Insect Control

Additional Resources

For additional information on monitoring, economic thresholds and biological control of insects in field crops, as well as information on insect management in commodities other than those covered in this guide, see the WCCP Guide to Integrated Control of Insect Pests of Crops at **https://www.westernforum.org/wccp%20guidelines.html**.

Insect Management Decisions

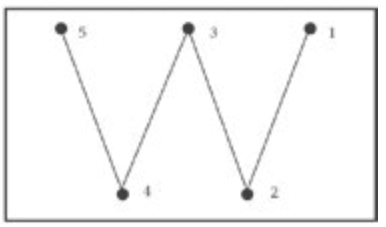
Crop rotations, cultivar selections, and seeding dates can be chosen to reduce the risk of injury from some insects that may be of higher risk to a crop. Management of insects with insecticides should only be considered when numbers or damage exceed economic thresholds. To select an insecticide, verify the registered products for the insect and field crop in the following insect management charts. Consideration should then be given to the preharvest intervals, beneficial insects that may be present, how the product will be applied, restrictions, precautions and the hazard rating.

Pre-harvest Interval

The **pre-harvest interval** is the number of days that must pass between the last application of a pesticide and harvest. Harvest is the cutting of the crop or removal of the produce from the plant. It includes direct-combining, cutting (swathing) or grazing; it does not include swath-combining or baling for hay.

Field Scouting

Field scouting is the regular examination of fields to accurately assess the kind and the number of insects, plant pathogens and weeds present and the amount of damage being done. Scouting should be done weekly during the growing season and more frequently when infestations approach economic levels or when weather conditions favour the rapid development of specific pests.



To properly scout for insects that feed on crops or are beneficial, you must know when they occur, where they live, what they look like, and how to find and count them. The number of locations to assess in a field will depend on the field size, and any specific pests that may be of concern. Generally a minimum of 5 sites should be sampled; however, some insects may require more sites to be sampled to accurately make management decisions.

There are several possible scouting patterns that can be used when checking fields. These options are based on insect distribution and field configuration.

- **Pattern 1:** Used when insects are uniformly distributed.
  - This scouting pattern typically looks like an X, Z or W, excluding field edges. Insects that fit this pattern include aphids, bertha armyworm and diamondback moth.

- **Pattern 2:** Used when insects are generally more abundant at the edges of fields.
  - Scout by walking along field edges, fence lines or ditches. Some examples of when you would include more focused scouting along field edges are to estimate early-season populations of flea beetles, Colorado potato beetles and grasshoppers.

In each area examined, use of a sweep net, if possible, is a good way to determine what potential crop feeding and beneficial insects may be present. This should be followed by examining some plants and the soil surface. More specific counts of a particular type of insect or plant damage may be necessary if they are abundant during the more general scouting.

Economic Thresholds

Monitoring methods, typical symptoms, and economic thresholds or nominal thresholds for the more common crop pests are described in the field scouting section for each commodity. The smallest number of insects (or level of injury) that cause damage equal to the pest management costs is called the **economic injury level**. The **economic threshold** is the density of insects (or level of injury) at which control measures should be applied to prevent an increasing population from reaching the economic injury level. Note that factors such as moisture, temperature conditions and stage of crop growth, can increase or decrease the impact of insects on crop production. In some instances, nominal thresholds are presented; these decision guidelines are based on experience rather than research quantifying the impact of the insects on the crop.

Estimating Percent Defoliation

Many economic thresholds for insects are based on percent defoliation of the plants they are feeding on. The following figure may assist in determining the percent defoliation. Although the following photo is of sunflower leaves, this figure can be used to estimate percent defoliation for many crops.

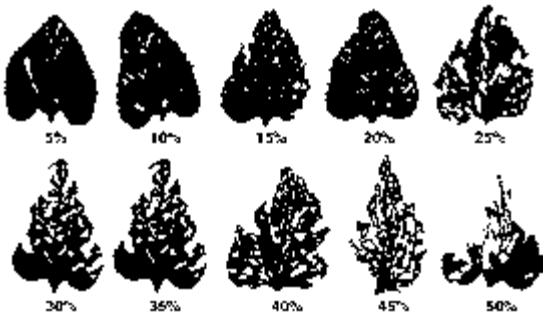


Photo courtesy of North Dakota State University Extension

Hazard Ratings and Residual Times of Insecticides to Bees

The following table can be used to assist in selecting an insecticide to apply to fields where either the crop or weeds may be flowering at the time of application. Residual time indicates the length of time the residue of the product remains toxic to bees after application. **These times are to be used as general guidelines only.** Environmental conditions influence the rate at which pesticides degrade.

INSECTICIDE	HAZARD RATING[a]		RESIDUE HAZARD (DAYS)[b]
	HONEY BEE	LEAFCUTTER BEE	
Least Hazardous Insecticides to Bees (no label precautions for bees)			
Dipel	3	3	none
Nolo Bait	3	3	none
Eco bran	3	3	N/A
Coragen MaX/Coragen	3	-	<3 hours
Carbine/Beleaf	3	-	<1
Moderately to Highly Hazardous to Bees (see label for precautions to bees)			
Assail/Aceta	1 to 2	-	<1
Delegate	1 to 2	1	3 hours
Closer	-	-	3 hours
Decis/Poleci	1 to 2	1 to 2	<8 hours
Rimon	1 to 2	2	1
Success/Entrust	1 to 2	1	<1 to >1
Admire	1	1 to 2	<1 to >1
Matador/Silencer/Labamba/Zivata	1	1	>1
Oberon	1 to 2	1	-
Movento	1	-	-
Cimegra	1	1	-
Agri-mek	1 to 3	2	<1 to 3
UP-Cyde/Ship	1	1	<1 to >3
Ambush/Pounce/Perm-UP/IPCO Syncro	1	1	<1 to 5
Imidan	1	1	1 to 5
Malathion	1 to 2	1	2 (honey bee), 6 (leafcutter bee)
Sevin	1 to 2	1 to 2	>1 to 7
Cygon/Lagon/Diamante 4	1	1	3 to 7

[a] ***HAZARD RATING*** **1 = Very poisonous to bees; DO NOT apply to crops or weeds in bloom unless bees are kept off for the period that residue on the crop is a hazard. 2 = Moderately poisonous to bees; avoid direct application to bees, but may be applied with minimum hazard in late evening when bees are not foraging. 3 = Not very poisonous to bees; may be applied with minimum hazard to bees.**

[b] **Residue hazard represents the average time in days that residues poisonous to honey bees will remain on foliage (may vary with formulation and weather). Unusually low temperatures following spray application may cause residues to remain toxic longer than under warmer conditions. Morning dew can also make residues more toxic to foraging bees. A more extensive list of hazard ratings of insecticides to bees and duration of toxicity can be found at the Western Committee on Crop Pests website at: https://www.westernforum.org/WCCP%20Guidelines.html.**

Reducing Bee Losses from Insecticides

Careless use of insecticides can kill bees and other beneficial insects such as pollinators, predatory and parasitic biological control insects. Help to reduce insecticide poisoning of bees by:

1. **Avoid applying insecticides that are toxic to bees when crops are in bloom.** Any field with even a small amount of bloom, whether it is the main crop, cover crop, or weeds will probably have foraging bees visiting the flowers. If at all possible, apply insecticides before or after the crop has gone into bloom. Control all flowering weeds prior to insecticide application.
2. **Apply insecticides when bees are least active.** The highest level of bee activity occurs during the day. Apply insecticides in late evening or early morning when the bees are not foraging. As a general rule, evening applications are less hazardous to bees than morning applications. DO NOT apply insecticides if unusually low temperatures or heavy dew are forecast following application, because residuals typically remain toxic to bees longer under these conditions.
3. **Minimize insecticide drift.** To avoid insecticides drifting into non-target locations, DO NOT apply insecticides during windy conditions. Choose nozzles with a low drift rating. As a general rule, ground applications of insecticide are less prone to drift than aerial applications. When planting insecticide treated seeds, reduce the movement of dust from the seeding equipment to flowering crops, weeds and water sources that are in or adjacent to the field being seeded. If seeding equipment may potentially generate dust, controlling flowering weeds in the field prior to seeding may reduce pollinators being attracted to the field.
4. **Contact the beekeeper before spraying.** Communication and cooperation between the insecticide applicator and the beekeeper can usually prevent bee losses. Notifying the beekeeper in advance (e.g. 48 hours) of applying insecticides will allow the beekeeper to move or protect the colonies from insecticide damage. The app BeeConnected (**http://www.beeconnected.ca/**) can be used to facilitate communication between farmers and beekeepers within a 5 km radius of the farm or beehives.
5. **If possible, use insecticides and/or insecticide formulations which are the least hazardous to bees.** The table "Hazard Ratings of Insecticides to Bees" will help in selecting the least hazardous insecticide. In general, dusts are more hazardous to bees than sprays. Wettable powders are more hazardous than emulsifiable concentrates (EC) or water-soluble formulations. Granular insecticides and spreadable bran bait insecticides are generally the least hazardous to bees.

Insecticide Poisoning in Humans

Organophosphate (OP) and carbamate insecticides (identified on the Insecticide Groups chart) can pose a serious risk to unprotected persons. Poisonings can occur while mixing, loading and/or during the application of these products without the appropriate protective equipment or measures. These pesticides are readily absorbed through the skin or the lungs, and can act as nervous system toxins. Overexposure can produce symptoms such as headache, nausea, pupil dilation and excessive sweating and salivation. Higher doses may cause breathing difficulties, muscle twitching, weakness and spasms. Very high doses have caused respiratory failure and death.

Both OP and carbamate pesticides inhibit an enzyme called cholinesterase. Measurements of cholinesterase in the blood before and during the application season can indicate harmful exposures to OPs and carbamates. **Persons who intend to mix, load and/or apply these types of pesticides repeatedly during a season, need a baseline and repeat measurements. Consult your doctor before the spraying season to arrange for these measurements.**

Degree of Risk and Hazard Rating:

(see introduction for full description on symbols and ratings)

Resistance of Insects to Insecticides

Repeated use of the same insecticide, or insecticides with the same mode of action, against a particular insect in a given area may result in the effectiveness of the insecticide being reduced. To delay or prevent resistance of insects to insecticides:

1. Integrate different control methods (cultural, biological, chemical) into insect control programs whenever possible,
2. Use insecticides only when the economic threshold for a pest has been surpassed and natural controls fail to limit economic damage,
3. Rotate between insecticides with different modes of action, particularly if several applications are made in a season, and
4. Keep accurate records of insecticides used for each of your fields.

Insecticides can be classified according to their similarity in chemical structure (chemical group in the table below), and by mode of action (the process by which the insecticide kills the insect). The "Group" column in the following table separates insecticides based on their mode of action. By selecting products with different modes of action for an insecticide rotation program, risk of insecticide resistance can be reduced.

Insecticide Groups Based on Modes of Action

GROUP	CHEMICAL GROUP	TRADE NAME	ACTIVE INGREDIENT	MODE OF ENTRY
1A	Carbamates	*Sevin XLR,* *Eco Bran*	carbaryl	contact/ingestion (*Sevin XLR*) ingestion (*Eco Bran*)
1B	Organophosphates	*Malathion*	malathion	contact
		Imidan	phosmet	contact/ingestion
		Lagon, Cygon, Diamante 4	dimethoate	contact/ingestion
		Thimet 20-G	phorate	ingestion
3A	Pyrethroids	*Decis, Poleci, Advantage Deltamethrin 5 EC*	deltamethrin	contact/ingestion
		UP-Cyde, Ship	cypermethrin	contact/ingestion
		Matador, Silencer, Labamba, Zivata	lambda-cyhalothrin	contact/ingestion
		Ambush, Pounce, Perm-UP, IPCO Syncro	permethrin	contact/ingestion
4A	Neonicotinoids	*Helix, Cruiser* *Actara 240SC* *Actara 25WG*	thiamethoxam	ingestion ingestion contact/ingestion
		Admire, Raxil PRO Shield, *Sombrero, Trilex EverGol Shield*	imidacloprid	contact/ingestion (flowable formulations) ingestion (seed treatments)
		Assail, Aceta	acetamiprid	contact/ingestion
		Prosper, Poncho, NipsIt, Titan, Clutch	clothianidin	ingestion
4C	Sulfoximines	*Closer*	sulfoxaflor	contact/ingestion
4D	Butenolides	*Sivanto Prime, BUTEO start*	flupyradifurone	contact/ingestion
5	Spinosyns	*Success, Entrust, Scorpio Ant and Insect Bait*	spinosad	contact/ingestion (*Success, Entrust*), ingestion (*Scorpio Ant and Insect Bait*)
		Delegate	spinetoram	contact/ingestion
6	Avermectins, Milbemycins	*Agri-mek*	abamectin	contact/ingestion
9D	Pyropenes	*Sefina*	Afidopyropen	contact
11A	Microbial disruptors of insect midgut membranes	*Dipel, Bioprotec*	*Bacillus thuringiensis var. Kurstaki*	ingestion
15	Benzoylureas	*Rimon*	novaluron	ingestion/contact
18	Ecdysone receptor agonists	*Intrepid*	methoxyfenozide	
23	Tetronic and tetramic acid derivatives	*Movento*	spirotetramat	
		Oberon	spiromesifen	contact
24A	Phosphides	*Phostoxin, Fumitoxin*	aluminum phosphide	inhalation (fumigant)
28	Diamides	*Coragen MaX, Coragen, Lumivia CPL, Lumivia*	chlorantraniliprole	ingestion mainly
		Lumiderm, Verimark, Fortenza, Exirel	cyantraniliprole	ingestion
		Harvanta	cyclaniliprole	contact/ingestion
		Vayego	tetraniliprole	contact/ingestion
29	Flonicamid	*Carbine, Beleaf*	flonicamid	contact/ingestion
30	Meta-diamides, isoxazolines	*Teraxxa F4, Cimegra*	broflanilide	
UNF	Fungal Agents of unknown or uncertain MOA	BioTitan	Beauveria bassiana	
UNM	Non-specific mechanical and physical disruptors	*Protect-it, Insecto*	diatomaceous earth	
		Superior 70 Oil	mineral oil	

A more detailed table showing insecticides organized by mode (site) of action, and specific information on the mode (site) of action for the different groups can be found on the Insecticide Resistance Action Committee website at: **https://irac-online.org/mode-of-action/**.

Field Scouting and Insect Management Charts

Field Scouting in Alfalfa

Sap Or Fluid Feeders

- **Lygus bugs/Alfalfa plant bug**
  - ***Typical Damage:*** Field blooms poorly or not at all. Flower buds blasted, whitish, and dry; flowers dropping off before fully open. Collapsed seed.
  - ***When and How to Monitor:*** Look for plant bugs when monitoring alfalfa in June through mid-August. Make five 180° sweeps with a 15 inch (40 cm) insect net through alfalfa canopy at each sampling site. Record total number of plant and lygus bugs (both nymphs and adults) captured. Calculate average number per sweep.
  - ***Economic Threshold:*** Hay: Control not recommended. Seed alfalfa at bud and early bloom: 8 lygus bugs per sweep (40 in 5 sweeps); 4 alfalfa plant bugs per sweep; or 5 bugs if the plant bug population is a combination of lygus bugs and alfalfa plant bug. If insecticides are used, attempt to spray before the onset of bloom. Protecting insect pollinators in seed production fields is very important.
- **Potato Leafhopper**
  - Leafhoppers are most severe in new seedings and in regrowth under hot dry weather.
  - ***When and How to Monitor:*** Take 20, 180° sweeps from 5 areas of the field. Avoid field edges. Determine the average number of potato leafhoppers per sweep.
  - ***Economic Threshold:*** For 9 cm stem height = 0.2 adult leafhoppers per sweep; 15 cm stem height = 0.5 adults per sweep; 25 cm stem height = 1 adult or nymph per sweep; 36 cm stem height = 2 adults or nymphs per sweep.
- **Pea Aphid**
  - ***Typical Damage:*** Suck juices from plants; stunt growth; cause premature drying.
  - ***When and How to Monitor:*** Look for when monitoring in July through August. Take 5 sweeps at each location. Monitor fields closely during periods of slow plant growth.
  - ***Economic Threshold:*** 100 to 200 aphids per 180° sweep when crop is moisture stressed, or until mid-August.

Defoliators

- **Alfalfa Weevil**
  - ***Typical Damage:*** Feed on developing buds and leaves. Stunt growth.
  - ***When and How to Monitor:*** Start scouting fields in mid-May. Look for shot holes initially, then clipping along the edges of leaves and pinhole damage. For determining if levels are at threshold in hay crops, collect 30 stems in an M-shaped pattern, place them inside a white pail and beat them against the side to knock off larvae. DO NOT include younger first and second instar larvae (3 mm or less) in the counts. Determine the average height of the crop as well.
  - ***Economic Threshold:***
    - *Alfalfa Hay:* One of the best control strategies is to cut fields for hay early. If early cutting of the hay crop is not possible, treatment thresholds are based on the following measurements of plant height and levels of larvae: <30 cm to 1 larva per stem; <40 cm to 2 larvae per stem; 3 larvae per stem is generally economical to control regardless of height of crop. On regrowth for second crop, 2 or more active larvae per crown (4 to 8 larvae per square feet) will require insecticide application.
    - *Alfalfa Seed:* 20 to 30 3rd or 4th instar larvae per sweep (90° = straight sweep) or 35 to 50 percent of foliage tips showing damage. In some instances it may be practical to just treat hotspots and not entire fields.

