiamethoxam (See NOTE.)	Cruiser 5 FS		

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) (<i>Ostrinia nubilalis</i>)					
Transgenic Corn					
To manage potential corn borer resistance, plant the appropriate refuge for the Bt corn trait used and follow all insect resistance management strategies mandated by the Canadian Food Inspection Agency. For more information regarding Bt corn and/or refuge options, see the Canadian Corn Pest Coalition website, found at www.cornpest.ca .	Bt corn	Agrisure 3000GT Agrisure 3120 Agrisure 3122 Agrisure CB/LL Agrisure GT/CB/LL Agrisure Viptera 3110 Agrisure Viptera 3111 Agrisure Viptera 3220 Genuity SmartStax Genuity VT Double Pro Genuity VT Triple Pro Herculex I Herculex XTRA Optimum AcreMax Optimum AcreMax Xtra Optimum AcreMax XTreme Optimum Intrasect Optimum Intrasect Xtra SmartStax	See Table 9–7. <i>Bt Corn Products/ Traits Currently Available in Canada (as of April 2017), on page 219, for Bt corn options.</i>	N/A	Insecticides have generally not provided economic control of ECB in field corn. Bt corn provides much better control. Use corn hybrids that express the Bt toxin in the ear as well as the stalk to help avoid stalk and ear rot. Keep careful and accurate records as to where Bt and non-Bt hybrids are planted or note if refuge in a bag is used.

CORN INSECTS

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
LEGEND: PHI = Pre-Harvest Interval (days) N/A = not applicable					
EUROPEAN CORN BORER (ECB) (<i>Ostrinia nubilalis</i>) (continued)					
Foliar Treatment					
See OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> , to calculate economic thresholds.	<i>Bacillus thuringiensis</i>	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.
	carbaryl	Sevin XLR Plus	2.5–4.0 L/ha (1.0–1.6 L/acre)	1	For larvae in whorls and foliage, treat entire plant. Repeat as necessary. For silks and ears, apply in 2–4-day intervals when silks first appear. 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.
	chlorantraniliprole	Coragen	250–375 mL/ha (101–151 mL/acre)	field corn: 14 seed corn: 1	Ground and aerial application. Apply to foliage when rain is not expected in the next 24 hr. Time 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).
	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.

CORN INSECTS

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

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	PHI	Comments (label precautions, restricted entry intervals, etc.)
LEGEND: PHI = Pre-Harvest Interval (days) N/A = not applicable					
EUROPEAN CORN BORER (ECB) (<i>Ostrinia nubilalis</i>) (continued)					
Foliar Treatment (continued)					
See OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> , to calculate economic thresholds.	deltamethrin	Decis 5 EC	250–300 mL/ha (100–120 mL/acre)	1	<p>Ground application only. Apply 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.</p> <p>Toxic to bees for 1 day after application. DO NOT apply when crop or weeds are in bloom.</p>
	lambda-cyhalothrin	Matador 120 E	187 mL/ha (76 mL/acre)	silage: 14 field and seed: 21	<p>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.</p> <p>This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. DO NOT apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.</p>
		Silencer 120 EC	83–187 mL/ha (34–76 mL/acre)		
lambda-cyhalothrin + chlorantraniliprole	Voliam Xpress	500 mL/ha (200 mL/acre)	silage: 14 field and seed: 21	<p>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.</p> <p>This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. DO NOT apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.</p>	

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) (<i>Ostrinia nubilalis</i>) (continued)					
Foliar Treatment (continued)					
See OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> , to calculate economic thresholds.	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.
	spinetoram	Delegate	120–210 gm/ha (50–85 g/acre)	grain: 28 days silage: 7 days	Ground application only. 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. This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. DO NOT apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.

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 (<i>Striacosta albicosta</i>)					
Transgenic Corn					
Plant the appropriate refuge for the Bt corn trait used and follow all insect resistance management strategies mandated by the Canadian Food Inspection Agency. For more information regarding Bt corn and/or refuge options, see the Canadian Corn Pest Coalition website, at www.cornpest.ca .	Bt corn	Agrisure Viptera 3110 Agrisure Viptera 3111 Agrisure Viptera 3220	See Table 9–7. <i>Bt Corn Products/Traits Currently Available in Canada (as of April 2017)</i> , on page 219, for Bt corn options.	N/A	Bt corn hybrids containing Vip3A provide full control. Bt corn hybrids containing Cry1F no longer provides protection against WBC. Keep careful and accurate records as to where Bt and non-Bt hybrids are planted or note if refuge in a bag is used.
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 full tassel stage. Look for egg masses and young larvae. Eggs hatch 1 or 2 days after turning purple. Spray is warranted if 5% of the plants have eggs or small larvae. 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. Additional information on pest status and management recommendations is provided at the Ontario WBC Trap Network: www.cornpest.ca .	chlorantraniliprole	Coragen	250–375 mL/ha (101–151 mL/acre)	seed corn: 1 field corn: 14	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).
	deltamethrin	Decis 5.0 EC	250–300 mL/ha (100–120 mL/acre)	1	Ground application only. 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.
	lambda-cyhalothrin	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. This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. DO NOT apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.

