

6. Canola and Mustard

CANOLA AND MUSTARD INSECTS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

CANOLA AND MUSTARD DISEASES

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

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

CANOLA AND MUSTARD DISEASES

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

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

CANOLA AND MUSTARD DISEASES

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

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

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

CANOLA AND MUSTARD DISEASES

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

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

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

CANOLA AND MUSTARD DISEASES

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

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

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

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

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

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