Alfalfa Insect Management Chart

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (Days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Belowground and Surface Feeders					
Cutworms	*Coragen MaX*	34 mL	0	G	>5,000
Sap or Fluid Feeders					
Lygus bugs	*Carbine/Beleaf 50SG* (F)	81 to 121 g	7	G	>2000
	Rimon (seed production only) (SB)	338 mL	14	G	3,914 to >5000
	Cormoran (seed production only) (SB + N)	304 to 364 mL	14	G	>2000
	Assail/Aceta (seed production only) (N)	35 to 69 g	1	G	1064
	Matador/ Silencer/Labamba/Zivata (P)	34 mL	DO NOT cut treated fields for hay or forage; do not graze treated fields.	A or G (Matador/ *Labamba*) G (*Silencer/ Zivata*)	56 to 98
	Decis 100 EC/ Advantage Deltamethrin 5 EC/Poleci (seed production only) (P)	41 to 51 mL (*Decis 100 EC*) 81 to 101 mL (*Advantage Delta...5 EC*) 162 to 202 mL (*Poleci*)	20	G	>300 to 2000
	Malathion 85E (OP)	0.445 to 0.544 L	7	A or G	>550
	Cygon 480-AG/Diamante 4 (OP) (seed and forage production)	0.17 L	2 (*Cygon 480-AG*) 10 (*Diamante 4*)	A or G	245-450
	Lagon/Cygon 480-AG/Diamante 4 (OP) (seed production only)	0.44 L	10 (*Cygon 480-AG*) 28 (*Lagon/Diamante 4*)	A or G	245 to 450
Alfalfa plant bug	*Cormoran* (seed production only) (SB + N)	304 to 364 mL	14	G	>2000
	Assail/Aceta (seed production only) (N)	35 to 69 g	1	G	1064
	Lagon/Cygon 480-AG/Diamante 4 (OP) (seed production only)	0.44 L	10 (*Cygon 480-AG*) 28 (*Lagon/Diamante 4*)	A or G	245 to 450
Potato leafhopper	*Sefina* (PP) (suppression only)	81 to 162 ml	0	A or G	>2,000
	Sivanto Prime (B)	202 to 304 mL	7	G	>2000
	Matador/Silencer/Labamba/Zivata (P)	34 mL	DO NOT cut treated fields for hay or forage; do not graze treated fields.	A or G (Matador/ *Labamba*) G (*Silencer/Zivata*)	56 to 98
	Malathion 85E (OP)	0.445 to 0.544 L	7	A or G	>550
	Lagon/Cygon 480-AG/Diamante 4 (OP)	0.17 L	2 (*Cygon 480-AG*) 10 (*Lagon/Diamante 4*)	A or G	245 to 450
Spittlebugs	*Malathion 85E* (OP) (adults)	0.445 to 0.544 L	7	A or G	>550
Pea aphid	*Sefina* (PP)	81 ml	0	A or G	>2,000
	Carbine/Beleaf 50SG (F)	49 to 65 g	7	G	>2000
	Sivanto Prime (B)	202 to 304 mL	7	G	>2000
	Matador/Silencer/Labamba/Zivata (P)	34 mL	DO NOT cut treated fields for hay or forage; do not graze treated fields.	A or G *(Matador/ Labamba*) G (*Silencer/Zivata*)	56 to 98
	Malathion 85E (OP)	0.445 to 0.544 L	7	A or G	>550
	Lagon/Cygon 480-AG/Diamante 4 (OP)	0.17 L	2 (*Cygon 480-AG*) 10 (*Lagon/Diamante 4*)	A or G	245 to 450

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (Days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Spider mites	*Malathion 85E* (OP)	0.445 to 0.544 L	7	A or G	>550
	Oberon (TT)	0.202 to 0.405 L		A or G	>2000
Defoliators					
Grasshoppers	**Spreadable Bran Baits**				
	Nolo Bait (M)	Minimum of 0.45 kg		A or G	
	Sprays				
	Coragen MaX/ Coragen (D)	17 to 33.5 mL 51 to 101 mL	0	G	>5000
	Matador/Silencer/Labamba/Zivata (P)	25 to 34 mL (ground) 34 mL (air)	DO NOT cut treated fields for hay or forage; do not graze treated fields.	A or G	56 to 98
	Decis 100 EC (seed production only) (P)	20 to 30 mL	20	G	633
	Malathion 85E (OP)	0.445 to 0.544 L	7	A or G	>550
	Lagon/Cygon 480-AG/Diamante 4 (OP)	0.22 L (nymphs) 0.34 to 0.36 L (adults)	10 (*Lagon*) 28 (*Cygon 480-AG/ Diamante 4*)	A or G	245 to 450
Alfalfa weevil	If alfalfa has reached the bud or early bloom stage, immediate **cutting** will kill many alfalfa weevil larvae.				
	Coragen MaX/ Coragen (D) (suppression only)	50.5 to 67.5 mL 152 to 202 mL	0	G	>5000
	Matador/Silencer/Labamba/Zivata (P)	34 mL	DO NOT cut treated fields for hay or forage; do not graze treated fields.	A or G (Matador/ *Labamba*) G (*Silencer/Zivata*)	56 to 98
	Decis 100 EC/Advantage Deltamethrin 5 EC/Poleci (seed crops only) (P)	41 to 51 mL (*Decis 100 EC*) 81 to 101 mL (*Advantage Delta...5 EC*) 162 to 202 mL (*Poleci*)	20	G	>300 to 2000
	Malathion 85E (larvae only) (OP)	0.445 to 0.544 L	7	A or G	>550
	Lagon/Cygon 480-AG/Diamante 4 (OP) (reduction only)	0.17 L	2 (*Cygon 480-AG*) 10 (*Lagon/Diamante 4*)	A or G	245 to 450
Leafminers					
Alfalfa blotch leafminer	*Malathion 85E* (OP)	0.544 L	7	A or G	>550
	Lagon/Cygon 480-AG/Diamante 4 (OP)	0.22 L	2 (*Cygon 480-AG*) 10 (*Lagon/Diamante 4*)	A or G	245 to 450

ALWAYS CONSULT THE INSECTICIDE LABEL BEFORE APPLYING ANY INSECTICIDE.

[1] Insecticide Group: M=microbials, SB=substituted benzoylurea, B=butenolides, F=flonicamid, N=neonicotinoids, P=pyrethroids, PP=pyropenes, C=carbamates, OP=organophosphates, TT=tetronic and tetramic acid derivatives.

[2] LD_{50} values represent the relative toxicity of a pesticide. They represent the dose (in milligram per kilogram body weight) that will kill 50 percent of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD_{50}.

Barley – *See Small Grain Cereals*

Scouting for insects in Beans (Dry Beans)

Belowground Feeders and Cutworm

- **Seedcorn Maggot**
  - ***Typical Damage:*** Seedcorn maggot attacks bean seed, preventing sprouting or weakening seedlings. The yellowish white maggot is found burrowing in the seeds or emerging stem. Seedcorn maggots are usually most severe in wet, cold seasons and on high organic matter soils.
- **Cutworm**
  - ***When and How to Monitor:*** To find cutworm, dig in the soil to a depth of 2.5 to 5 cm at the base of recently damaged plants.
  - ***Nominal Threshold:*** Treatment is warranted when one cutworm or more is found per metre of row and the larvae are still small (less than 2 cm long).

Sap Feeders

- **Leafhoppers**
  - ***Typical Damage:*** Foliage becomes dwarfed, crinkled, and curled. Small triangular brown areas appear at the tips of leaves, gradually spreading around the entire leaf margin.
  - ***When and How to Monitor:*** Leafhopper adults are quick and can be observed by running your hand over the top of the plants as you approach them and observing adults that fly off the plants. On the same plants, turn over each leaf to determine the number of nymphs per trifoliate.
  - ***Economic Threshold:*** Unifoliate stage – 0.25 leafhoppers per trifoliate; second trifoliate stage – 0.5 leafhoppers per trifoliate; fourth trifoliate stage – 1.0 leafhopper per trifoliate; first bloom – 2.0 leafhoppers per trifoliate.

Defoliators

- **Grasshoppers**
  - ***Economic Threshold:*** Substantial yield loss does not occur until up to 35 percent defoliation occurs before bloom and 15 percent after bloom.

Beans (Dry) Insect Management Chart

Insect	Insecticide (and insecticide group[1])	Rate/Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Belowground and Surface Feeders					
Wireworms	*Cruiser 5FS* (N)	83 mL/100 kg seed	Must be applied in commercial seed treatment facilities.		
	Trilex EverGol Shield	A seed treatment containing *Stress Shield 600* and 3 fungicides.			
	Scorpio Ant and Insect Bait (suppression) (Sp)	10 to 20 kg	Incorporate into the soil at planting to a depth of 10 to 20 cm.		
Seedcorn maggot	Sow seeds as shallow as possible in a warm, well-prepared seedbed. If manure is used, apply and plow it under the previous fall.				
	Cruiser 5FS (N)	50 to 83 mL/100 kg seed	Must be applied in commercial seed treatment facilities.		
Cutworms	*Lumivia CPL* (D)	32 to 64 mL/100 kg seed	Seed treatment		>5000
	Scorpio Ant and Insect Bait (black cutworm) (Sp)	10 to 20 kg	28	G	
	Coragen MaX/ Coragen (D)	33.5 mL 101 mL	1	A or G	>5000
	Matador/ Silencer/Labamba/ Zivata (P)	34 mL	14 (Matador/*Labamba*) 21 (*Silencer/Zivata*)	A or G	56 to 98
	Decis 100 EC (P)	41 mL	7	A or G	633
Sap or Fluid Feeders					
Lygus bugs	*Carbine* (F)	81 g	7	G	>2000
	Matador/Silencer/Labamba/ Zivata (P)	34 mL	14 (Matador/*Labamba*) 21 (*Silencer/Zivata*)	A or G	56 to 98
	Voliam Xpress (D+P)	91 mL	14. Do not feed treated crop to livestock.	A or G	98
	Decis 100 EC (P)	41 mL	7	A or G	633
	Sevin XLR (C)	2.12 to 2.59 L	5	G	699
	Cygon 480-AG (OP)	0.28 to 0.40 L	7	A or G	450

Insect	Insecticide (and insecticide group[1])	Rate/Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Potato leafhopper	*Sivanto Prime* (B)	202 to 304 mL	7	A or G	>2000
	Matador/ Silencer/Labamba/ Zivata (P)	34 mL	14 (Matador/*Labamba*) 21 (*Silencer/Zivata*)	A or G	56 to 98
	Voliam Xpress (D+P)	91 mL	14. Do not feed treated crop to livestock.	A or G	98
	Sevin XLR (C)	1.01 L	5	G	699
	Cygon 480-AG (OP)	0.28 to 0.40 L	7	A or G	450
Aphids	*Carbine* (F)	49 to 65 g	7	G	>2000
	Movento (TT)	75 to 111 mL	7	G	>2000
	Sivanto Prime (B)	202 to 304 mL	7	A or G	>2000
	Matador/Silencer/Labamba/ Zivata (P)	34 to 94 mL	14 (Matador/Labamba) 21 (Silencer/*Zivata*)	A or G	56 to 98
	Voliam Xpress (D+P)	91 to 223 mL	14. Do not feed treated crop to livestock.	A or G	98
	Malathion 85E (OP)	0.297 to 0.544 L	3	G	>550
	Cygon 480-AG (OP)	0.28 to 0.40 L	7	A or G	450
Spider mites	*Oberon* (TT)	202 to 243 mL	10	A or G	>2000
	Cygon 480-AG (OP)	0.28 to 0.40 L	7	A or G	450
Defoliators and Borers					
Grasshoppers	**Spreadable Bran Baits**				
	Eco bran (C)	0.8 to 1.6 kg	5	G	N/A
	Sprays				
	Coragen MaX/ Coragen (D)	17 to 33.5 mL 51 to 101 mL	1	A or G	>5000
	Voliam Xpress (D+P)	91 mL	14. Do not feed treated crop to livestock	A or G	98
	Decis 100 EC (P)	20 to 30 mL	7	A or G	633
European corn borer	*Coragen MaX/ Coragen* (D)	33.5 to 50.5 mL 101 to 152 mL	1	A or G	>5000
	Intrepid (E)	121 to 243 mL	7	G	>5000
	Matador/Silencer/Labamba/ Zivata (P)	34 mL	14 (Matador/*Labamba*) 21 (*Silencer/Zivata*)	A or G	56 to 98
	Voliam Xpress (D+P)	202 mL	14. Do not feed treated crop to livestock.	A or G	98

ALWAYS CONSULT THE INSECTICIDE LABEL BEFORE APPLYING ANY INSECTICIDE.

[1] Insecticide Group: F=flonicamid, D=diamides, E=ecdysone receptor agonists, N=neonicotinoids, P=pyrethroids, C=carbamates, OP=organophosphates, TT = tetronic and tetramic acid derivatives.

[2] LD^{50} values represent the relative toxicity of a pesticide. They represent the dose (in milligram per kilogram body weight) that will kill 50 percent of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD^{50}.

Buckwheat Insect Management Chart

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Belowground and Surface Feeders					
Cutworms	*Coragen MaX/ Coragen* (D)	33.5 mL 101 mL	1	A or G	>5000
Defoliators					
Grasshoppers	*Coragen MaX/ Coragen* (D)	17.0 to 33.5 mL 51 to 101 mL	1	A or G	>5000

ALWAYS CONSULT THE INSECTICIDE LABEL BEFORE APPLYING ANY INSECTICIDE.

[1] Insecticide Group: D=diamides

[2] LD^{50} values represent the relative toxicity of a pesticide. They represent the dose (in milligram per kilogram body weight) that will kill 50 percent of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD_{50}.

Scouting for insects in Canaryseed

Sap Feeders

- **Aphids**
  - ***When and How to Monitor:*** Start checking for aphids when monitoring during the early heading stage of canaryseed. The head should be bent and closely inspected for aphids hiding along the small stem inside the canaryseed head. Also check the stems, underside of leaves, and in the canaryseed boot.
  - ***Nominal Threshold:*** 10 to 20 aphids on 50 percent of the stems prior to the soft dough stage.

Canaryseed Insect Management Chart

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Sap Feeders					
Aphids	*Lagon/Cygon 480-AG/ Diamante 4* (OP)	0.20 L	21	A or G	245 to 450
	Malathion 85E (OP)	0.277 L	14	A or G	>550

ALWAYS CONSULT THE INSECTICIDE LABEL BEFORE APPLYING ANY INSECTICIDE.

[1] Insecticide Group: OP=organophosphates

[2] LD^{50} values represent the relative toxicity of a pesticide. They represent the dose (in milligram per kilogram body weight) that will kill 50 percent of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD_{50}.

Field Scouting in Canola

Scouting Calendar

Early-season: Flea beetles, cutworm, red turnip beetle, diamondback moth

Mid-season: Diamondback moth, cabbage seedpod weevil, grasshoppers

Late season: Bertha armyworm, diamondback moth, Lygus bugs, grasshoppers, alfalfa looper

- **Cutworm**
  - ***Typical Damage:*** Notched, wilted, dead, or cut-off plants (weed or crop seedlings). Plants missing from rows, bare patches appearing in field.
  - ***When and How to Monitor:*** Look for cutworm, and evidence of cutworm feeding, when monitoring canola in late May to mid-July. Often cutworms will be close to the cut or shriveled plants that they have just damaged. Cutworm will sometimes be most abundant in patches or a specific area of a field.
  - ***Nominal Threshold:*** 25 to 30 percent stand reduction. Sometimes it is most economical to just treat infested patches, and not whole fields.

Sap Or Fluid Feeders

- **Lygus bugs**
  - ***Typical Damage:*** Attacked buds appear shrunken and bleached white. Damaged seeds appear dark brown and shriveled.
  - ***When and How to Monitor:*** Monitor from when flowering is complete until seeds within the pod have become firm. Make 10 sweeps with a 38 cm diameter insect net at each of at least 5 sampling site. If while doing these samples populations appear to be of concern, take additional samples; a minimum of 15 samples is needed to accurately determine whether controls are economical. Sample canola for lygus bugs on a sunny day when the temperature is above 20°C and the crop canopy is dry.
  - ***Economic Threshold:*** A threshold of 20 to 30 per 10 sweeps is suitable for good growing conditions. Using the lower end of the threshold (about 20 per 10 sweeps) may be appropriate for stressed canola with less ability to compensate for feeding. When most pods become

leathery and when seeds inside are firm, lygus bugs can no longer penetrate the pods or seeds with their mouthparts and are no longer an economic threat. When precipitation is greater than 100 mm from the onset of bud formation to the end of flowering, the crop may partially compensate for plant bug damage.

- **Aphids**
  - ***Economic Threshold:*** Control aphids in canola if densities exceed 25 aphids per 10 cm shoot tip after flowering.

Defoliators

- **Flea beetles**
  - ***Typical Damage:*** Shot-holes in leaves to complete destruction of seedling plants in late May through June. Holes chewed in pods in August (occasional).
  - ***When and How to Monitor:*** Look for when monitoring in May through June when crop is in seedling stage. Examine 10 plants at random at each stop. Estimate overall percentage leaf loss.
  - ***Economic Threshold:*** When 25 percent of leaf surface is destroyed and flea beetles are present. If damage is only along the field margins and beetles are still congregated there, then control measures should be applied to the damaged areas only.
- **Cabbage Seedpod Weevil**
  - ***When and How to Monitor:*** Sample at 10 to 20 percent flower. Do 10 sweeps (180°) at a minimum of 4 locations; field edge, 50 metres into the field, and repeat the 2 sets at the opposite end of the field. If weevil numbers are close to the threshold the estimate may be improved by taking additional samples.
  - ***Economic Threshold:*** 25 to 40 weevils per 10 sweeps.
- **Diamondback moth**
  - ***Typical Damage:*** Flowers clipped or chewed, outer layers of stem and pods chewed, holes chewed in pods.
  - ***When and How to Monitor:*** Look for when monitoring in late May through early September. Observing for adults and larvae while taking sweep net samples can determine the presence and relative abundance of diamondback moth in the field. If levels appear to be of concern, shake plants within a 50 cm x 50 cm area and count larvae on the ground or surface (such as a sweep net) that plants were shaken over. Another alternative is to clip or pull the plants and knock over a light colored surface (such as a sweep net, jacket, hood of a car, etc.). Multiply by 4 to get the number of larvae per square metre. Do this in at least 5 areas of the field.
  - ***Nominal Threshold:*** 100 to 150 larvae per square metre in immature to flowering plants. 200 to 300 larvae per square metre in plants with flowers and pods.
    - Note that these threshold numbers are based on stands averaging 150 to 200 plants per square metre. In areas where stands are thinner, the economic threshold should be lowered accordingly. A nominal threshold of 25 to 33 percent defoliation with larvae still present can be applied for canola at seedling stage.
- **Bertha Armyworm**
  - ***Typical Damage:*** Outer layers of stems and pods chewed resulting in whitish appearance, holes chewed in pods.
  - ***When and How to Monitor:*** Look for larvae when monitoring fields in late July through early August. At each stop, shake plants in a 1/4 square metre (50 cm x 50 cm) area and carefully check soil surface for dislodged larvae. During heat of the day, larvae will often be found under leaves on soil surface.
  - ***Economic Threshold:*** A loss of 0.058 bushels per acre for each larva per square metre can be expected. Multiplying 0.058 x average number of larvae per square metre x expected seed value (dollars per bushel) will determine the economic loss (in dollars per acre) due to the larvae. Only if control costs (insecticide plus application costs) can be applied for less than this economic loss will insecticide applications be economical. Yield loss may be greater for canola under moisture stress.
    - At an expected seed value of $6.00 per bushel, the economic threshold will be between about 20 and 34 larvae per square metre, depending on control costs. At an expected seed value of $8 per bushel, the economic threshold will be between about 15 and 26 larvae per square metre, depending on control costs. Tables showing specific economic thresholds at various expected seed values and control costs can be found at: **http://www.gov.mb.ca/agriculture/crops/insects/fad03s01.html**.