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 (<i>Striacosta albicosta</i>) (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. This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. DO NOT apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.
	spinetoram	Delegate	120–210 gm/ha (50–85 g/acre)	field corn: 28 silage: 7 days	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.

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 – <i>Pseudaletia unipuncta</i>, FALL – <i>Spodoptera frugiperda</i>)					
Foliar Treatment					
<p>Late-planted corn is most susceptible to leaf and whorl feeding by armyworm.</p> <p>True armyworm: 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.</p> <p>Fall armyworm: 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.</p> <p>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.</p>	carbaryl	Sevin XLR Plus	2.5–4.0 L/ha (1.0–1.6 L/acre)	1	<p>For larvae in whorls and foliage, treat entire plant. Repeat as necessary. Follow label precautions regarding honeybees.</p> <p>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.</p>
	chlorantraniliprole	Coragen	250–375 mL/ha (101–151 mL/acre)	field corn: 14 seed corn: 1	<p>Ground and aerial application. Apply to foliage when rain is not expected in the next 24 hr. Use a minimum of 100 L/ha of water. Maximum 4 applications/yr. 12-hr restricted entry interval.</p> <p>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).</p>
	lambda-cyhalothrin	Matador 120 E Silencer 120 EC	83–208 mL/ha (34–84 mL/acre) 83 mL/ha (34 mL/acre)	silage: 14 field and seed: 21	<p>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.</p> <p>This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. DO NOT apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.</p>
CORN LEAF APHID (<i>Rhopalosiphum maidis</i>)					
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	<p>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.</p> <p>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.</p> <p>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.</p>

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.)
BROWN MARMORATED STINK BUG (<i>Halyomorpha halys</i>)					
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 2017. 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.	malathion	Malathion 85E	1.345 L/ha (544 mL/acre)	5	Ground application only. Use a minimum of 500 L water/ha. Toxic to bees exposed to direct treatment, drift or residues on flowering crops and weeds. DO NOT apply this product to flowering crops or weeds if bees are visiting the treatment area.
POTATO STEM BORER (<i>Hydraecia micacea</i>)					
No insecticides are registered.					
SLUGS (Various species)					
Usually not an economic pest because growing point is not affected.					
SAP BEETLES (<i>Glischrochilus quadrisignatus</i>)					
Not an economic pest but can carry <i>Fusarium</i> .					

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) (<i>Helicoverpa zea</i>)					
<p>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.</p> <p>For best results, apply at or shortly after egg hatch. Target insecticides to cover the corn ear and silks.</p>	chlorantraniliprole	Coragen	250–375 mL/ha (101–151 mL/acre)	field corn: 14 seed corn: 1	<p>Ground and aerial application. Apply to foliage when rain is not expected in the next 24 hr. Use a minimum of 100 L/ha of water. Maximum 4 applications/yr. 12-hr restricted entry interval.</p> <p>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).</p>
	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.
	lambda-cyhalothrin	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. This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. DO NOT apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.
		Silencer 120 EC	83 mL/ha (34 mL/acre)		
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. This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. DO NOT apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.	
TWO-SPOTTED SPIDERMITES (<i>Tetranychus urticae</i>)					
Spidermites 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)	field and seed: 30 silage: 5	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.