Canola Insect Management Chart

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Belowground and Surface Feeders					
Root maggots	• **Increased seeding rates and increased row spacing** (to about 25 to 30 cm) can reduce damage to the roots by root maggots. • **Cultivating** prior to seeding reduces adult emergence from overwintered pupae. Root maggot infestations are greater under zero-till systems than under conventional tillage, but yields under zero tillage usually still exceed those with conventional tillage.				
Cutworms	**Seed treatments**				
	Fortenza Advanced (D)[3]	A co-pack of *Fortenza* and *Rascendo* (sulfoxaflor) that can be combined with neonicotinoid-based seed treatments.			
	Lumiderm (D)[4]	A seed treatment that can be combined with a neonicotinoid-based seed treatment.			>5000
	Foliar Sprays				
	Coragen MaX/ Coragen (D)	33.5 mL 101 mL	1	A or G	>5000
	Matador/Labamba (P)	34 mL	7	A or G	56 to 93
	Decis 100 EC (P)	40 mL	7	A or G	633
	Pounce/Perm-UP/IPCO Syncro (P) *Ambush* (P)	73 to 158 mL 57 to 121 mL	Treat up to 5-leaf stage	A or G (see labels)	789 to 1030
Sap and Fluid Feeders					
Lygus bugs	*Decis 100 EC/Advantage Deltamethrin 5 EC/Poleci* (P)	30 mL (*Decis 100 EC*) 60 mL (*Advantage Delta..5EC*) 121 mL (*Poleci*)	7	A or G	>300 to 2000
	Matador/ Silencer/Labamba/ Zivata (P)	34 mL	7	A or G	56 to 98
	Voliam Xpress (D+P)	91 mL	7. Do not feed treated crop to livestock.	A or G	98
	Cygon 480-AG (OP)	182 to 364 ml	21	A or G	450
Turnip aphid	*Lagon/Cygon 480-AG/ Diamante 4* (OP)	0.34 to 0.36 L	21	A or G	245 to 450
Aster leafhopper	*Lagon/Cygon 480-AG/ Diamante 4* (OP)	0.34 to 0.36 L	21	A or G	245 to 450
Defoliators					
Flea beetles (crucifer and/or striped)	**Seed treatments**				
	Lumiderm (D)[4]	Applied combined with a neonicotinoid-based seed treatment.			
	Fortenza Advanced (D)[3]	A co-pack of *Fortenza* and *Rascendo* (sulfoxaflor) that can be combined with neonicotinoid-based seed treatments.			
	BUTEO start (B)	625 to 1042 mL/ 100 kg seed	Seed treatment containing flupyradifurone – applied combined with a neonicotinoid-based seed treatment		1,030
	Helix Vibrance (N)	A seed treatment containing *Helix Xtra* and *Vibrance 500FS*.			
	Prosper EverGol (N)	A seed treatment containing the insecticide clothianidin and 3 fungicides.			
	NipsIt INSIDE (N)	250 to 666 mL/ 100 kg seed	Seed treatment		3044
	Sombrero (N)	0.67 to 1.33 L/ 100 kg seed	Seed treatment		N/A

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Flea beetles (crucifer and/ or striped), ***continued***	**Foliar Sprays**				
	Decis 100 EC/Advantage Deltamethrin 5 EC/Poleci (P)	20 to 30 mL (*Decis 100 EC)* 40 to 60 mL (*Advantage Delta..5EC*) 81 to 121 mL (*Poleci*)	7	A or G	>300 to 2000
	UP-Cyde/Ship (P)	56.6 mL	30	A or G	355
	Matador/ Silencer/Labamba/ Zivata (P)	34 mL	7	A or G	56 to 98
	Voliam Xpress (D+P)	91 mL	7. Do not feed treated crop to livestock	A or G	98
	Pounce/Perm-Up/IPCO Syncro (P) *Ambush* (P)	36 to 73 mL 28 to 57 mL	Treat up to 5-leaf stage	A or G	789 to 1030
	Malathion 85E (OP)	0.217 to 0.346 L	7	A or G	>550
	Sevin XLR (C)	0.202 L	Seedling application only	A or G	699
Cabbage seedpod weevil	**Trap crops** of earlier-flowering canola can be used to concentrate cabbage seedpod weevils, which can be managed with an insecticide if needed.				
	Matador/Silencer/Labamba/ Zivata (P)	34 mL	7	A or G	56 to 98
	Voliam Xpress (D+P)	91 mL	7. Do not feed treated crop to livestock	A or G	98
	Decis 100 EC/Advantage Deltamethrin 5 EC/Poleci (for control of adults only) (P)	40 mL (*Decis 100 EC*) 80 mL (*Advantage Delta..5EC*) 162 mL (*Poleci*)	7	A or G	>300 to 2000
Diamondback moth	*Plutex*	20 to 81 mL	0	G	
	CoragenMax/ Coragen (D)	17 mL 51 mL	1	A or G	>5000
	Decis 100 EC/ Advantage Deltamethrin 5 EC/ Poleci (P)	20 to 30 mL (*Decis 100 EC)* 40 to 60 mL (*Advantage Delta..5EC*) 81 to 121 mL (*Poleci*)	7	A or G	>300 to 2000
	Matador/ Silencer/Labamba/ Zivata (P)	34 mL	7	A or G	56 to 98
	Voliam Xpress (D+P)	91 mL	7. Do not feed treated crop to livestock.	A or G	98
	Malathion 85E (OP)	0.109 to 0.168 L	7	A or G	>550
Bertha armyworm	**Seeding as early as possible** and choosing **early maturing varieties of canola** may help minimize damage in years when outbreaks are forecasted.				
	Coragen MaX/ Coragen (D)	17 to 50.5 mL 51 to 152 mL	1	A or G	>5000
	Decis 100 EC/Advantage Deltamethrin 5 EC/ Poleci (P)	20 to 30 mL (*Decis 100 EC)* 40 to 60 mL (*Advantage Delta..5EC*) 81 to 121 mL (*Poleci*)	7	A or G	>300 to 2000
	UP-Cyde/Ship (P)	81 to 113 mL	30	A or G	355

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Bertha armyworm, *continued*	*Matador/Silencer/Labamba/ Zivata* (P)	34 mL	7	A or G	56 to 98
	Voliam Xpress (D+P)	91 mL	7. Do not feed treated crop to livestock	A or G	98
Cabbage looper	*Coragen MaX/ Coragen* (D)	33.5 mL 101 mL	1	A or G	>5000
Beet webworm	*Decis 100 EC/ Advantage Deltamethrin 5 EC/ Poleci* (P)	20 to 30 mL (*Decis 100 EC)* 40 to 60 mL (*Advantage Delta..5EC*) 81 to 121 mL (*Poleci*)	7	G	>300 to 2000
Clover cutworm	*Decis 100 EC/ Advantage Deltamethrin 5 EC/ Poleci* (P)	20 to 30 mL (*Decis 100 EC)* 40 to 60 mL (*Advantage Delta..5EC*) 81 to 121 mL (*Poleci*)	7	A or G	>300 to 2000
Imported cabbageworm	*Coragen MaX/ Coragen* (D)	33.5 mL 101 mL	1	A or G	>5000
	Matador/Silencer/Labamba/ Zivata (P)	34 mL	7	A or G	56 to 98
	Voliam Xpress (D+P)	91 mL	7. Do not feed treated crop to livestock	A or G	98
Grasshoppers	**Spreadable Bran Baits**				
	Eco bran (C)	0.8 to 1.6 kg	Treat only seedlings	G	N/A
	Sprays				
	Coragen MaX/ Coragen (D)	17 to 33.5 mL 51 to 101 mL	1	A or G	>5000
	Decis 100 EC/Advantage Deltamethrin 5 EC/Poleci (P)	20 to 30 mL (*Decis 100 EC)* 40 to 61 mL (*Advantage Delta..5EC)* *Poleci*: 81 to 121 mL (ground), 121 mL (air)	7	A or G	>300 to 2000
	Matador/Silencer/Labamba/ Zivata (young grasshoppers only) (P)	25 to 34 mL (ground), 34 mL (air)	7	A or G	56 to 98
	Voliam Xpress (D+P)	91 mL	7. Do not feed treated crop to livestock	A or G	98
	UP-Cyde/Ship (P) (young grasshoppers only)	33 to 46 mL	30	G	355
	Malathion 85E (OP)	0.217 to 0.346 L	7	A or G	>550
	Lagon/Cygon 480-AG/ Diamante 4 (OP)	0.34 to 0.36 L	21	A or G	245 to 450
Slugs	*Sluggo Professional*	10 to 20 kg		G	>5000

ALWAYS CONSULT THE INSECTICIDE LABEL BEFORE APPLYING ANY INSECTICIDE.

[1] Insecticide Group: D=diamides, B=butenolides, N=neonicotinoids, S=sulfoximines, P=pyrethroids, C=carbamates, OP=organophosphates.

[2] LD_{50} values represent the relative toxicity of a pesticide. They represent the dose (in milligram per kilogram body weight) that will kill 50 percent of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD_{50}.

[3] DO NOT apply any subsequent applications of a group 28 insecticide (such as *Coragen*) after planting seed treated with *Fortenza*.

[4] DO NOT apply any subsequent applications of a group 28 insecticide (such as *Coragen*) for a minimum of 60 days after planting seed treated with *Lumiderm*.

Chickpea Insect Management Chart

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Belowground and Surface Feeders					
Wireworms	*Cruiser 5FS* (N)	17 to 50 mL/100 kg seed	May be applied on-farm or by commercial seed treaters.		
	Trilex EverGol Shield (N)	A seed treatment containing *Stress Shield 600* and 3 fungicides.			
	Scorpio Ant and Insect Bait (suppression) (Sp)	10 to 20 kg	Incorporate into the soil at planting to a depth of 10 to 20 cm		
Cutworms	*Lumivia CPL (D)*	32 to 64 mL/100 kg seed	Seed treatment		>5000
	Scorpio Ant and Insect Bait (black cutworm) (Sp)	10 to 20 kg	28	G	
	Coragen MaX/ Coragen (D)	33.5 mL 101 mL	1	A or G	>5000
	Matador/Silencer/Labamba/ Zivata (P)	34 mL	14 (Matador/*Labamba*) 21 (*Silencer/Zivata*)	A or G	56 to 98
	Decis 100 EC (P)	41 mL	7	A or G	633
Sap Feeders					
Pea aphid	Carbine (F)	49 to 65 g	7	G	>2000
	Movento (TT)	75 to 111 mL	7	G	>2000
	Sivanto Prime (B)	202 to 304 mL	7	A or G	>2000
	Matador/Silencer/Labamba/ Zivata (P)	34 to 94 mL	14 (Matador/*Labamba*) 21 (*Silencer/Zivata*)	A or G	56 to 98
	Voliam Xpress (D+P)	91 to 223 mL	14. Do not feed treated crop to livestock	A or G	98
Potato leafhopper	*Sivanto Prime* (B)	202 to 304 mL	7	A or G	>2000
	Matador/Silencer/Labamba/ Zivata (P)	34 mL	14 (Matador/*Labamba*) 21 (*Silencer/Zivata*)	A or G	56 to 98
	Voliam Xpress (D+P)	91 mL	14. Do not feed treated crop to livestock	A or G	98
Defoliators					
Grasshoppers	*Coragen MaX/ Coragen* (D)	17 to 33.5 mL 51 to 101 mL	1	A or G	>5000
	Matador/Silencer/Labamba/ Zivata (P)	34 mL	14 (Matador/*Labamba*) 21 (*Silencer/Zivata*)	A or G	56 to 98
	Voliam Xpress (D+P)	91 mL	14. Do not feed treated crop to livestock	A or G	98
	Decis 100 EC (P)	20 to 30 mL	7	A or G	633

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[1] Insecticide Group: F=flonicamid, D=diamides, P=pyrethroids, N=neonicotinoids, TT= tetronic and tetramic acid derivatives.

[2] LD_{50} values represent the relative toxicity of a pesticide. They represent the dose (in milligram per kilogram body weight) that will kill 50 percent of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD_{50}.

Field Scouting in Clovers

Defoliators

- **Sweetclover Weevil**
  - ***Typical Damage:*** Adults chew crescent-shaped and jagged notches in leaves and can completely defoliate plants.
  - ***When and How to Monitor:*** Inspect clover seedlings for weevil damage in spring as the seedlings emerge. In midsummer and throughout August, inspect first-year clover stands for damage along crop margins. Invading weevils move into these stands only as far as necessary to satisfy their food requirements, so an insecticide application to affected field margins is usually all that is required. Visually estimating the number of weevils per plant must be done carefully because weevils fall from plants easily and are difficult to see on the ground.
  - ***Economic Threshold:*** 1st year stands: 1 weevil adult per 3 seedlings (1 per 5 seedlings under dry conditions). 2nd year stands: 9 to 12 weevil adults per plant.

Clovers (sweet, red, alsike) Insect Management Chart

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Belowground and Surface Feeders					
Cutworms	*Coragen MaX*	34 mL	0	G	>5000
Defoliators					
Grasshoppers	*Coragen MaX/ Coragen* (D)	17 to 33.5 mL 51 to 101 mL	0	G	>5000
	Malathion 85E (OP)	0.445 to 0.544 L	7	A or G	>550
	Lagon/Diamante 4 (OP)	172 to 405 mL	2 to 28 (see label)	A or G	245 to 425
Sweetclover Weevil	Locate new seedlings as far as possible from 2nd year clover. Cultivating 2nd year stands of sweet clover silage and hay as soon as possible after the crop is taken kills the new generation weevil larvae in the soil.				
	Malathion 85E (OP) (sweet clover only)	0.445 to 0.544 L	7 (cattle may be returned immediately after spraying)	A or G	>550
	Lagon/Cygon 480-AG / Diamante 4 (OP)	0.34 to 0.45 L	28	A or G	245 to 450
Alfalfa weevil	*Coragen Max/Coragen* (D) (suppression only)	50.5 to 67.5 mL/ 152 to 202 mL	0	G	>5000
Lesser clover leaf weevil	*Decis 100 EC/Advantage Deltamethrin 5 EC/ Poleci* (P) (suppression only/red clover seed production only)	51 mL (*Decis 100 EC*) 101 mL (*Advantage Delta..5EC*) 202 mL (*Poleci*)		G	>300 to 2000
Sap or Fluid Feeders					
Lygus bugs	*Carbine/Beleaf 50SG* (F)	81 to 121 g	7	G	>2000
	Lagon/Diamante 4 (OP)	172 ml	2	A or G	245 to 425
Leafhoppers	*Sefina* (PP) (suppression only)	81 to 162 mL	0	A or G	>2000
	Malathion 85E (OP)	0.445 to 0.544 L	7	A or G	>550
Aphids	*Sefina* (PP)	81 mL	0	A or G	>2,000
	Carbine/Beleaf 50SG (F)	49 to 65 g	7	G	>2000
	Malathion 85E (OP)	0.445 to 0.544 L	7	A or G	>550

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[1] Insecticide Group: D=diamides, F=flonicamid, P=pyrethroids, C=carbamates, OP=organophosphates.

[2] LD_{50} values represent the relative toxicity of a pesticide. They represent the dose (in milligram per kilogram body weight) that will kill 50 percent of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD_{50}.

Field Scouting in Corn (Field Corn)

- **Cutworm**
  - ***Typical Damage:*** Notched, wilted, dead, or cut-off plants (weed or crop seedlings). Plants missing from rows, bare patches appearing in field.
  - ***When and How to Monitor:*** Look for cutworm, and evidence of cutworm feeding, when monitoring corn in late May to mid-July. Often cutworms will be close to the cut or shriveled plants that they have just damaged. Cutworm will sometimes be most abundant in patches or a specific area of a field. At each stop, examine 100 plants in a row. Calculate percentage of plants cut off or showing leaf feeding.
  - ***Economic Threshold:*** When 2 to 4 percent of plants are cut below the ground or when 6 to 8 percent of plants are cut above the soil surface, and cutworms less than 1 inch long are present. Sometimes it is most economical to just treat infested patches, and not whole fields.
- **European corn borer**
  - ***Typical Damage:*** Shot-holes in leaves. Holes in stalk, tassels and ears. Damage may cause stalk breakage prior to harvest or cobs to fall to the ground. Nutrient flow in the plant may be restricted, resulting in smaller cobs.
  When and How to Monitor: Begin looking for European corn borer when field scouting in early July. At 5 locations, examine 10 plants for young larvae and egg masses. Calculate percentage of plants infested. Scout every 5 to 7 days until the end of July or larvae start to tunnel into the stalks.
  - ***Economic Threshold:*** The level of European corn borer where control becomes economical depends on the value of the crop, and cost of control. Information on determining specific economic thresholds for European corn borer in corn can be found at **http://www.gov.mb.ca/agriculture/crops/insects/european-corn-borer.html**, or from your local agriculture office.
  These thresholds are based on a 5 percent yield loss per corn borer per plant on average. If the majority of larvae have bored into the stalk, DO NOT apply insecticide, as they are ineffective once the larvae have entered the stalk.
- **Armyworm**

Economic Threshold: For corn past the 6-leaf stage, if 50 percent of the plants are showing damage and have larvae smaller than 2.5 cm (1 inch), insecticide treatment may be warranted. As long as the growing point of the plant is not damaged, the corn plant is usually able to recover from moderate feeding.

Corn (Field Corn) Insect Management Chart

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Belowground and Surface Feeders					
Cutworms	**Seed treatments**				
	Lumivia (D)[3]	64 mL/unit (80,000 seed unit)	Seed treatment – by commercial treaters with closed transfer systems only		>5000
	Fortenza (D)[4]	83 to 167 mL/ 100 kg seed	Seed treatment – by commercial treaters with closed transfer systems only		>5000
	Foliar Sprays				
	Coragen MaX/ Coragen (D)	33.5 mL 101 mL	14 (field corn) 1 (seed corn or sweet corn)	A or G	>5000
	Vayego (D)	61 mL	14	G	>2000
	Matador/Silencer/Labamba/ Zivata (P)	34 mL	DO NOT cut treated fields for silage/ forage, do not graze treated fields.	A or G	56 to 98
	UP-Cyde/Ship (P)	115 mL	21	G	355
	Pounce/Perm-UP /IPCO Syncro (P) *Ambush* (P)	73 to 158 mL 57 to 121 mL	30	A or G (see labels)	789 to 1030

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Wireworms	*Cimegra*	250 mL/ha in furrow	In-furrow application		>2000
	Fortenza (D)[4]	Seed treatment			
	Lumivia (D)[3]	64 mL/unit (80,000 seed unit)	Seed treatment – by commercial treaters with closed transfer systems only		>5000
	Cruiser Maxx Corn (N)	83 mL *Cruiser 5FS*/ 100 kg seed	A seed treatment containing *Cruiser 5 FS* and *Maxim Quattro*.		>5000
	Poncho 600 FS (N)	33.3 to 66.6 mL of *Poncho 600*/ 80,000 units of seed	Seed treatment – for use in commercial seed treatment facilities with closed transfer equipment only		2000
	NipsIt INSIDE (N)	33.3 to 66.6 mL/ 80,000 units of seed	Seed treatment	Seed treatment	3044
	Sombrero (N)	0.16 mg/kernel	Seed treatment	Seed treatment	N/A
Seedcorn maggot	*Lumivia* (D)[3] (suppression)	64 mL/unit (80,000 seed unit)	Seed treatment – by commercial treaters with closed transfer systems only		>5000
	Fortenza (D)[4] (suppression)	167 mL/100 kg seed	Seed treatment – by commercial treaters with closed transfer systems only		>5000
	Cruiser Maxx Corn (N)	83 to 166 mL *Cruiser 5FS*/100 kg seed	A seed treatment containing *Cruiser 5 FS* and *Maxim Quattro*.		>5000
	Poncho 600 FS (N)	33.3 to 66.6 mL of *Poncho 600*/ 80,000 units of seed	Seed treatment – for use in commercial seed treatment facilities with closed transfer equipment only		2000
	NipsIt INSIDE (N)	33.3 to 66.6 mL/ 80,000 units of seed	Seed treatment	Seed treatment	3044
Corn rootworm	**Crop rotation** is an effective management strategy.				
	Resistant Cultivars: Some cultivars of Bt corn are resistant to feeding by corn rootworm. A table of registered Bt corn products in Canada (as of March 2023) is available at: https://cornpest.ca/wp-content/uploads/2023/03/Canadian-Bt-Traits-Table-March-2023-English-4.pdf.				
	Cimegra	250 mL/ha in furrow	In-furrow application		>2000
Sap Feeders					
Aphids	*Sivanto Prime* (B)	202 to 304 mL	7 (silage, forage, sweet corn) 21 (grain)	A or G	>2000
	Closer (S)	30 to 61 mL	7 (forage) 14 (grain)	A or G	>5000
	Vayego (D) (suppression)	61 mL	14	G	>2000
Spider mites	*Oberon* (TT)	162 to 243 mL	5 (green forage) 30 (grain or stover)	A or G	>2000
Defoliators and Borers					
Grasshoppers	*Coragen MaX*	17 to 34 mL	14 (field corn) 1 (seed corn or sweet corn)	A or G	>5000

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
European corn borer	**Stalk Management:** Primary tillage such as chisel plowing or moldboard plowing in the fall can reduce overwintering populations. Mowing corn stalks after harvest can reduce overwintering populations up to 85 percent. **Resistant Cultivars:** Some cultivars of Bt corn are resistant to feeding by European corn borer. A table of registered Bt corn products in Canada (as of March 2023) is available at: **https://cornpest.ca/wp-content/uploads/2023/03/Canadian-Bt-Traits-Table-March-2023-English-4.pdf.**				
	Dipel 2X DF (M)	0.23 to 0.45 kg	0	G	>5000
	Bioprotec CAF/ Bioprotec PLUS (M)	1.13 to 1.62 L 0.73 to 1.0 L	0	G	N/A
	Coragen MaX/ Coragen (D)	33.5 to 50.5 mL 101 to 152 mL	14 (field corn) 1 (seed corn or sweet corn)	A or G	>5000
	Vayego (D)	61 mL	14	G	>2000
	Intrepid (E)	121 to 243 mL	21 (field corn) 3 (sweet corn)	G	>5000
	Delegate (Sp)	49 to 85 g	28	A or G	>5000
	Matador/Silencer/Labamba/ Zivata (P)	34 to 76 mL	21 (field corn) DO NOT cut treated fields for silage/ forage, do not graze treated fields.	A or G	56 to 98
	Voliam Xpress (D+P)	202 mL	21. Do not feed treated crop to livestock	A or G	98
	Decis 100 EC/Advantage Deltamethrin 5 EC/ Poleci (P)	51 to 61 mL (*Decis 100 EC*) 101 to 121 mL (*Advantage Delta..5EC*) 202 to 243 mL (*Poleci*)	1	G	>300 to 2000
	UP-Cyde/Ship (P)	113 mL	5	A or G	355
	Malathion 85E (OP)	0.445 to 0.544 L	5	A or G	>550
Corn earworm	Some cultivars of Bt corn are resistant to feeding by corn earworm.				
	Coragen MaX/ Coragen (D)	33.5 to 50.5 mL 101 to 152 mL	14 (field corn) 1 (seed corn or sweet corn)	A or G	>5000
	Vayego (D)	61 mL	14	G	>2000
	Matador/Silencer/Labamba/ Zivata (P)	34 to 76 mL	21 (field corn) DO NOT cut treated fields for silage/ forage, do not graze treated fields.	A or G	56 to 98
	Voliam Xpress (D+P)	202 mL	21. Do not feed treated crop to livestock	A or G	98
	UP-Cyde/Ship (P)	113 mL	5	A or G, see product label	355
	Malathion 85E (OP)	0.445 to 0.544 L	5	A or G	>550

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Armyworm	Some cultivars of Bt corn are resistant to feeding by armyworms.				
	Coragen MaX/ Coragen (D)	33.5 to 50.5 mL 101 to 152 mL	14 (field corn) 1 (seed corn or sweet corn)	A or G	>5000
	Vayego (D)	61 mL	14	G	>2000
	Matador/Silencer/Labamba/ Zivata (P)	34 to 84 mL (Matador/ *Labamba*) 34 mL (*Silencer/Zivata*)	21 (field corn) DO NOT cut treated fields for silage/ forage, do not graze treated fields.	A or G	56 to 98
	Voliam Xpress (D+P)	202 mL	21. Do not feed treated crop to livestock	A or G	98
Fall armyworm	Some cultivars of Bt corn are resistant to feeding by fall armyworm.				
	Coragen MaX/ Coragen (D)	33.5 to 50.5 mL 101 to 152 mL	14 (field corn) 1 (seed corn or sweet corn)	A or G	>5000
	Matador/Silencer/Labamba/ Zivata (P)	34 mL	DO NOT cut treated fields for silage/ forage, do not graze treated fields.	A or G	56 to 98

ALWAYS CONSULT THE INSECTICIDE LABEL BEFORE APPLYING ANY INSECTICIDE.

[1] Insecticide Group: M=microbials, D=diamides, E=ecdysone receptor agonists, B=butenolides, N=neonicotinoids, P=pyrethroids, C=carbamates, OP=organophosphates, TT = tetronic and tetramic acid derivatives.

[2] LD_{50} values represent the relative toxicity of a pesticide. They represent the dose (in milligram per kilogram body weight) that will kill 50 percent of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD_{50}.

[3] DO NOT make a subsequent foliar application of any group 28 insecticide (such as Coragen) for a minimum of 60 days after planting seed treated with Lumivia.

[4] DO NOT make any subsequent applications of a group 28 insecticide (such as Coragen) following Fortenza seed treatment.

Faba Bean Insect Management Chart

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Belowground Feeders					
Cutworms	*Lumivia CPL* (D)	32 to 64 mL/100 kg seed	Seed treatment		>5000
	Scorpio Ant and Insect Bait (black cutworm) (Sp)	10 to 20 kg	28	G	
	Coragen MaX/ Coragen (D)	33.5 mL 101 mL	1	A or G	>5000
	Decis 100 EC (P)	41 mL	7	A or G	633
Wireworms	*Cruiser 5FS* (N)	17 to 50 mL/100 kg seed	May be applied on-farm or by commercial seed treaters.		
	Trilex EverGol Shield (N)	A seed treatment containing *Stress Shield 600* and 3 fungicides.			
	Scorpio Ant and Insect Bait (suppression) (Sp)	10 to 20 kg	Incorporate into the soil at planting to a depth of 10 to 20 cm.		

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Pea leaf weevil	*Lumivia CPL* (D)	64 to 96 mL/100 kg seed	Seed treatment		
	Trilex EverGol Shield (N)	A seed treatment containing *Stress Shield 600* and 3 fungicides.			
	Cruiser Maxx Vibrance Pulses (N)	A seed treatment combining *Cruiser 5FS* and *Vibrance Maxx RFC*.			
	Cruiser 5FS (N)	50 mL/100 kg seed	May be applied on-farm or by commercial seed treaters.		
	Voliam Xpress (D+P)	91 mL	14. Do not feed treated crop to livestock	A or G	98
	Decis 100 EC (P) (suppression)	30 mL	7	A or G	633
Sap and Fluid Feeders					
Lygus bugs	*Carbine* (F)	81 g	7	G	>2000
	Matador/Silencer/ Labamba/ Zivata (P)	34 mL	14 (Matador/*Labamba*) 21 (*Silencer/Zivata*) DO NOT cut treated fields for hay/forage. Do not graze treated fields.	A or G	56 to 98
	Voliam Xpress (D+P)	91 mL	14. Do not feed treated crop to livestock	A or G	98
	Decis 100 EC (P)	41 mL	7	A or G	633
Potato leafhopper	*Sivanto Prime* (B)	202 to 304 mL	7	A or G	>2000
	Matador/Silencer/ Labamba/Zivata (P)	34 mL	14 (Matador/*Labamba*) 21 (*Silencer/Zivata*) DO NOT cut treated fields for hay/forage. Do not graze treated fields.	A or G	56 to 98
	Voliam Xpress (D+P)	91 mL	14. Do not feed treated crop to livestock	A or G	98
Pea aphid	*Carbine* (F)	49 to 65 g	7	G	>2000
	Sivanto Prime (B)	202 to 304 mL	7	A or G	>2000
	Matador/Silencer/ Labamba/Zivata (P)	34 to 94 mL	14 (Matador/*Labamba*) 21 (*Silencer/Zivata*) DO NOT cut treated fields for hay/forage. Do not graze treated fields.	A or G	56 to 98
	Voliam Xpress (D+P)	91 to 223 mL	14. Do not feed treated crop to livestock.	A or G	98
Defoliators					
Grasshoppers	*Coragen MaX/ Coragen* (D)	17 to 33.5 mL 51 to 101 mL	1	A or G	>5000
	Voliam Xpress (D+P)	91 mL	14. Do not feed treated crop to livestock	A or G	98
	Decis 100 EC (P)	20 to 30 mL	7	A or G	633

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[1] Insecticide Group: D=diamides, F=flonicamid, N=neonicotinoids, P=pyrethroids.

[2] LD_{50} values represent the relative toxicity of a pesticide. They represent the dose (in milligram per kilogram body weight) that will kill 50 percent of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD_{50}.

Field Scouting in Flax

- **Cutworms**
  - ***Typical Damage:*** Notched, wilted, dead, or cut-off plants (weed or crop seedlings). Plants missing from rows, bare patches appearing in field.
  - ***When and How to Monitor:*** Look for cutworm, and evidence of cutworm feeding, when monitoring in late May to mid-July. Often cutworm will be close to the cut or shriveled plants that they have just damaged. Cutworm will sometimes be most abundant in patches or a specific area of a field. In areas of the field where cutworm damage is noticeable, check around damaged plants in a 0.25 square metres (50 cm x 50 cm) area. Use trowel or shovel to carefully search through top 5 cm of soil for cutworm larvae. Multiply the number of cutworms found by 4 to get the number per square metre. Repeat in several locations to get an accurate assessment of what cutworm levels are.
  - ***Economic Threshold:*** 4 to 5 larvae per square metre. Sometimes it is most economical to just treat infested patches, and not whole fields.
- **Aphids**
  - ***Typical Damage:*** Extract plant fluids from the stems, leaves and developing bolls. Can cause fewer seeds to be produced.
  - ***When and How to Monitor:*** The easiest way to detect aphids in flax is to sample the upper portions of the plant with an insect sweep net when the crop is in full bloom, or tap plants over a white tray or bucket. If aphids are found, fields need to be more closely inspected by randomly sampling plants. To inspect plants, lightly tap the plants on a white surface, such as a tray or the canvas of a sweep net, to dislodge the insects. Plants can be severed at the base prior to tapping if desired. Inspect a minimum of 25 plants at full bloom and 20 plants at early green boll randomly in the field to provide an accurate estimate of aphid density. Record total number of aphids and calculate average per plant.
    - If control is not warranted at full bloom, aphid densities should be assessed again at the green boll stage.
  - ***Economic Threshold:*** Varies with crop value and control costs, but generally about 3 aphids per main stem at full bloom or 8 aphids per main stem at the green boll stage.
    - The yield loss of flax is 0.3346 bushels per acre per aphid per plant for crops sampled at full bloom and 0.1275 bushels per acre per aphid per plant for crops sampled at the green boll stage.
    - The potato aphid is highly susceptible to attack by fungi (especially in years of high rainfall and humidity in late June and July). Aphid populations sampled at full bloom that have many diseased insects should be sampled again at the early green boll stage to determine the effect of the disease on aphid densities.
- **Beet webworm**
  - ***Nominal Threshold:*** >10 larvae per square metre.

Flax Insect Management Chart

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Belowground and Surface Feeders					
Wireworms	No insecticides registered for the control of wireworm in flax.				
Cutworms	*Coragen MaX/ Coragen* (D)	33.5 mL 101 mL	1	A or G	>5000
	Decis 100 EC/Advantage Deltamethrin 5 EC/Poleci (P)	40 mL (*Decis 100 EC*) 81 mL (*Advantage Delta..5EC*) 162 mL (*Poleci*)	7 (*Decis*) 40 (*Poleci, Advantage Delta..5EC*)	A or G	>300 to 2000
	Matador/Labamba (P)	34 mL	7	A or G	56
	Pounce/Perm-UP/ IPCO Syncro (P) *Ambush* (P)	73 to 158 mL 57 to 121 mL	Treat up to 5 leaf stage	A or G (see labels)	789 to 1030
Sap Feeders					
Potato aphid	*Lagon/Cygon 480-AG/ Diamante 4* (OP)	173 mL	21	A or G	245 to 450
Lygus bugs	*Decis 100 EC* (P)	30 mL	7	A or G	633
	Voliam Xpress (D+P)	91 mL	7. Do not feed treated crop to livestock.	A or G	98

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Defoliators					
Grasshoppers	*Coragen MaX/ Coragen* (D)	17 to 33.5 mL 51 to 101 mL	1	A or G	>5000
	Decis 100 EC/Advantage Deltamethrin 5 EC/Poleci (P)	20 to 30 mL (*Decis 100 EC*) 40 to 61 mL (*Advantage Delta..5EC*) *Poleci*: 81 to 121 mL (ground), 121 mL (air)	7 (*Decis 100 EC*) 40 (*Poleci, Advantage Delta..5EC*)	A or G	>300 to 2000
	Matador/Silencer/Labamba/ Zivata (young grasshoppers only) (P)	25 to 34 mL (ground) 34 mL (air)	7	A or G	56 to 98
	Voliam Xpress (D+P)	91 mL	7. Do not feed treated crop to livestock.	A or G	98
	Malathion 85E (OP)	0.217 to 0.346 L	7	A or G	>550
Bertha armyworm	*Coragen MaX/ Coragen* (D)	17 to 50.5 mL 51 to 152 mL	1	A or G	>5000
	Decis 100 EC (P)	20 to 30 mL	7	A or G	633
	Voliam Xpress (D+P)	91 mL	7. Do not feed treated crop to livestock.	A or G	98
Clover cutworm	*Decis 100 EC/Advantage Deltamethrin 5 EC/Poleci* (P)	20 to 30 mL (*Decis 100 EC*) 40 to 61 mL (*Advantage Delta..5EC*) 81 to 121 mL (*Poleci*)	7 (*Decis 100 EC)* 40 (*Poleci, Advantage Delta..5EC*)	A or G	>300 to 2000
Beet webworm	*Decis 100 EC/Advantage Deltamethrin 5 EC/ Poleci* (P)	20 to 30 mL (*Decis 100 EC*) 40 to 61 mL *(Advantage Delta..5EC*) 81 to 121 mL (*Poleci*)	7 (*Decis 100 EC*) 40 (*Poleci, Advantage Delta..5EC*)	G	>300 to 2000

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[1] Insecticide Group: D=diamides, P=pyrethroids, C=carbamates, OP=organophosphates, OC=organochlorines.

[2] LD_{50} values represent the relative toxicity of a pesticide. They represent the dose (in milligram per kilogram body weight) that will kill 50 percent of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD_{50}.

Forage Grasses (Timothy, etc.) Insect Management Chart

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Belowground and Surface Feeders					
Cutworms	*Coragen MaX*	34 mL	0	G	>5000
Sap and Fluid Feeders					
Plant bugs	*Lagon/Cygon 480-AG / Diamante 4* (OP)	0.17 L	2	A or G	245 to 450
Defoliators					
Grasshoppers	**Spreadable Bran Baits**				
	Nolo Bait	Minimum of 0.45 kg		A or G	
	Eco bran (C)	0.8 to 1.6 kg	1 to 2	G	N/A

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Grasshoppers, *continued*	**Sprays**				
	Coragen MaX/ Coragen (D) (for feed)	17 to 33.5 mL 51 to 101 mL	0	G	>5000
	Matador/Silencer/Labamba/ Zivata (P) (on timothy - seed production only)	25 to 34 mL	14	G	56 to 98
	Sevin XLR (C)	0.49 to 1.42 L	1 to 2	G	699
	Lagon/Cygon 480-AG/ Diamante 4 (OP)	0.17 to 0.22 L (nymphs) 0.34 to 0.40 L (adults)	2 to 28	A or G	245 to 450
European skipper (on timothy)	*Dipel 2X DF* (M)	57 to 111 g	N/A	A or G	>5000
	Bioprotec CAF (M)/ Bioprotec PLUS (M)	0.22 to 0.28 L 0.14 to 0.18 L	0	G	N/A
Armyworm	*Coragen MaX/ Coragen* (D)	33.5 to 50.5 mL 101 to 152 mL	0	G	>5000

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[1] Insecticide Group: M=microbials, D=diamides, P= pyrethroids, C=carbamates, OP=organophosphates.

[2] LD_{50} values represent the relative toxicity of a pesticide. They represent the dose (in milligram per kilogram body weight) that will kill 50 percent of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD_{50}.

Field Scouting in Lentils

- **Grasshoppers**
  - ***When and How to Monitor:*** Look for when monitoring fields from the early bud stage through pod development.
  - ***Economic Threshold:*** 2 grasshoppers per square metre during the flowering and podding stages, especially if two-striped grasshopper is the dominant species.
- **Lygus Bugs**
  - ***When and How to Monitor:*** Look for lygus bugs when monitoring lentils during blooming and podding by using a sweep net, making 25, 180° sweeps in at least 5 randomly selected places in a field. Afternoon sampling provides more accurate estimates than morning sampling.
  - ***Threshold:*** As a nominal threshold, insecticide treatment is recommended when 7 to 10 Lygus bugs are collected per 25 sweeps.
- **Pea aphid**
  - ***Economic Threshold:*** 30 to 40 aphids per 180° sweep of a 38 cm (15 inch) diameter insect net, and few natural enemies are present, and when aphid numbers DO NOT decline over a 2 day period.

Lentil Insect Management Chart

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Belowground and Surface Feeders					
Wireworms	*Cruiser 5FS* (N)	17 to 50 mL/100 kg seed	May be applied on-farm or by commercial seed treaters.		
	Trilex EverGol Shield (N)	A seed treatment containing *Stress Shield 600* and 3 fungicides.			
	Scorpio Ant and Insect Bait (suppression) (Sp)	10 to 20 kg	Incorporate into the soil at planting to a depth of 10 to 20 cm.		
Cutworms	*Lumivia CPL* (D)	32 to 64 mL/100 kg seed	Seed treatment		>5000
	Scorpio Ant and Insect Bait (black cutworm) (Sp)	10 to 20 kg	28	G	
	Coragen MaX/ Coragen (D)	33.5 mL 101 mL	1	A or G	>5000
	Decis 100 EC/Advantage Deltamethrin 5 EC/ Poleci (P)	41 mL (*Decis 100 EC*) 81 mL (*Advantage Delta..5EC*) 162 mL (*Poleci*)	7 (*Decis 100 EC)* 30 (*Poleci, Advantage Delta..5EC*)	A or G	>300 to 2000

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Cutworms, *continued*	*Matador/Silencer/Labamba/ Zivata* (P)	34 mL	14 (Matador/*Labamba*) 21 (*Silencer/Zivata*)	A or G	56 to 98
	Pounce/Perm-UP/ IPCO Syncro (P) *Ambush* (P)	73 to 158 mL 57 to 121 mL	7	A or G (see labels)	789 to 1030
Sap and Fluid Feeders					
Lygus bugs	*Carbine* (F)	81 g	7	G	>2000
	Matador/Silencer/Labamba/ Zivata (P)	34 mL	14 (Matador/*Labamba*) 21 (*Silencer/Zivata*)	A or G	56 to 98
	Voliam Xpress (D+P)	91 mL	14. Do not feed treated crop to livestock	A or G	98
	Decis 100 EC (P)	41 mL	7	A or G	633
Potato leafhopper	*Sivanto Prime* (B)	202 to 304 mL	7	A or G	>2000
	Matador/Silencer/Labamba/ Zivata (P)	34 mL	14 (Matador/*Labamba*) 21 (*Silencer/Zivata*)	A or G	56 to 98
	Voliam Xpress (D+P)	91 mL	14. Do not feed treated crop to livestock.	A or G	98
Pea aphid	*Carbine* (F)	49 to 65 g	7	G	>2000
	Movento (TT)	75 to 111 mL	7	G	>2000
	Sivanto Prime (B)	202 to 304 mL	7	A or G	>2000
	Matador/Silencer/Labamba/ Zivata (P)	34 to 94 mL	14 (Matador/*Labamba*) 21 (*Silencer/Zivata*)	A or G	56 to 98
	Voliam Xpress (D+P)	91 to 223 mL	14. Do not feed treated crop to livestock	A or G	98
Defoliators					
Grasshoppers	*Coragen MaX/ Coragen* (D)	17 to 33.5 mL 51 to 101 mL	1	A or G	>5000
	Decis 100 EC/Advantage Deltamethrin 5 EC/ Poleci (P)	20 to 30 mL (*Decis 100 EC*) 40 to 60 mL (*Advantage Delta..5EC*) *Poleci:* 81 to 121 mL (ground), 121 mL (air)	7 (*Decis 100 EC)* 30 (*Poleci, Advantage Delta..5EC*)	A or G	>300 to 2000
	Matador/Silencer/Labamba/ Zivata (P)	34 mL	14 (Matador/*Labamba*) 21 (*Silencer/Zivata*)	A or G	56 to 98
	Voliam Xpress (D+P)	91 mL	14. Do not feed treated crop to livestock	A or G	98
	Malathion 85E (OP)	0.336 L	14	A or G	>550

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[1] Insecticide Group: F=flonicamid, D=diamides, N=neonicotinoids, P= pyrethroids, OP=organophosphates, TT = tetronic and tetramic acid derivatives.

[2] LD_{50} values represent the relative toxicity of a pesticide. They represent the dose (in milligram per kilogram body weight) that will kill 50 percent of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD_{50}.