Field and Seed Corn

All field and seed corn should be treated with a fungicide seed treatment to prevent early-season preemergence and postemergent 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 (<i>Pythium</i> spp.)				
Seed Treatment				
<p>This disease can occur on all soil types but losses are greatest in cold, wet clay soils. Minimize soil compaction and remove excess moisture through increased drainage. 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.</p> <p>Consult with your seed company for hybrid selection.</p>	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 ai/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 <i>Rhizoctonia solani</i> 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 (<i>Rhizoctonia solani</i>)				
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 <i>Seeds Act</i> 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 (<i>F. culmorum</i>, <i>F. graminearum</i> and <i>F. avenaceum</i>)				
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 <i>Seeds Act</i> 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 (<i>Aspergillus</i> 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 (<i>Penicillium oxalicum</i>) 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 (<i>Puccinia sorghi</i> and <i>Puccinia polysora</i>)					
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	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)	grain corn: 30 sweet corn: 7	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. Ground and aerial application. 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 detasselling.
	propiconazole	Bumper 432 EC	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. Only in seed corn, under severe disease pressure, can a third application be made 14 days later. Can be tank-mixed with Mako or Matador for insect control.
		Nufarm Propiconazole			
	Tilt 250 E	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 (<i>Puccinia sorghi</i> and <i>Puccinia polysora</i>) (continued)					
(continued)	prothioconazole	Proline 480 SC	315–420 mL/ha (127–170 mL/acre)	24 hr OR 20 days for hand- detasselling 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-detasselling 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	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 detasselling 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.
	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 (<i>Puccinia polysora</i>)					
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 blown 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	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 detasselling 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 (<i>Setospaeria turcica</i>)						
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. Chemical control is not usually economical in field corn.	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.	
	fluoxastrobin	Evito	146–296 mL/ha (59–120 mL/acre)	grain: 30 sweet corn: 7	Provides suppression only. 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. Ground and aerial application. 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	150–300 mL/ha (60–121 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. Only in seed corn, under severe disease pressure, can a third application be made 14 days later. Can be tank-mixed with Mako or Matador for insect control.
		Tilt 250 E		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- detasselling 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-detasselling 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 (<i>Setosphaeria turcica</i>) (continued)					
(continued)	prothioconazole + trifloxystrobin	Stratego PRO	572 mL/ha (232 mL/acre)	30	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 detasselling 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.
	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 (<i>Cochliobolus carbonum</i>)					
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 rust pustules first appear. Under severe disease pressure, a second application 14 days later may be necessary. Only in seed corn, under severe disease pressure, can a third application be made 14 days later. Can be tank-mixed with Mako or Matador for insect control.
		Nufarm Propiconazole			
		Tilt 250 E	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 (<i>Aureobasidium zeae</i> or <i>Kabatiella zeae</i>)					
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 rust pustules first appear. Under severe disease pressure, a second application 14 days later may be necessary. Only in seed corn, under severe disease pressure, can a third application be made 14 days later. Can be tank-mixed with Mako or Matador for insect control.
		Nufarm Propiconazole			
		Tilt 250 E			
	prothioconazole	Proline 480 SC	315–420 mL/ha (127–170 mL/acre)	24 hr OR 20 days for hand-detasselling 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-detasselling 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	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 detasselling 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.	
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 (<i>Aureobasidium zeae</i> or <i>Kabatiella zeae</i>) (continued)					
(continued)	pyraclostrobin + fluxapyroxad	Priaxor	300 mL/ha (120 mL/acre)	21	Provides suppression only. 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 (<i>Cochliobolus heterostrophus</i>)					
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	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)	grain corn: 30 sweet corn: 7	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. Ground and aerial application. 12-hr restricted entry interval.
	propiconazole	Bumper 432 EC Nufarm Propiconazole Tilt 250 E	150–300 mL/ha (60–121 mL/acre) 250–500 mL/ha (100–200 mL/acre)	14	Ground and aerial application. Apply when disease first appears. Can be tank-mixed with Mako or Matador for insect control. Under severe disease pressure, a second application 14 days later may be necessary. Only in seed corn, under severe disease pressure can a third application can be made 14 days later.

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 (<i>Cercospora zeae-maydis</i>)						
This disease is becoming more common in Southwestern 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	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)	grain: 30 sweet corn: 7	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. Ground and aerial application. 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 detasselling.	
	propiconazole	Bumper 432 EC	Nufarm Propiconazole Tilt 250 E	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. Only in seed corn, under severe disease pressure, can a third application be made 14 days later. Can be tank-mixed with Mako or Matador for insect control.
		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- detasselling 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-detasselling 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 (<i>Cercospora zea-maydis</i>) (continued)					
(continued)	prothioconazole + trifloxystrobin	Stratego PRO	572 mL/ha (232 mL/acre)	30	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 detasselling 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.
	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 (<i>Longidorus</i> spp.), ROOT LESION (<i>Pratylenchus</i> spp.), ROOT KNOT (<i>Meloidogyne</i> 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.	<i>Bacillus firmus</i> 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 (<i>Fusarium</i>, <i>Gibberella</i> and <i>Colletotrichum</i>)					
Foliar Treatment					
<p>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 <i>Colletotrichum</i>, <i>Gibberella</i> and <i>Fusarium</i>. However, <i>Diplodia</i> and <i>Pythium</i> have also been observed in Ontario.</p> <p>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.</p>	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 (<i>Fusarium</i> spp.) and GIBBERELLA (<i>Gibberella</i> spp.) EAR ROTS					
<p>Any of the <i>Fusarium</i> or <i>Gibberella</i> rots can establish after pollination in wounds created by insects or birds. Warm rainy weather or long dews any time after pollination may lead to ear rots in these wounded cobs. The most common and important ear mould in Ontario is <i>Gibberella zeae</i>, which is the sexual reproductive stage of <i>Fusarium graminearum</i>. 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 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.</p> <p>See OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i>, for more information.</p>	metconazole	Caramba	1.0 L/ha (404 mL/acre)	20	<p>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.</p> <p>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.</p>
	prothioconazole	Proline 480 SC	420 mL/ha (170 mL/acre)	24 hr OR 20 days for hand- detasselling seed corn	<p>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.</p> <p>EXCEPTION: 20 days for hand-harvesting sweet corn and hand-detasselling 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).</p>

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 (<i>Colletotrichum graminicola</i>)					
Foliar Treatment					
<p>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.</p>	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.