Mustard Insect Management Chart

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Belowground and Surface Feeders					
Root maggots	No insecticides registered.				
Cutworms	**Seed treatments**				
	Lumiderm (D)[3]	Applied combined with a neonicotinoid-based seed treatment.			
	Fortenza Advanced (D)[4]	A co-pack of *Fortenza* and *Rascendo* (sulfoxaflor) that can be combined with neonicotinoid-based seed treatments.			
	Foliar Sprays				
	Coragen MaX/ Coragen (D)	33.5 mL 101 mL	1	A or G	>5000
	Decis 100 EC (P)	40 mL	7	A or G	633
Sap Feeders					
Lygus bugs	*Decis 100 EC/Advantage Deltamethrin 5 EC/ Poleci* (P)	30 mL (*Decis 100 EC*) 60 mL (*Advantage Delta..5EC*) 121 mL (*Poleci*)	7	A or G	>300 to 2000
	Voliam Xpress (D+P)	91 mL	7. Do not feed treated crop to livestock	A or G	98
Defoliators					
Flea beetles	**Seed treatments**				
	Lumiderm (D)[3]	Applied combined with a neonicotinoid-based seed treatment.			
	Fortenza Advanced (D)[4]	A co-pack of *Fortenza* and *Rascendo* (sulfoxaflor) that can be combined with neonicotinoid-based seed treatments.			
	Helix Vibrance (N)	A seed treatment containing *Helix Xtra* and *Vibrance 500FS*.			
	Prosper EverGol (N)		Seed treatment	Seed treatment	>2000
	Sombrero (N)	0.67 to 1.33 L/ 100 kg seed	Seed treatment	Seed treatment	N/A
	Sprays				
	Decis 100 EC/Advantage Deltamethrin 5 EC/ Poleci (P)	20 to 30 mL (*Decis 100 EC*) 40 to 60 mL (*Advantage Delta..5EC*) 81 to 121 mL (*Poleci*)	7	A or G	>300 to 2000
	UP-Cyde/Ship (P)	56.7 mL	30	A or G	355
	Matador/Silencer/Labamba/ Zivata (P)	34 mL	7	A or G	56 to 98
	Voliam Xpress (D+P)	91 mL	7. Do not feed treated crop to livestock.	A or G	98
	Malathion 85E (OP)	0.217 to 0.346 L	7	A or G	>550

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Cabbage seedpod weevil	Note: Yellow mustard *(Sinapis alba)* is resistant to cabbage seedpod weevil; oriental and brown mustards *(Brassica juncea)* are susceptible to feeding by cabbage seedpod weevil.				
	Matador/Silencer/Labamba/ Zivata (adults) (P)	34 mL	7	A or G	56 to 98
	Voliam Xpress (D+P)	91 mL	7. Do not feed treated crop to livestock	A or G	98
	Decis 100 EC/Advantage Deltamethrin 5 EC/ Poleci (for control of adults only) (P)	40 mL (*Decis 100 EC*) 80 mL (*Advantage Delta..5EC*) 162 mL (*Poleci*)	7	A or G	>300 to 2000
Diamondback moth	*Coragen MaX/ Coragen* (D)	17 mL 51 mL	1	A or G	>5000
	Decis 100 EC/Advantage Deltamethrin 5 EC/ Poleci (P)	20 to 30 mL (*Decis 100 EC*) 40 to 60 mL (*Advantage Delta..5EC*) 81 to 121 mL (*Poleci*)	7	A or G	>300 to 2000
	Matador/Silencer/Labamba/ Zivata (P)	34 mL	7	A or G	56 to 98
	Voliam Xpress (D+P)	91 mL	7. Do not feed treated crop to livestock	A or G	98
	Malathion 85E (OP)	0.109 to 0.168 L	7	A or G	>550
Bertha armyworm	*Coragen MaX/ Coragen* (D)	17 to 50.5 mL 51 to 152 mL	1	A or G	>5000
	Decis 100 EC/Advantage Deltamethrin 5 EC/ Poleci (P)	20 to 30 mL (*Decis 100 EC*) 40 to 60 mL (*Advantage Delta..5EC*) 81 to 121 mL (*Poleci*)	7	A or G	>300 to 2000
	Matador/Silencer/Labamba/ Zivata (P)	34 mL	7	A or G	56 to 98
	Voliam Xpress (D+P)	91 mL	7. Do not feed treated crop to livestock	A or G	98
Clover cutworm	*Decis 100 EC/Advantage Deltamethrin 5 EC/ Poleci* (P)	20 to 30 mL (*Decis 100 EC*) 40 to 60 mL (*Advantage Delta..5EC*) 81 to 121 mL (*Poleci*)	7	A or G	>300 to 2000
Imported cabbageworm	*Coragen MaX/ Coragen* (D)	33.5 mL 101 mL	1	A or G	>5000
	Matador/Silencer/Labamba/ Zivata (P)	34 mL	7	A or G	56 to 98
	Voliam Xpress (D+P)	91 mL	7. Do not feed treated crop to livestock.	A or G	98
Beet webworm	*Decis 100 EC/Advantage Deltamethrin 5 EC/ Poleci* (P)	20 to 30 mL (*Decis 100 EC*) 40 to 60 mL (*Advantage Delta..5EC*) 81 to 121 mL (*Poleci*)	7	G	>300 to 2000

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Cabbage looper	*Coragen MaX/ Coragen* (D)	33.5 mL 101 mL	1	A or G	>5000
	Matador/Silencer/Labamba/ Zivata (P)	34 mL	7	A or G	56 to 98
	Voliam Xpress (D+P)	91 mL	7. Do not feed treated crop to livestock.	A or G	98
Grasshopper	*Coragen MaX/ Coragen* (D)	17 to 33.5 mL 51 to 101 mL	1	A or G	>5000
	Decis 100 EC/Advantage Deltamethrin 5 EC/ Poleci (P)	20 to 30 mL (*Decis 100 EC*) 40 to 60 mL (*Advantage Delta..5EC*) *Poleci*: 81 to 121 mL (ground), 121 mL (air)	7	A or G	>300 to 2000
	Matador/Silencer/Labamba/ Zivata (young grasshoppers only) (P)	25 to 34 mL (ground) 34 mL (air)	7	A or G	56 to 98
	Voliam Xpress (D+P)	91 mL	7. Do not feed treated crop to livestock	A or G	98
	Malathion 85E (OP)	0.217 to 0.346 L	7	A or G	>550

ALWAYS CONSULT THE INSECTICIDE LABEL BEFORE APPLYING ANY INSECTICIDE.

[1] Insecticide Group: D=diamides, N= neonicotinoids, P=pyrethroids, C=carbamates, OP=organophosphates.

[2] LD_{50} values represent the relative toxicity of a pesticide. They represent the dose (in milligram per kilogram body weight) that will kill 50 percent of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD_{50}.

[3]DO NOT apply any subsequent applications of a group 28 insecticide (such as Coragen) for a minimum of 60 days after planting seed treated with Lumiderm.

[4] DO NOT apply any subsequent applications of a group 28 insecticide (such as Coragen) after planting seed treated with Fortenza.

Oats – See small grain cereals

Pastures and Rangelands Insect Management Chart

Note: Insects for biological control of weeds such as leafy spurge may be introduced and established in some pastures in Manitoba and Saskatchewan. If insect feeding to pastures gets to economic levels, consider using control strategies and insecticides that will minimize harm to these biological control agents where possible.

Insects	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Grasshoppers	**Reduced Agent and Area Treatments (RAATs):** Grasshoppers on rangelands may be managed by applying certain insecticides in treated swaths, which alternate with untreated swaths. This can reduce the cost of control and amount of insecticide used by more than 50 percent, while resulting in effective control.				
	Spreadable Bran Baits				
	Nolo Bait	Minimum of 0.45 kg		A or G	
	Eco bran (C)	0.8 to 1.6 kg	1 – entry of beef cattle or other livestock. 2- entry of dairy cattle.	G	N/A
	Sprays				
	Coragen Max/ Coragen (D)	17 to 34 mL 51 to 101 mL	0	G	>5000

Insects	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Grasshoppers, *continued*	Decis 100 EC/ Advantage Deltamethrin 5 EC/ Poleci (P)	20 to 30 mL (Decis 100 EC) 40 to 60 mL (Advantage Deltamethrin 5EC) 81 to 121 mL (Poleci)	N/A	A or G	>300 to 2000
	Sevin XLR (C)	486 to 931 mL (for nymphs or sparse vegetation 931 mL to 1.4 L (for adults or dense vegetation)	1 to 2 (see label)	G	699
	Malathion 85E (OP)	0.336 L	DO NOT apply to fields occupied by dairy animals, but may be grazed or harvested on the day of application.	G	>550
	Lagon/ Cygon 480-AG/ Diamante 4 (OP) (pastures)	223 mL (nymphs) 344 to 405 mL (adults)	2 days: 223 mL rate 7 to 28 days: 344 to 405 mL rates (see labels)	A or G	245 to 450
Armyworms	Coragen MaX/ Coragen (D)	34 to 51 mL 101 to 152 mL	0	G	>5000

ALWAYS CONSULT THE INSECTICIDE LABEL BEFORE APPLYING ANY INSECTICIDE.

[1] Insecticide Group: D=diamides, P=pyrethroids, C=carbamates, OP=organophosphates.

[2] LD_{50} values represent the relative toxicity of a pesticide. They represent the dose (in milligram per kilogram body weight) that will kill 50 percent of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD_{50}.

Field Scouting in Peas (Field Peas)

- Cutworm
  - ***Nominal Threshold:*** 2 to 3 cutworms per square metre.

Sap Feeders

- Aphids
  - **When and How to Monitor:** Look for when monitoring field peas at the beginning of flowering. Take 180° sweeps or check 10, 8 inch (20 cm) plant tips at each stop. Record total number of aphids and calculate average per sweep or plant tip.
  - **Economic Threshold:** If, at the beginning of flowering, there are 9 to 12 aphids per sweep or 2 to 3 aphids per 8 inch (20 cm) plant tip, an insecticide application when 50 percent of plants have produced some young pods will be cost-effective.

Peas (Field Peas) Insect Management Chart

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Belowground and Surface Feeders					
Wireworms	*Cruiser 5FS* (N)	17 to 50 mL/100 kg seed	May be applied on-farm or by commercial seed treaters.		
	Trilex EverGol Shield	A seed treatment containing *Stress Shield 600* and 3 fungicides.			
	Scorpio Ant and Insect Bait (suppression) (Sp)	10 to 20 kg	Incorporate into the soil at planting to a depth of 10 to 20 cm.		
Cutworms	*Lumivia CPL* (D)	32 to 64 mL/100 kg seed	Seed treatment		>5000
	Scorpio Ant and Insect Bait (black cutworm) (Sp)	10 to 20 kg	28	G	
	Coragen MaX/ Coragen (D)	33.5 mL 101 mL	1	A or G	>5000
	Matador/Silencer/Labamba/ Zivata (P)	34 mL	14 (Matador/*Labamba*) 21 (*Silencer/Zivata*) Do not cut treated fields for hay/forage. Do not graze treated fields.	A or G	56 to 98
	Decis 100 EC (P)	41 mL	7	A or G	633
	Pounce/Perm-UP/ IPCO Syncro (P) *Ambush* (P)	73 to 158 mL 57 to 121 mL	7	A or G (see labels)	789 to 1030
Sap and Fluid Feeders					
Leafhoppers	*Sivanto Prime* (B)	202 to 304 mL	7	A or G	>2000
	Malathion 85E (OP)	0.445 L	3	A or G	>550
Pea aphid	*Carbine* (F)	49 to 65 g	7	G	>2000
	Movento (TT)	75 to 111 mL	7	G	>2000
	Sivanto Prime (B)	202 to 304 mL	7	A or G	>2000
	Matador/Silencer/Labamba/ Zivata (P)	34 to 94 mL	14 (Matador/*Labamba*) 21 (*Silencer/Zivata*) Do not cut treated fields for hay/forage. Do not graze treated fields.	A or G	56 to 98
	Voliam Xpress (D+P)	91 to 223 mL	14. Do not feed treated crop to livestock	A or G	98
	Malathion 85E (OP)	0.445 L	3	A or G	>550
	Lagon/Diamante 4 (OP)	0.11 to 0.15 L	3 to 21 (see labels)	A or G	245 to 450
Defoliator					
Grasshoppers	*Coragen MaX/ Coragen* (D)	17 to 33.5 mL 51 to 101 mL	1	A or G	>5000
	Matador/Silencer/Labamba/ Zivata (P)	34 mL	14 (Matador/*Labamba*) 21 (*Silencer/Zivata*) Do not cut treated fields for hay/forage. Do not graze treated fields.	A or G	56 to 98
	Voliam Xpress (D+P)	91 mL	14. Do not feed treated crop to livestock	A or G	98
	Decis 100 EC (P)	20 to 30 mL	7	A or G	633

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Alfalfa looper	*Sevin XLR* (C)	1.90 L	3	G	699
Pea leaf weevil	*Lumivia CPL* (D)	64 to 96 mL/100 kg seed		Seed treatment	
	Cruiser 5FS (N)	50 or 83 mL/100 kg seed	On-farm application at the lower rate only.		
	Trilex EverGol Shield (N)	A seed treatment containing *Stress Shield 600* and 3 fungicides.			
	Matador/Silencer/Labamba/ Zivata (P)	34 mL	14 (Matador/*Labamba*) 21 (*Silencer/Zivata*) Do not cut treated fields for hay/forage. Do not graze treated fields.	A or G	56 to 98
	Voliam Xpress (D+P)	91 mL	14. Do not feed treated crop to livestock.	A or G	98
	Decis 100 EC (P) (suppression)	30 mL	7	A or G	633
Armyworm	*Lumivia CPL* (D)	32 to 64 mL/100 kg seed	Seed treatment		>5000
	Coragen MaX/ Coragen (D)	33.5 to 50.5 mL 101 to 152 mL	1	A or G	>5000
	Voliam Xpress (D+P)	202 mL	14. Do not feed treated crop to livestock	A or G	98

ALWAYS CONSULT THE INSECTICIDE LABEL BEFORE APPLYING ANY INSECTICIDE.

[1] Insecticide Group: F=flonicamid, D=diamides, N=neonicotinoids, P=pyrethroids, C=carbamates, OP=organophosphates, TT = tetronic and tetramic acid derivatives.

[2] LD_{50} values represent the relative toxicity of a pesticide. They represent the dose (in milligram per kilogram body weight) that will kill 50 percent of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD_{50}.

Scouting and Thresholds for Insects in Potatoes

- **Matador/Aphids**
  - ***Typical damage:*** Several species of aphids are sap feeders on potato leaves. At very high numbers this sap feeding may cause plants to wilt in small localized areas of the field as "aphid holes". The greatest injury is due to transmission of viruses. Identification and control of aphids is critical in potato seed production to prevent virus spread. In commercial production tuber quality may be reduced by net necrosis of tubers.
  - ***When and How to Monitor:*** Aphid identification and scouting should start in early July when aphids begin to be observed in fields. Sample 25 lower canopy leaves from each of 4 areas in the field (100 leaves in total). Count potato aphids and green peach aphids on each compound leaf, using a magnifying device to identify the species.
  - ***Economic threshold:*** For seed potatoes = 3 to 10 green peach aphids per 100 leaves. For processing potatoes = 30 to 100 green peach aphids per 100 leaves. There are no economic thresholds for buckthorn and potato aphids. These thresholds relate to transmission of potato leafroll virus and are not useful in determining infectivity relative to potato virus Y. No economic thresholds have been established for aphids that relate to potato virus Y transmission.
- **Leafhoppers**
  - ***Typical damage:*** the potato leafhopper injects a toxin into the plant which results in hopper burn, a yellowing and curling of the tips and margins of the leaflets, which ultimately turn brown and brittle. Damaged plants die prematurely and yield may be reduced.
  - ***When and How to Monitor:*** Nymphs are scouted by visual inspection; sample 100 plants from 3 to 5 areas of the field. Count the wingless nymphs on compound leaves taken from mid canopy. Adults are sampled with a sweep net (20 sweeps per location at 5 locations for a total of 100 sweeps).
  - ***Economic threshold:*** Nymphs – 1 nymph per 10 leaves. Adults – 1 leafhopper per sweep.
- **Colorado potato beetle**
  - ***Typical damage:*** Larvae feeding may cause extensive defoliation of leaves and is capable of transmitting spindle tuber virus and bacterial ring rot.
  - ***When and How to Monitor:*** Start scouting for larvae 2 weeks after crop emergence. On field edges, count number of beetles on 20 separate plants. Record per cent defoliation of leaves. Repeated scouting is required since beetles have developed resistance to many insecticides and 2 generations may occur during the year.

- ***Economic threshold:*** Economic threshold based on beetle numbers may vary by cost of treatment, expected returns and variety. Typical thresholds are 18 larvae per 20 plants for Russet Burbank vs 6 larvae per 20 plants for Norland. Treat when defoliation exceeds 10 percent.

- **Potato flea beetle**
  - ***Typical damage:*** Beetle feeding causes "shot holes" in the leaves. Two generations may attack the foliage.***When and How to Monitor:*** Estimate feeding damage on the leaf or numbers of beetles on plants.
  - ***Economic threshold:*** Early in the season treat if greater than 10 percent defoliation. Later in the season (August) treat if greater than 25 percent defoliation or with greater than 65 beetles per plant for Norland or 300 beetles per plant for Russet Burbank.

Potatoes* Insect Management Chart

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Belowground and Surface Feeders					
Wireworms	*Cimegra*	250 mL/ha in furrow	In-furrow application		>2000
	Titan (N)	20.8 mL/100 kg potato seed pieces	Seed treatment	Seed treatment	2000
	NipsIt INSIDE (N)	20.8 mL/100 kg potato seed pieces	Seed treatment	Seed treatment	3044
	Thimet 20-G (OP)	105 g/100 m in sandy or light soil 161 g/100 m in silt or heavy soils	DO NOT harvest potatoes before 90 days after planting time.	G	5.1 to 13.5
	Scorpio Ant and Insect Bait (suppression) (Sp)	10 to 20 kg	Incorporate into the soil at planting to a depth of 10 to 20 cm.		
Cutworms	*Scorpio Ant and Insect Bait* (black cutworm) (Sp)	10 to 20 kg	7	G	
	Pounce/Perm-UP/IPCO Syncro (P) *Ambush* (P)	73 to 158 mL 57 to 121 mL	1	A or G (see labels)	789 to 1030
	UP-Cyde /Ship (P)	115 mL	21	G	355
Sap or Fluid Feeders					
Aphids	**Seed Piece Treatments**				
	Actara 240SC (N)	See chart on label	N/A	Seed treatment	>5000
	Admire 240 F (N)	11.79 to 17.69 mL/ 100 pounds (45.36 kg) of potato seed tubers	N/A	Seed treatment	>4870
	Cruiser Maxx Potato Extreme (N)	20 mL/100 kg seed	NA	Seed treatment	3129
	Titan (N)	10.4 to 20.8 mL/100 kg potato seed pieces	N/A	Seed treatment	2000
	NipsIt INSIDE (N)	10.4 to 20.8 mL/100 kg potato seed pieces	Seed treatment	Seed treatment	3044
	In-Furrow Application				
	Minecto Duo (N, D)	178 to 283 g		G	>5000
	Actara 240SC (N)	0.15 to 0.20 L (based on 90 cm row spacing)		G	>5000
	Foliar Sprays				
	Beleaf 50SG (F)	49 to 65 g	7	G	>2000
	Sefina (PP)	81 mL	7	A or G	>2000
	Superior 70 Oil	4 L	14	G	>5000

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Aphids, *continued*	*Movento*	89 to 148 mL	7	A or G	>2000
	Exirel (D)	202 to 607 mL	7	A or G	>5000
	Vayego (D) (suppression)	61 mL	14	A or G	>2000
	Sivanto Prime (B)	202 to 304 mL	7	A or G	>2000
	Closer (S)	20 to 61 mL	7	A or G	>5000
	Cormoran (SB + N)	263 to 304 mL	7	G	>2000
	Actara 240SC (N)	44.1 mL	7	A or G	>5000
	Actara 25WG (N)	42.5 g	7	A or G	>5000
	Admire 240 F (N)	81 mL	7	G	4143 to 4870
	Assail/Aceta (N)	22.7 to 34.8 g	7	G	1064
	Clutch (N)	28 to 43 g	14	A or G	3900 to 4700
	Concept (N + P)	263 mL	7	G	2500
	Decis 100 EC (P) (potato aphid and buckthorn aphid)	51 mL	1	G	633
	Malathion 85E (OP)	0.297 to 0.445 L	3	G	>550
	Lagon/Cygon 480-AG/ Diamante 4 (OP)	0.22 to 0.41 L	7	G	245 to 450
	Imidan (OP)	0.65 kg	7	G	258 to 275
Potato psyllid	*Beleaf 50SG* (F)	81 g	7	G	>2000
	Agri-mek (A)	49 to 91 mL	14	G	310
	Minecto Pro (A + D)	150 to 271 mL	14	G	451
	Movento (TT)	89 to 148 mL	7	A or G	>2000
	Harvanta (suppression) (D)	324 to 486 mL	7	A or G	>2000
Leafhoppers	**Seed Piece Treatments**				
	Actara 240SC (N)	See chart on label	N/A	Seed treatment	>5000
	Cruiser Maxx Potato Extreme (N)	20 mL/100 kg seed	NA	Seed treatment	3129
	Titan (N)	10.4 to 20.8 mL/100 kg potato seed pieces	N/A	Seed treatment	2000
	NipsIt INSIDE (N)	10.4 to 20.8 mL/100 kg potato seed pieces	Seed treatment	Seed treatment	3044
	In-Furrow Application				
	Minecto Duo (N, D)	178 to 283 g		G	>5000
	Actara 240SC (N)	0.15 to 0.20 L (based on 90 cm row spacing)		G	>5000
	Foliar Sprays				
	Sivanto Prime (B)	202 to 304 mL	7	A or G	>2000
	Closer (S)	121 mL	7	A or G	>5000
	Cormoran (SB + N)	198 to 304 mL	7	G	>2000
	Actara 240SC (N)	44.1 mL	7	A or G	>5000
	Actara 25WG (N)	42.5 g	7	A or G	
	Clutch (N)	28 to 43 g	14	A or G	3900 to 4700
	Pounce/Perm-UP/IPCO Syncro (P)	73 to 105 mL	1	A or G	789 to 1030

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Leafhoppers *continued*	*Decis 100 EC/ Advantage Deltamethrin 5 EC/Poleci* (P)	20 to 30 mL (*Decis 100 EC*) 40 to 60 mL (*Advantage Delta..5EC*) 81 to 121 mL (*Poleci*)	1	A or G	>300 to 2000
	Matador/Silencer/Labamba/ Zivata (P)	34 mL	7	A or G	56 to 98
	UP-Cyde/Ship (P)	57 mL	7	A or G	355
	Concept (N + P)	263 mL	7	G	2500
	Sevin XLR (C)	1.01 L	7	G	699
	Malathion 85E (OP)	0.297 to 0.445 L	3	G	>550
	Lagon/Cygon 480-AG/ Diamante 4 (OP)	0.22 to 0.41 L	7	G	245 to 450
	Imidan (OP)	0.65 kg	7	G	258 to 275
Lygus bugs	*Closer* (S)	121 mL	7	A or G	>5000
	Pounce/Perm-UP/IPCO Syncro (P) *Ambush* (P)	73 to 105 mL 57 to 81 mL	1	A or G	789 to 1030
	Decis 100 EC/Advantage Deltamethrin 5 EC/ Poleci (P)	20 to 30 mL (*Decis 100 EC*) 40 to 60 mL (*Advantage Delta..5EC*) 81 to 121 mL (*Poleci*)	1	A or G	>300 to 2000
	Matador/Silencer/Labamba/ Zivata (P)	34 mL	7	A or G	56 to 98
	UP-Cyde/Ship (P)	81 mL	7	A or G	355
	Sevin XLR (C)	2.12 to 2.59 L	7	G	699
	Concept (N + P)	263 mL	7	G	2500
	Lagon (OP)	0.22 to 0.41 L	7	G	425
Defoliators					
Colorado potato beetle	Note: Colorado potato beetles have been found to be resistant to several families of insecticides in localized areas of Manitoba. Rotation between different families of insecticides is essential.				
	Seed Piece Treatments				
	Fortenza (D)	10 to 22.5 mL/ 100 kg seed	N/A	Seed treatment	>5000
	Actara 240SC (N)	See chart on label	N/A	Seed treatment	>5000
	Admire 240 F (N)	11.79 to 17.69 mL/ 100 pounds (45.36 kg) of potato seed tubers	N/A	Seed treatment	4143 to 4870
	Cruiser Maxx Potato Extreme (N)	20 mL/100 kg seed	NA	Seed treatment	3129
	Titan (N)	10.4 to 20.8 mL/100 kg potato seed pieces	N/A	Seed treatment	2000
	NipsIt INSIDE (N)	10.4 to 20.8 mL/100 kg potato seed pieces	Seed treatment	Seed treatment	3044
	In-Furrow Application				
	Verimark (D)	304 to 405 mL (based on 90 cm row spacing)	N/A	G	>5000
	Vayego (D)	6.75 mL/100 m of row		G	>2000

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Colorado potato beetle, *continued*	*Minecto Duo* (N, D)	178 to 283 g		G	>5000
	Actara 240SC (N)	0.15 to 0.20 L (based on 90 cm row spacing)		G	>5000
	Clutch (N)	108 to 181 g (based on 90 cm row spacing)	14	G	3900 to 4700
	Foliar Sprays				
	BioTitan WP	809 to 3,238 g	0	G	
	Rimon (SB)	0.17 to 0.33 L	14	G	3914 to >5000
	Entrust (Sp)	68 to 135 mL	7	G	>5000
	Success (Sp)	34 to 67 mL	7	G	>5000
	Delegate (Sp)	65 to 97 g	7	A or G	>5000
	Coragen MaX/ Coragen (D)	33.5 to 67.5 mL 101 to 202 mL	1	A or G	>5000
	Exirel (D)	304 to 405 mL	7	A or G	>5000
	Harvanta (D)	324 to 486 mL	7	A or G	>2000
	Vayego (D)	61 mL	14	A or G	>2000
	Sivanto Prime (B)	304 to 405 mL	7	A or G	>2000
	Agri-mek (A)	49 to 91 mL	14	G	310
	Minecto Pro (A + D)	225 to 271 mL	14	G	451
	Cormoran (SB + N)	178 to 283 mL	7	G	>2000
	Actara 240SC (N)	44.1 mL	7	A or G	>5000
	Actara 25WG (N)	42.5 g	7	A or G	>5000
	Admire (N)	81 mL	7	G	4143 to 4870
	Assail/Aceta (N)	16.2 to 32.4 g	7	G	1064
	Clutch (N)	28 to 43 g	14	A or G	3900 to 4700
	Pounce/Perm-UP/IPCO Syncro (P) *Ambush* (P)	73 to 105 mL 57 to 81 mL	1	A or G	789 to 1030
	Decis 100 EC/Advantage Deltamethrin 5 EC/ Poleci (P)	20 to 30 mL (*Decis 100 EC*) 40 to 60 mL (*Advantage Delta..5EC*) 81 to 121 mL (*Poleci*)	1	A or G	>300 to 2000
	Matador/Silencer/Labamba/ Zivata (P)	34 to 50 mL (ground) 34 mL (air)	7	A or G	56 to 98
	Up-Cyde/Ship (P)	57 mL	7	A or G	355
	Concept (N + P)	263 mL	7	G	2500
	Cimegra	51 to 76 mL	14	G	>2000
	Sevin XLR (C)	0.51 L	7	G	699
	Imidan (OP)	0.65 kg	7	G	258 to 275

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Potato flea beetle	**Seed Piece Treatments**				
	Admire 240 F (N)	11.79 to 17.69 mL/ 100 pounds (45.36 kg) of potato seed tubers	N/A	Seed treatment	4143 to 4870
	Titan (N)	10.4 to 20.8 mL/100 kg potato seed pieces			2000
	NipsIt INSIDE (N)	10.4 to 20.8 mL/100 kg potato seed pieces	Seed treatment	Seed treatment	3044
	In-Furrow Application				
	Verimark (D)	In-furrow application: 304 to 405 mL (based on 90 cm row spacing)	N/A	In-furrow application	>5000
	Vayego (D)	6.75 mL/100 m of row		G	>2000
	Foliar Sprays				
	Exirel (D)	202 to 405 mL	7	A or G	>5000
	Vayego (D)	61 mL	14	A or G	>2000
	Minecto Pro (A + D)	150 to 271 mL	14	G	451
	Minecto Duo (N + D)	178 to 283 g		G	>5000
	Pounce/Perm-UP/IPCO Syncro (P) *Ambush* (P)	73 to 105 mL 57 to 81 mL	1	A or G	789 to 1030
	Decis 100 EC/Advantage Deltamethrin 5 EC/ Poleci (P)	20 to 30 mL (*Decis 100 EC*) 40 to 60 mL (*Advantage Delta..5EC*) 81 to 121 mL (*Poleci*)	1	A or G	>300 to 2000
	Matador/ Silencer/Labamba/ Zivata (P)	34 mL	7	A or G	56 to 98
	UP-Cyde/Ship (P)	57 mL	7	A or G	355
	Concept (N + P)	263 mL	7	G	2500
	Sevin XLR (C)	1.01 L	7	G	699
	Imidan (OP)	0.65 kg	7	G	258 to 275
Variegated cutworm	*Coragen MaX/ Coragen* (D)	33.5 to 50.5 mL 101 to 152 mL	1	A or G	>5000
	Exirel (D)	202 to 304 mL	7	A or G	>5000
	Minecto Pro (A + D)	150 to 225 mL	14	G	451
	Pounce/Perm-UP/IPCO Syncro (P) *Ambush* (P)	73 mL 57 mL	1	G	789 to 1030
	UP-Cyde/Ship (P)	115 mL	7	G	355
	Voliam Xpress (D+P)	202 mL	7. Do not feed treated crop to livestock	A or G	98
	Sevin XLR (C)	45 mL/100 m of row	7	G	699

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Armyworm	*Coragen MaX/ Coragen* (D)	33.5 to 50.5 mL 101 to 152 mL	1	A or G	>5000
	Exirel (D)	202 mL	7	A or G	>5000
	Minecto Pro (A + D)	150 mL	14	G	451
	Cormoran (SB + N)	178 to 304 mL	7	G	>2000
	Matador/Silencer/Labamba/ Zivata (P)	34 mL	7	A or G	56 to 98
Grasshoppers	*Coragen MaX*	17 to 34 mL	1	A or G	>5000
Stem Borers					
European corn borer	*Rimon* (SB)	0.17 to 0.33 L	14	G	3914 to >5000
	Entrust (Sp)	101 mL	7	G	>5000
	Success (Sp)	51 mL	7	G	>5000
	Delegate (Sp)	65 g	7	A or G	>5000
	Coragen MaX/ Coragen (D)	33.5 to 50.5 mL 101 to 152 mL	1	A or G	>5000
	Exirel (D)	202 to 304 mL	7	A or G	>5000
	Vayego (D)	61 mL	14	A or G	>2000
	Minecto Pro (A + D)	150 to 225 mL	14	G	451
	Cormoran (SB + N)	263 to 304 mL	7	G	>2000
	Matador/Silencer/Labamba/ Zivata (P)	34 mL	7	A or G	56 to 98
	Decis 100 EC (P)	30 to 51 mL	1	G	633
	Pounce/Perm-UP/IPCO Syncro (P) *Ambush* (P)	73 mL 57 mL	1	A or G	789 to 1030
	Concept (N + P)	263 mL	7	G	2500
	Sevin XLR (C)	1.01 to 2.12 L	7	G	699

*Before using any pesticide on potatoes, consult the list of **Agricultural Pesticides Approved for Use**, available from Simplot Canada and McCain Foods (Canada).

ALWAYS CONSULT THE INSECTICIDE LABEL BEFORE APPLYING ANY INSECTICIDE.

[1] Insecticide Group: A = Avermectins, F=flonicamid, SB=substituted benzoylurea, Sp=spinosyns, D=diamides, S=sulfoxamines, B=butenolides, N=neonicotinoids, P=pyrethroids, PP=pyropenes, C=carbamates, OP=organophosphates, PAD= Pyridine azomethine derivatives

[2] LD_{50} values represent the relative toxicity of a pesticide. They represent the dose (in milligram per kilogram body weight) that will kill 50 percent of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD_{50}.

Quinoa Insect Management Chart

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Sap or Fluid Feeders					
Lygus bugs	*Closer* (S)	81 mL	14	G	>5000
Stem borers					
European corn borer	*Dipel* (M)	227 to 453 g	N/A	A or G	>5000
	Bioprotec CAF (M)	1.13 to 1.62 L	0	G	N/A
Beet webworm	*Bioprotec CAF* (M)	0.57 to 1.13 L	0	G	N/A

ALWAYS CONSULT THE INSECTICIDE LABEL BEFORE APPLYING ANY INSECTICIDE.

[1] Insecticide Group: M=microbial, S=sulfoxamines

[2] LD_{50} values represent the relative toxicity of a pesticide. They represent the dose (in milligram per kilogram body weight) that will kill 50 percent of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD_{50}.

Grasshopper Management on **Roadsides, Headlands and Summerfallow**.

Note: Insects for biological control of weeds such as leafy spurge may be introduced and established in some areas of Manitoba and Saskatchewan. If grasshopper numbers become high, consider using control strategies and insecticides that will minimize harm to these biological control agents.

Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Spreadable Bran Baits				
Eco bran (roadsides, headlands, field borders, right-of-way, wastelands) (C)	0.8 to 1.6 kg	0	G	N/A
Sprays				
Decis 100 EC/ Advantage Deltamethrin 5 EC/ Poleci (P) (roadside)	20 to 30 mL (Decis 100 EC) 40 to 60 mL (Advantage Deltamethrin 5 EC) 81 to 121 mL (Poleci)	N/A	G	>300 to 2000
UP-Cyde/ Ship (P) (roadsides, headlands, and summerfallow) (young grasshoppers only)	33 to 46 mL		G	355
Matador/Labamba (P) (summerfallow) (young grasshoppers only)	25 to 34 mL (ground) 34 mL (air)	Treated areas must not be grazed or cut for hay or forage.	A or G	56 to 93
Sevin XLR (C) (headlands, ditchbanks, field borders, rights-of-way)	486 to 931 mL (for nymphs or sparse vegetation 931 mL to 1.4 L (for adults or dense vegetation)	0	G	699
Lagon/ Cygon 480-AG/ Diamante 4 (OP) (wastelands)	223 mL (nymphs) 344 to 405 mL (adults)	2 days: 223 mL rate 7 to 28 days: 344 to 405 mL rates (see labels)	A or G	245 to 450

ALWAYS CONSULT THE INSECTICIDE LABEL BEFORE APPLYING ANY INSECTICIDE.

[1] Insecticide Group: P=pyrethroids, C=carbamates, OP=organophosphates.

[2] LD_{50} values represent the relative toxicity of a pesticide. They represent the dose (in milligram per kilogram body weight) that will kill 50 percent of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD_{50}

Field Scouting in Rye

Information on typical damage, when and how to monitor, and economic thresholds for cutworm, aphids and armyworm in rye can be found in the section on field scouting in small grain cereals (wheat, barley, oats).

Rye Insect Management Chart

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Belowground and Surface Feeders					
Wireworms	*Teraxxa F4*	300 mL/100 kg seed	Seed treatment		>2000
	Lumivia CPL (D)	24 to 40 mL/100 kg seed	Seed treatment		>5000
	Cruiser Vibrance Quattro (N)	325 mL/100 kg seed		Seed treatment	>5000
	Cruiser 5FS (N)	17 to 50 mL/100 kg seed	May be applied on-farm or by commercial seed treaters.		
Cutworms	*Lumivia CPL* (D)	8 to 24 mL/100 kg seed	Seed treatment		>5000
	Coragen MaX/ Coragen (D)	33.5 mL 101 mL	1	A or G	>5000
	Pounce/Perm-UP/ IPCO syncro (P)	73 to 158 mL	7	A or G (see labels)	789 to 1030
Sap Feeders					
Aphids	*Malathion 85E* (OP)	0.445 to 0.544 L	7	A or G	>550
Defoliators					
Grasshoppers	**Spreadable Bran Baits**				
	Nolo Bait	Minimum of 0.45 kg		A or G	
	Sprays				
	Coragen MaX/ Coragen (D)	17 to 33.5 mL 51 to 101 mL	1	A or G	>5000
	Malathion 85E (OP)	0.445 to 0.544 L	7	A or G	>550
	Lagon 480 E (OP)	0.22 L (nymphs) 0.34 to 0.41 L (adults)	35	A or G	60
Armyworm	*Lumivia CPL* (D)	8 to 24 mL/100 kg seed	Seed treatment		>5000
	Coragen MaX/ Coragen (D)	33.5 to 50.5 mL 101 to 152 mL	1	A or G	>5000
	Delegate (Sp)	40 to 81 g	21	G	>5000
	Matador/Labamba (P)	34 mL	28 days. Do not cut treated fields for hay/ forage. Do not graze treated fields.	A or G	56-93
	Malathion 85E (OP)	0.445 to 0.544 L	7	A or G	>550

ALWAYS CONSULT THE INSECTICIDE LABEL BEFORE APPLYING ANY INSECTICIDE.

[1] Insecticide Group: N=neonicotinoids, P=pyrethroids, C=carbamates, OP=organophosphates, Sp=spinosyns

[2] LD_{50} values represent the relative toxicity of a pesticide. They represent the dose (in milligram per kilogram body weight) that will kill 50 percent of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD_{50}.

Safflower Insect Management Chart

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Belowground and Surface Feeders					
Cutworms	*Coragen MaX/ Coragen* (D)	33.5 mL 101 mL	1	A or G	>5000
Defoliators					
Grasshoppers	*Coragen MaX/ Coragen* (D)	17 to 33.5 mL 51 to 101 mL	1	A or G	>5000
	Lagon 480 E/Cygon 480-AG (OP)	0.22 to 0.40 L	21	A or G	425 to 450

ALWAYS CONSULT THE INSECTICIDE LABEL BEFORE APPLYING ANY INSECTICIDE.

[1] Insecticide Group: D=diamides, OP=organophosphates.

[2] LD_{50} values represent the relative toxicity of a pesticide. They represent the dose (in milligram per kilogram body weight) that will kill 50 percent of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD_{50}.

Field Scouting in Small Grain Cereals (wheat, barley, oats)

Belowground and Surface Feeders

- **Cutworm**
  - ***Typical Damage:*** Notched, wilted, dead, or cut-off plants. Plants missing from rows, bare patches appearing in field.
  - ***When and How to Monitor:*** Look for cutworm, and evidence of cutworm feeding, when monitoring in late May to mid-July. Often cutworms will be close to the cut or shriveled plants they have just damaged. Cutworm will sometimes be most abundant in patches or a specific area of a field. In areas of the field where cutworm damage is noticeable, check around damaged plants in a 0.25 square metre (50 cm x 50 cm) area. Use trowel or shovel to carefully search through top half to 1 inch of soil for cutworm larvae. Multiply the number of cutworms found by 4 to get the number per square metre. Repeat in several locations to get an accurate assessment of what the cutworm levels are.
  - ***Economic Threshold:*** Pale western cutworm – 3 to 4 per square metre; Redbacked and army cutworm – 5 to 6 per square metre. Well established fall-seeded crops or spring seeded crops with good moisture conditions can tolerate higher numbers. Sometimes it is most economical to just treat infested patches, and not whole fields.

Sap Feeders

- **Aphids**
  - ***Typical Damage:*** Visible wilting of plants, yellow patches in fields, plants are sticky.
  - ***When and How to Monitor:*** Look for aphids when monitoring prior to the soft dough stage. While monitoring the field, using a sweep net or tapping plants over a white tray or bucket can alert you to the presence and relative abundance of aphids. If aphid levels appear concerning, a more thorough examination is needed. Count aphids on 20 randomly selected stems in each of 5 areas. Counts should be at least 50 paces apart, and observations should be made well into the center of the field. Too frequently farmers become alarmed after checking a few plants along the margins, especially near shelterbelts, where populations are high. Record the total number of aphids and calculate the average per plant.
  - ***Economic Threshold:*** 12 to 15 aphids per stem prior to the soft dough stage.
    - ***Cereal Aphid Manager*** is a mobile app that helps growers determine aphid populations by predicting what the aphid population will be in 7 days along with beneficial insect pressure on the population and suggests if insecticide application is necessary. **https://open.canada.ca/en/app/cereal-aphid-manager-mobile-app**
- **Barley Thrips**
  - ***When and How to Monitor:*** Sampling should begin when the flag leaf is first visible and continue until the head is completely emerged from the boot. Barley thrips exhibit an edge effect; there are usually more thrips near protected field margins than other areas of the field. Most thrips can be found under the top 2 leaf sheaths. Unroll the leaf sheaths away from the stem to find the thrips.
  - ***Economic Threshold:*** Insecticide treatments are only effective when applied before heading is complete. Treat when thrips are equal to or greater than the number calculated by: Threshold (Thrips per stem) = (Cost of Control ÷ expected $ value per bushel)/0.4

Defoliators

- **Grasshoppers**
  - ***Typical Damage:*** Black strips along margins of newly emerging crops, head clipping later in season.
  - ***When and How to Monitor:*** Look for grasshoppers when monitoring fields from late – May through to harvest. Check along edges of crop, particularly areas adjacent to hayland, pastures and roadsides. Estimate number of hoppers per square yard (m^2).
  - ***Economic Threshold:*** 8 to 13 grasshoppers per square metre. Early in the season, when grasshoppers are small, 18 grasshoppers per square metre and visible crop damage may be a more appropriate threshold.
    - A rough estimate for an economic threshold for grasshoppers in crops to be used as greenfeed has been suggested at 20 grasshoppers per square metre or higher.

- **Armyworm**
  - ***Typical Damage:*** Leaves stripped from plants, awns chewed from heads, heads clipped.
  - ***When and How to Monitor:*** Check the soil surface for armyworm, and the plants for feeding, when monitoring in mid- June through early-August. At each stop shake plants and carefully check soil surface for dislodged larvae. During the day larvae may be under plant trash, soil clods or in soil cracks. Check the backs of armyworms for parasite eggs.
  - ***Economic Threshold:*** Four unparasitized larvae, smaller than 2.5 cm (1 inch) per square foot. If heads are being clipped, treat when two or more armyworms per square foot are present. For migrating armyworms: treat a couple of swaths ahead of the infestation in the direction of movement to form a barrier strip.

Seed Feeders Only

- **Wheat Midge (wheat only)**
  - When and How to Monitor: Monitor wheat in July when crop emerges from boot stage until flowering. Check crop canopy at dusk for signs of wheat midge adult activity. At each stop, examine 10 heads. Record the number of midge adults observed on or near heads. Calculate average number of midge per head.
    - Sticky traps may be used to capture adult midge activity in wheat fields.
  - ***Economic Threshold:*** *For yield only:* 1 adult midge per 4 to 5 heads. At this level of infestation, wheat yields will be reduced by approximately 15 percent if the midge is not controlled. *To maintain optimum grade:* 1 adult midge per 8 to 10 wheat heads during the susceptible stage.

Small Grain Cereals (wheat, barley, oats) Insect Management Chart

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Belowground and Surface Feeders					
Wireworms	*Teraxxa F4*	300 mL/100 kg seed	Seed treatment		>2000
	Lumivia CPL (D)[3]	24 to 40 mL/100 kg seed	Seed treatment		>5000
	Fortenza (D)[4]	17 to 50 mL/100 kg of seed	Seed treatment		
	Cruiser Vibrance Quattro (N)	325 mL/100 kg seed		Seed treatment	>5000
	Cruiser 5FS (N) (wheat and barley only)	17 to 50 mL/100 kg seed	May be applied on-farm or by commercial seed treaters.		
	NipsIt SUITE Cereals (N) (wheat only)	326 mL/100 kg seed	Seed treatment	Seed treatment	>5000
	NipsIt INSIDE (N)	17 to 100 mL/100 kg seed	Seed treatment	Seed treatment	3044
	Sombrero 600 FS (N)	17 to 50 mL/100 kg seed	Seed treatment	Seed treatment	500 to 825
	Raxil PRO Shield (N)	A co-pack of *Raxil PRO* and *StressShield 600*.			
Cutworms	*Lumivia CPL* (D)[3]	8 to 24 mL/100 kg seed	Seed treatment		>5000
	Coragen MaX/ Coragen (D)	33.5 mL 101 mL	1	A or G	>5000
	Decis 100 EC/Advantage Deltamethrin 5 EC/ Poleci (P)	40 mL (*Decis 100 EC*) 81 mL (*Advantage Delta..5EC*) 162 mL (*Poleci*)	31 (oats) 40 (barley, wheat)	A or G	>300 to 2000
	UP-Cyde/Ship (P) (barley and wheat only)	115 mL	21	G	355
	Pounce/Perm-UP/ IPCO Syncro (P)	73 to 158 mL	7	A or G (see labels)	789 to 1030
Sap and Fluid Feeders					
Aphids	*Malathion 85E* (OP)	0.445 to 0.544 L	7	A or G	>550
	Cygon 480-AG/ Diamante 4 (OP)	0.17 L	35	A or G	245 to 450
Thrips	*Lagon 480 E/Cygon 480-AG/ Diamante 4* (OP)	0.40 L	35	A or G	245 to 450

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Defoliators					
Grasshoppers	**Spreadable Bran Baits**				
	Nolo Bait	Minimum of 0.45 kg		A or G	
	Sprays				
	Coragen MaX/ Coragen (D)	17 to 33.5 mL 51 to 101 mL	1	A or G	>5000
	Decis 100 EC/Advantage Deltamethrin 5 EC/ Poleci (P)	20 to 30 mL (*Decis 100 EC*) 40 to 60 mL (*Advantage Delta..5EC*) 81 to 121 mL (*Poleci*)	31 (oats) 40 (wheat, barley)	A or G	>300 to 2000
	UP-Cyde/Ship (P) (young grasshoppers only) (wheat and barley only)	33 to 46 mL	30 (wheat) 45 (barley)	G	355
	Matador/Silencer/Labamba/ Zivata (P) (young grasshoppers only)	25 to 34 mL (ground) 34 mL (air)	28 days. Do not cut treated fields for hay/ forage. Do not graze treated fields.	A or G	56 to 98
	Malathion 85E (OP)	0.445 to 0.544 L	7	A or G	>550
	Lagon 480 E (OP)	nymphs: 0.22 L adults: 0.34 to 0.40 L	35	A or G	425 to 450
Cereal leaf beetle	A parasitoid of cereal leaf beetle, *Tetrastichus julis*, has been released and established in many areas.				
	Malathion 85E (OP)	0.435 L	7	A or G	>550
Armyworm	*Lumivia CPL* (D)[3]	8 to 24 mL/100 kg seed	Seed treatment		>5000
	Coragen MaX/ Coragen (D)	33.5 to 50.5 mL 101 to 152 mL	1	A or G	>5000
	Delegate (Sp)	40 to 81 g	21	G	>5000
	Matador/Silencer/Labamba/ Zivata (P)	34 mL	28 days. Do not cut treated fields for hay/ forage. Do not graze treated fields.	A or G	56 to 98
	Malathion 85E (OP)	0.445 to 0.544 L	7	A or G	>550
Slugs	*Sluggo Professional*	10 to 20 kg		G	>5000
Pests of Seed Only					
Wheat midge (a pest of wheat only)	**Rotate Crops** – Continuous wheat cropping encourages higher wheat midge populations.				
	Resistant Varieties – there are many varieties of wheat resistant to feeding by wheat midge. For an updated list of varieties and information on them see: **https://www.midgetolerantwheat.ca/farmers/**				
	Biological Control - A parasitoid, *Macroglenes penetrans*, was found to control an average of 32 percent of the wheat midge in Saskatchewan.				
	Lagon 480 E/Cygon 480-AG/ Diamante 4 (OP)	0.40 L	35	A or G	245 to 450
Stem-Borers					
Hessian fly	• Never plant wheat in the same field 2 years in a row in areas where Hessian flies are a problem. • The spring wheat cultivar *Superb* is partially resistant to the Hessian fly. • Early seeded spring wheat (prior to June) is less susceptible to stem breakage caused by Hessian fly than later seeded wheat. • Winter wheat planted in September will likely be free of Hessian flies.				

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Wheat stem maggot	Crop rotation and stubble cultivation may reduce populations.				
Wheat stem sawfly	• Solid-stem wheat varieties can reduce damage by wheat stem sawfly larvae compared to susceptible varieties, however the level of control can vary depending on environmental conditions. • The parasitoid *Bracon cephi* can reduce population of wheat stem sawfly in localized areas. Parasitoids of wheat stem sawfly can be conserved by increasing stubble height at harvest. • Early swathing can reduce losses.				

ALWAYS CONSULT THE INSECTICIDE LABEL BEFORE APPLYING ANY INSECTICIDE.

[1] Insecticide Group: Sp=spinosyns, D=diamides, N= neonicotinoids, P=pyrethroids, C=carbamates, OP=organophosphates.

[2] LD_{50} values represent the relative toxicity of a pesticide. They represent the dose (in milligram per kilogram body weight) that will kill 50 percent of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD_{50}.

[3] DO NOT make a subsequent foliar application of any group 28 insecticide (such as Coragen) for a minimum of 60 days after planting seed treated with Lumivia CPL.

[4] DO NOT make any subsequent applications of a group 28 insecticide (such as Coragen) following Fortenza seed treatment.

Scouting for insects in Soybeans

- **Cutworm**
  - A nominal threshold that may be used for cutworm in soybeans is 1 or more larvae per 3 feet of row and larvae are small (less than 2 cm), or 20 percent of plants cut.
- **Soybean Aphid**
  - ***Typical Damage:*** Soybean aphids suck sap from soybean plants. Infested leaves may wilt or curl when infestations are large. Other symptoms may include plant stunting, reduced pod and seed count, and yellowing of leaves.
  - ***When and How to Monitor:*** Check 30 plants (6 plants in 5 areas) per field. Examine the entire plant and estimate populations of soybean aphids (counting exact numbers will not be possible or practical with higher populations). Once soybean aphid numbers reach 250 aphids per plant, scout the field frequently to determine if soybean aphid numbers are increasing. A population can stay at 250 to 300 aphids per plant and not cause economical yield loss. If the levels are not rising above 250 to 300 per plant, there is a good indication that field conditions are favouring natural enemies (such as beneficial insects and fungi) that are helping control the aphids. An app called Aphid Advisor can be used to integrate common natural enemies of soybean aphids into the management decision (**http://www.aphidapp.com/**).
  - ***Economic Threshold:*** When there are on average at least 250 aphids per plant and the population is increasing, and the plants are in the R1 (beginning bloom) to R5 (beginning seed) growth stages, treatment would be economical. This threshold gives an approximate 7 day lead time before aphid populations are expected to exceed the economic injury level (670 aphids per plant), where cost of control is equal to yield loss. When soybean aphid populations are not actively increasing above 250 aphids per plant, natural enemies are keeping up with the aphid population. DO NOT use an insecticide in this case, as it will kill the natural enemies which may enable the aphid population to increase above the economic injury level.
  - with the aphid population. DO NOT use an insecticide in this case, as it will kill the natural enemies which may enable the aphid population to increase above the economic injury level.

Soybean Insect Management Chart

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Belowground and Surface Feeders					
Wireworms	*Lumiderm* (D)[3]	0.0375 to 0.125 mg ai/seed			
	Fortenza (D)[4]	83 mL/100 kg seed			
	Cruiser 5FS (N)	83 mL/100 kg seed	May only be applied by commercial seed treaters.		
	Sombrero 600 FS (N)	Apply 104 to 208 mL/100 kg seed			
	Scorpio Ant and Insect Bait (suppression) (Sp)	10 to 20 kg	Incorporate into the soil at planting to a depth of 10 to 20 cm.		

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Seedcorn maggot	*Lumiderm* (D)[3]	0.0375 to 0.125 mg ai/seed			
	Fortenza (D)[4]	41.5 to 83 mL/100 kg seed			
	Cruiser 5FS (N)	50 to 83 mL/ 100 kg seed	May only be applied by commercial seed treaters.		
	Sombrero 600 FS (N)	Apply 104 to 208 mL/100 kg seed			
Cutworms	*Lumiderm* (D)[3]	0.0375 to 0.075 mg ai/seed			
	Fortenza (D)[4]	41.5 to 83 mL/100 kg seed			
	Scorpio Ant and Insect Bait (black cutworm) (Sp)	10 to 20 kg	28	G	
	Coragen MaX/ Coragen (D)	33.5 mL 101 mL	1	A or G	>5000
	Vayego (D)	61 mL	14	G	>2000
	Matador/Silencer/Labamba/Zivata (P)	34 mL	21. Do not feed treated crops to livestock	A or G	56 to 98
Sap or Fluid Feeders					
Soybean aphid	*Sefina* (PP)	81 mL	7	A or G	>2000
	Movento (TT)	75 to 111 mL	21	A or G	>2000
	Sivanto Prime (B)	202 to 304 mL	21	A or G	>2000
	Matador/Silencer/Labamba/Zivata (P)	34 to 94 mL	21. Do not cut treated fields for hay/forage. Do not graze treated fields.	A or G	56 to 98
	Voliam Xpress (D+P)	91 to 223 mL	21. Do not feed treated crop to livestock.	A or G	98
	Concept (N + P)	132 to 263 mL	20	G	2500
	Lagon 480 E/Cygon 480-AG (OP)	0.28 to 0.40 L	30	A or G (*Lagon 480 E*) G only (*Cygon 480-AG*)	425 to 450
Leafhoppers	*Sivanto Prime* (B)	202 to 304 mL	21	A or G	>2000
	Voliam Xpress (D+P)	91 mL	21. Do not feed treated crop to livestock	A or G	98
	Lagon 480 E/Cygon 480-AG (OP)	0.28 to 0.40 L	30	A or G (*Lagon 480 E*) G only (*Cygon 480-AG*)	425 to 450
Lygus bugs	*Matador/Silencer/Labamba/Zivata* (P)	34 mL	21. Do not cut treated fields for hay/forage. Do not graze treated fields.	A or G	56 to 98
	Voliam Xpress (D+P)	91 mL	21. Do not feed treated crop to livestock.	A or G	98
	Lagon 480 E/Cygon 480-AG (OP)	0.28 to 0.40 L	30	A or G (*Lagon 480 E*) G only (*Cygon 480-AG*)	425 to 450

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Spider mites	*Lagon 480 E/Cygon 480-AG/ Diamante 4* (OP)	0.40 L	30	A or G (*Lagon 480 E*) G only (*Cygon 480-AG, Diamante 4*)	245 to 450
		Defoliators			
Armyworm	*Coragen MaX/ Coragen* (D)	33.5 to 50.5 mL 101 to 152 mL	1	A or G	>5000
	Vayego (D)	61 mL	14	G	>2000
	Delegate (Sp)	40 to 81 g	28	G	>5000
	Voliam Xpress (D+P)	202 mL	21. Do not feed treated crop to livestock.	A or G	98
Corn earworm	*Coragen MaX/ Coragen* (D)	33.5 to 50.5 mL 101 to 152 mL	1	A or G	>5000
	Voliam Xpress (D+P)	202 mL	21. Do not feed treated crop to livestock.	A or G	98
Grasshoppers	*Coragen MaX/ Coragen* (D)	17 to 33.5 mL 51 to 101 mL	1	A or G	>5000
	Matador/Silencer/Labamba/Zivata (P)	34 mL	21. Do not cut treated fields for hay/forage. Do not graze treated fields.	A or G	56 to 98
	Voliam Xpress (D+P)	91mL	21. Do not feed treated crop to livestock.	A or G	98

ALWAYS CONSULT THE INSECTICIDE LABEL BEFORE APPLYING ANY INSECTICIDE.

[1] Insecticide Group: D=diamides, Sp=spinosyns, N= neonicotinoids, P=pyrethroids, PP=pyropenes, OP=organophosphates, TT = tetronic and tetramic acid derivatives.

[2] LD_{50} values represent the relative toxicity of a pesticide. They represent the dose (in milligram per kilogram body weight) that will kill 50 percent of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD_{50}.

[3] DO NOT make a subsequent foliar application of any group 28 insecticide (such as Coragen) for a minimum of 60 days after planting seed treated with Lumiderm.

[4]DO NOT make any subsequent applications of a group 28 insecticide (such as Coragen) following Fortenza seed treatment.

Stored Grain Insect Control-

See Insect Control in Stored Grain; after Insect Management Charts.

Summerfallow-

See grasshopper management on Pastures, etc.

Scouting for insects in Sunflowers

Belowground and Surface Feeders

- **Cutworm**
  - ***Typical Damage:*** Notched, wilted, dead, and cut-off plants (weed or crop seedlings). Plants missing from rows, bare patches appearing in field.
  - ***When and How to Monitor:*** Look for cutworm, and evidence of cutworm feeding, when monitoring sunflowers in late May to mid-July. Often cutworms will be close to the cut or shriveled plants that they have just damaged. Cutworm will sometimes be most abundant in patches or a specific area of a field. In areas of a field where cutworm damage is noticeable, check around damaged plants in a 0.25 square metre (50 cm x 50 cm) area. Use trowel or shovel to carefully search through top half to 1 inch of soil for cutworm larvae. Multiply the number of cutworms found by 4 to get the number per square metre. Repeat in several locations to get an accurate assessment of what the cutworm levels are.
  - ***Nominal Threshold:*** 1 cutworm or more per square foot (30 by 30 cm) or if there is a 25 to 30 percent stand reduction. Sometimes it is most economical to just treat infested patches, and not whole fields.

Defoliators

- **Sunflower Beetle**
  - ***Typical Damage:*** Adults: Leaves of seedling plants chewed or completely destroyed late May through June, shot-holes or large areas of leaves chewed July through August. Larvae: Leaves of plants chewed or completely destroyed.
  - ***When and How to Monitor:*** Adults: Look for when monitoring sunflower seedlings in May through June. Examine 10 plants at random at each stop. Larvae: Look for when monitoring sunflowers in July through mid-August. Examine 10 plants at random at each sampling site. Peel back leaves around growing tip and record total number of larvae found. Calculate average number per plant.
  - ***Economic Threshold:*** Adults: 1 to 2 per seedling; Larvae: 10 to 15 per plant or 25 to 30 percent defoliation.

Insects affecting the seeds

Pests of Seed Only

- **Red Sunflower Seed Weevil**
  - ***Typical Damage:*** Seeds partly or completely destroyed, exit hole in hull. Shriveled kernels, kernels completely destroyed.
  - ***When and How to Monitor:*** Monitor fields when ray petals being to form and continue every 2 to 3 days until pollination is complete. When scouting, use the X pattern and begin counts at least 70 to 100 feet into the field to avoid margin effects. Examine 5 plants at each site for a total of 25 plants. For checking individual sunflower heads, brush the face of the head vigorously to bring the weevils to the surface, or use a commercial preparation of mosquito repellent containing diethyl toluamide (DEET) to spray the heads. This will cause the weevils to move out of hiding spots. Record total number of weevils and calculate average per head.
  - ***Economic Threshold:***
    - Confection Sunflowers: 1 to 2 weevils per plant. Control is based on a need to keep seed damage below 3 or 4 percent because of industry standards.
    - Oilseed sunflowers: 12 to 14 weevils per head.
    - The ideal plant stage to treat is when most plants in the field are at 40 percent pollen shed (R5.4).
- **Banded Sunflower Moth**
  - ***When and How to Monitor:*** Look for banded sunflower moth adults when monitoring fields in the late bud (R-4) to early bloom (R5.1) plant growth stage. Count moths on 20 plants from 5 different sites for a total of 100 plants. Sampling in early evening or early morning when the moths are most active gives the most accurate counts.
    - Sampling strategies based on scouting for adult moths during daylight hours, and counting eggs, have also been developed.
  - ***Economic Threshold:*** 1 moth per 2 plants when monitoring in the early evening or early morning.
    - If monitoring for eggs or adult moths during daylight hours, tables for determining economic thresholds can be found at: **http://www.ag.ndsu.edu/extensionentomology/field-crops-insect-pests/Documents/sunflower/e-823-banded- sunflower-moth**. If treatment is warranted, it should be applied at the R5.1 sunflower plant growth stage.
- **Lygus bugs**
  - ***Economic Threshold:*** Confection – One adult lygus bug per 9 heads can result in economic losses through the reduction in seed quality. Lygus bug management should be initiated between when the inflorescence begins to open (R4) to early bloom (R5.1) stages if adult densities reach economic levels. No control is needed in oilseed sunflowers not used for human consumption.

Sunflowers Insect Management Chart

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Belowground and Surface Feeders					
Wireworms	Wireworm may sometimes damage sunflowers. Seeding sunflowers when the soil temperature is at least 8 to 10°C at 1 to 1.5 inches depth may minimize damage by wireworm.				
Cutworms	*Fortenza* (D)	16.56 to 32.56 mL/ 10,000 seed	Seed treatment – by commercial treaters with closed transfer systems only		>5000
	Coragen MaX/ Coragen (D)	33.5 mL 101 mL	1	A or G	>5000
	Pounce/Perm-UP/ IPCO Syncro (P) *Ambush* (P)	73 to 158 mL 57 to 121 mL	Treat up to 5-leaf stage	A or G (see labels)	789 to 1030

Insect	Insecticide (and insecticide group[1])	Rate per Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD_{50} (Mammalian Toxicity)[2]
Defoliators					
Sunflower beetle	*Decis 100 EC/Advantage Deltamethrin 5 EC/ Poleci* (P)	20 mL (*Decis 100 EC*) 40 mL (*Advantage Delta..5EC*) 81 mL (*Poleci*)	70	A or G	>300 to 2000
	UP-Cyde/Ship (P)	40 mL	70	A or G	355
Grasshoppers	*Coragen MaX/ Coragen* (D)	17 to 33.5 mL 51 to 101 mL	1	A or G	>5000
Pests of Head and Seeds					
Lygus bugs	**Note:** Because the most appropriate timing of insecticides to control Lygus bugs in sunflowers includes flowering stages, steps to minimize harm to pollinators should be taken and insecticides should only be used when economic thresholds are exceeded.				
Sunflower seed weevil	Early planting helps to reduce seed damage by sunflower seed weevils.				
	Note: Because the most appropriate timing of insecticides to control sunflower seed weevils is during the flowering stage, steps to minimize harm to pollinators should be taken and insecticides should only be used when economic thresholds are exceeded.				
	UP-Cyde/Ship (P)	40 mL	70	A or G	355
Banded sunflower moth	Late planting may provide some control.				
	Note: Because the most appropriate timing of insecticides to control banded sunflower moth includes flowering stages, steps to minimize harm to pollinators should be taken and insecticides should only be used when economic thresholds are exceeded.				
	Coragen MaX/ Coragen (D) (reduces damage)	33.5 to 50.5 mL 101 to 152 mL	1	A or G	>5000
Sunflower moth	*Dipel 2X DF* (young larvae) (M)	127 to 253 g	N/A	A or G	>5000
	Bioprotec CAF/ Bioprotec PLUS (M)	0.32 to 0.65 L 0.20 to 0.40 L	0	A or G	N/A
	Coragen MaX/ Coragen (D)	33.5 to 50.5 mL 101 to 152 ml	1	A or G	>5000
Sunflower midge	**Crop rotation:** If a sunflower midge infestation is anticipated, new fields should be established away from fields damaged the previous season.				

ALWAYS CONSULT THE INSECTICIDE LABEL BEFORE APPLYING ANY INSECTICIDE.

[1] Insecticide Group: M=microbial, D=diamides, N=Neonicotinoids, P=pyrethroids, C=carbamates, OP=organophosphates.

[2] LD_{50} values represent the relative toxicity of a pesticide. They represent the dose (in milligram per kilogram body weight) that will kill 50 percent of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD_{50}.

Sweet Clover- See clovers (sweet, red, alsike)

Timothy-

See forage grasses

Wheat-

See small grain cereals

Insect Control in Stored Grain

Prevention

Clean in and around storage facilities. Grain storage facilities, and the area around storage facilities, should be cleaned thoroughly prior to storing grain.

Clean equipment used to move grain. Grain left in equipment throughout the summer months can result in new grain that is being placed into storage becoming infested. Combines, truck beds, grain wagons, augers and other equipment used to move grain should be cleaned of grain residue. Other potential sources of grain infesting insects include livestock feeds, old seed bags, spilled grain, etc.

Inspect grain storage facilities for signs of deterioration, especially for leaks or holes through which insects or rodents can gain access to the stored grain. Moving and storing the grain in clean facilities will eliminate one source of infestation. However, grain stored for long periods of time still has the potential for renewed infestations.

Treating storage facilities. Depending on the commodity to be stored, storage facilities may additionally be sprayed or dusted, if needed, with a recommended insecticide before storing grain in the bin (e.g. malathion or diatomaceous earth – refer to product labels for details). ***Note:*** some commodities, such as canola, flax and sunflowers, should not be stored in facilities recently treated with malathion.

Dry and Cool Grain. Ideally, the grain should be dry before being put into storage, and cooled as quickly as possible. For long-term storage, producers are urged to lower the grain temperature below 15°C as soon as possible after the grain is placed in storage. At 15°C the stored product insects stop laying eggs and development stops. Aeration systems used during the night immediately after harvest should have the grain below 15°C in about 2 weeks. Grain that is not moved or aerated after harvest can remain warm enough to allow insects to survive the winter. Convection currents arising from this warm air can also promote condensation, sprouting (heating) and mould growth in unmanaged grain. These conditions are very attractive to stored product pests and support their development.

Once the grain mass is cooled to the desired temperature, fans should be sealed to prevent unwanted air migration through the mass that could result in early grain mass warm-up. Cold grain has a longer storage life than warm grain.

Note, however, that under cool grain temperatures, insect movement is reduced to the point that some insecticides may not be effective.

Monitoring for Insects

Bin probe and Sieves: Stored grain insects can be monitored by taking grain samples with a bin probe, sieving the grain, and looking in the dockage for Insects.

Probe Traps: Another means of detecting insects in stored grain is through placing probe traps (such as the WB PROBE II Trap from Trece) in the grain and monitoring them. Often the first indication of an infestation will be found near the top centre of a storage bin, and therefore, this is where traps should be placed. Monitoring should take place once every 7 to 10 days during the onset of storage (first 60 days) and then the frequency of monitoring may be adjusted.

Identifying insects in stored grain

Correct identification of insects found in stored grain is important in determining the most appropriate control methods. Some of the insects found in stored grain feed directly on the grain, referred to as primary pests, while others feed on grain that is damaged or going out of condition, referred to as secondary pests.

Primary insect pests

Insects that feed directly on the grain include rusty grain beetles, red flour beetles, and sawtoothed grain beetles.

Rusty grain beetles are reddish brown beetles about 2 mm long. Heavy infestations of this insect cause grain to heat and spoil.

The **red flour beetle** is another common insect pest of stored grain in the prairies. Red flour beetles cannot feed on undamaged, dry seed with less than 12 percent moisture content. They prefer grain dust, broken grain and milled stocks.

Sawtoothed grain beetles are more common in stored oats than in stored wheat and barley.

Secondary insect pests:

Insects that feed on fungus in the grain bin or stored grain that is damaged include the foreign grain beetle, hairy fungus beetle, psocids, and grain mites.

Foreign grain beetles resemble the rusty grain beetle, but can be distinguished from it by club-shaped antennae. Also, when placed in a glass jar, foreign grain beetles will climb up the sides, while rusty grain beetles cannot. While foreign grain beetle is considered a fungus feeder, they will feed on grain if the moisture content is in the high end of the acceptable range (e.g. 14.5 percent mc wheat).

Grain mites are whitish, about 0.2 to 0.5 mm long, and can be hard to see with the naked eye. About eight kinds of mites are common in farm granaries and elevators.

Psocids are soft-bodied insects, about 1 mm long, with long antennae relative to the body size.

Fungus feeding insects and mites cannot survive in dry grain. Chemical control is not necessary for fungus feeding pests in stored grain. Practices that result in the grain drying may be all that is needed to control such pests.

Information to help identify insect pests of stored grain can be found on the Canadian Grain Commission website at: **https://www.grainscanada.gc.ca/en/grain-quality/manage/**.

Control Techniques:

The Canada Grain Act states that an elevator operator may reject any grain if the operator has reason to believe it is infested or contaminated. Outlined below are some control techniques and when and how these techniques can be best used.

Cold Temperatures

Rusty grain beetles are cold hardy and can survive subzero temperatures. Rusty grain beetles and other stored grain insects can be killed by reducing core grain temperatures as follows:

Time Required to Kill Insects at Various Grain Temperatures

Grain Temperature	Time required to kill insects
-5°C	12 weeks
-10°C	8 weeks
-15°C	4 weeks
-20°C	1 week

Cooling the grain, through aeration or moving the grain several times during mid-winter, should provide effective control of rusty grain beetles.

Moving Grain

Moving grain using cyclone-based pneumatic conveyors (grain vacs) at about 200 bushels per hour has been shown to be an effective means of controlling insects in stored grain. However, moving too large a volume of grain at a time using a pneumatic conveyor results in the grain protecting the insects and reduces kill of stored grain insects. Loading the grain using a pneumatic grain conveyor removes insects from grain being delivered to elevators.

Phostoxin, Fumitoxin

Company: Degesch America Inc. (*Phostoxin* round tablets – PCP#15736; *Phostoxin* pellets – PCP#15735; *Fumitoxin* tablets – PCP#19227).

Formulation: 55% aluminum phosphide.

Formulation	Primary Use	Container Size
Phostoxin tablets (3 g each) *Fumitoxin* tablets (3g each)	On the farm or country elevator	333 tablets (1kg) (*Phostoxin*) 500 tablets (1.5 kg) (*Fumitoxin*)
Phostoxin pellets (0.6 g each) Fumitoxin pellets (0.6g each)	On the farm or country elevator	1666 pellets (1kg) (*Phostoxin*) 2490 pellets (1.5kg) (*Fumitoxin*)
Phostoxin tablets prepac	Containers	1 to 4 strips of 33 tablets to a pouch

Insects and other pests controlled: Rusty grain beetle, red flour beetle, saw toothed grain beetle, granary weevil, yellow mealworm, lesser grain borer, spider beetles, hairy fungus beetles, Indian meal moth, Hessian fly, nematodes, mice and rodents.

Approved for use on the following stored grains: Barley, corn, dried peas, lentils, millet, oats, rye, soybeans, sunflower seeds, triticale, wheat, straw and hay.

Restricted Product: The use and sale of Aluminum Phosphide (*Phostoxin* or *Fumitoxin*) is restricted to licensed pesticide applicators possessing a valid fumigation license (Saskatchewan) or stored agricultural products license (Manitoba).

Phostoxin or *Fumitoxin* can only be used in conjunction with a detailed fumigation management plan.

Rate and Minimum Exposure Period: Refer to labels to determine rate. For grain bins a dosage of 250 to 500 tablets (or 880 to 2560 pellets) per 100 square metres of bin space being treated (not volume of grain) is recommended. It is important to ensure that bins are relatively secure. It is not advisable to use phosphine products in bins that are leaky or not well sealed.

The following table may be used as a guide to determine the minimum length of exposure period to *Phostoxin* or *Fumitoxin* at the indicated temperatures:

Temperature	Exposure Period
Below 5°C (40°F)	DO NOT fumigate
5°C to 12°C (40° to 53°F)	10 days
13° to 15°C (54° to 59°F)	5 days
16° to 20°C (60° to 68°F)	4 days
above 20°C (68°F)	3 days

Aluminum phosphide cannot be used when the grain temperature is below 5°C as the tablets release the gas too slowly. Very dry grain will also slow the release of the gas from the pellets. A shortened exposure period cannot be compensated for by increased dosage. Also ensure that storage is well ventilated for at least 24 hours after the required time for fumigation.

Environmental Hazards: Toxic to birds and mammals. Carefully inspect the outside and inside of the structure prior to application to ensure the absence of nesting or roosting birds. Avoid application if birds are present.

Diatomaceous earth (*Protect-It, Insecto*)

Company: Hedley Technologies Ltd. (*Protect-It* – PCP#24259); Natural Insecto Products Inc. (*Insecto* – PCP#22489)

Formulation: ***Protect-It:*** 74 percent Silicon dioxide, 10 percent Silica aerogel; ***Insecto:*** 90 percent Silicon dioxide

Insects controlled: ***Beetles*** – Rusty grain beetle, red flour beetle, rice weevil, granary weevil. ***Moths*** – Angoumois grain moth, Mediterranean flour moth, Indian meal moth.

Approved for use on the following stored products: Feed grains, seed, stored grains, wheat, barley, buckwheat, corn, oats, rye, flax, peas, soybeans and sorghum. Also registered for structural treatment of empty grain storage and transportation containers.

How it works: Diatomaceous earth damages the cuticle of the insect, reducing the insect's ability to retain moisture. The insect eventually dies from dehydration. A 6 week period of treatment above 20°C is needed for maximum efficacy.

Rate, for empty storage structures: Use a dust blower or aeration fan to get diatomaceous earth into the cracks, crevices and void spaces of the structure being treated. Dust areas at a rate of 1 kg per 200 square metres (5 g per square metre).

Rate, while grain is being placed into storage:

- **Protect-It:** The application rate for *Protect-It* varies by crop and insect species, ranging from 100 g per tonne for control of rusty grain beetle in wheat to 1000 g per tonne for red flour beetle in corn. Refer to the label for details.
- **Insecto:** Apply to grain at the time of storage at a rate of 0.5 to 1 kg per metric ton of grain (500 to 1000 ppm).

Precautions: The application of DE will lower the test weight measurement of the grain, but usually not to the point of downgrading. If test weight loss is excessive, the grain can be diluted with untreated grain. DE is non-toxic to humans and animals.

Malathion Grain Protector Dust

Company: Loveland Products Canada (PCP#15896)

Formulation: 2% malathion

Insects controlled: confused flour beetles, flat grain beetles, granary weevil, Indian meal moth, lesser grain borer, rusty grain beetle and sawtoothed grain beetle.

Approved for use on the following stored grains: Wheat, rye, barley and oats as stored grains.

Malathion Grain Dust can be applied to grain when it is in the truck or wagon prior to binning. It can also be used to control surface infestations by applying to the grain surface and raking in to 15 cm depth of the grain. Malathion controls insects by ingestion and contact and insects must be active for it to be effective.

Rate:

Crop	Rate-g/1000 kg (tonne) grain
Wheat	415
Rye	450
Barley	520
Oats	735

DO NOT apply to grain within 7 days of sale.

Be aware that the Canadian Grain Commission allows only 8 ppm of malathion residues in stored grains.

Malathion 85E

Refer to the label for this product for insect and mite control in *empty* grain bins, grain elevators, grain box cars and flour mills.

Note: Some commodities, such as canola, should not be stored in facilities recently treated with malathion. Malathion residue can linger in bins for up to six months after treatment and can be transferred from the bin to canola seed. Canola found with malathion residues is unacceptable for export customers.

Malathion 85E (Loveland Products Canada)

Insect	Rate	Note
Rusty grain beetle, red flour beetle, sawtoothed grain beetle, confused flour beetle, grain mite, granary weevil, Indian meal moth, lesser grain borer, flat grain beetles, rice weevils (empty grain storage facilities)	Mix 490 mL in 15 L of water. Apply 5 L of mixture on 100 m^2	Wait until spray has thoroughly dried before storing grain in treated areas.

Insecticide Product Pages

For rates and pre-harvest intervals for insecticides, see the insect management charts on pp. 638-677.

Acetamiprid

Insecticide Group 4A

Company:

Sharda CropChem Limited (*Aceta 70 WP* – PCP#33298)
Nippon Soda Company Ltd. (*Assail 70 WP* – PCP#27128)
Distributed by Belchim Crop Protection.

Formulations:

70% acetamiprid formulated as a wettable powder.

Insects Controlled and Registered Crops:

Crop	Insect
Potato	Colorado potato beetle, aphids
Seed alfalfa	Alfalfa plant bug, Lygus bug

Application:

- **Ground application:** Apply in a minimum finished spray volume of 200 per hectare. Use the higher rates when the majority of the Colorado Potato Beetle population is in the adult stage and for heavy pest pressure.
  - ***Seed alfalfa*** – Apply in a minimum finished spray volume of 100 L per hectare by ground. Apply prior to bloom up to the time when 50 percent of seed pods are ripe. Begin when adults and/or 4-5th instar nymphs have reached economic threshold levels for your area.
- **Aerial application:** Aerial use on potatoes is permitted in the provinces of Alberta, Saskatchewan and Manitoba only.

How it Works:

Aceta 70 WP and *Assail 70WP* are neonicotinoid insecticides that works by contact or ingestion. They have an anti-feedant effect that can prevent pest damage to host plants prior to the death of the insect. Products rapidly degrades in the soil with no carryover effects.

Restrictions:

- **Potato:** DO NOT make more than 2 applications per crop year. DO NOT apply more than once every 7 days. DO NOT exceed a total of 120 g active ingredient (172 g product) per hectare per season.
- **Seed alfalfa:** DO NOT make more than 3 applications per season. DO NOT apply more than once every 7 days. DO NOT exceed a total of 357 g active ingredient (510 g product) per hectare per season. DO NOT cut treated seed alfalfa fields for hay/forage.
- **Grazing:** DO NOT graze treated seed alfalfa fields.
- **Pre-harvest Interval:**
  - ***Potato*** – DO NOT harvest within 7 days of application.
  - ***Seed Alfalfa*** – DO NOT apply less than 1 day before harvest.
- **Re-Entry:** DO NOT re-enter treated areas for 12 hours after foliar application.
- **Buffer Zones:**

Application method	Buffer Zones (metres) Required for the Protection of:	
	Aquatic Habitats	Terrestrial habitat
Ground (Field sprayer)	20	2

Precautions

If this product is to be applied to a product destined for export to the United States, information on acceptable residue levels are available at **www.croplife.ca**.
Storage: DO NOT store in or around the home. Store unused product in a cool, ventilated, dry, locked area. DO NOT allow prolonged storage in areas where temperatures frequently exceed 46**°C**.

Environmental Hazards:

Bees: Toxic to bees exposed to direct treatment, drift, or residues in 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 application site.

Aquatic Organisms: Toxic to aquatic organisms. To reduce runoff from treated areas into aquatic habitats, avoid application to areas with a moderate to steep slope, compacted soil, or clay. Avoid application when heavy rain is forecasted.

Others: The lower rates allow for maximum beneficial survival and faster rebound of beneficial populations.

Hazard Rating:

Warning – Poison

Refer to the Introduction for an explanation of the symbols.

Actara

Insecticide Group 4A

Company:

Syngenta Canada

Formulations:

Actara 240SC (PCP#28407): 240 g/L thiamethoxam formulated as a soluble concentrate.

- Container size - 2 x 2.04 L

Actara 25WG (PCP#28408): 25% thiamethoxam formulated as a water dispersible granule.

- Container size - 4 x 850 g

Insects Controlled and Registered Crops:

Crop	Insect
Potato	Colorado potato beetle, aphids, potato leafhopper

Application:

Actara 240SC

- **Soil application:** Apply as an in-furrow spray during planting to allow the insecticide to be absorbed by plant roots. For 90 cm row spacing, apply 151 to 196 mL per acre. Use the higher rate for extended control. DO NOT follow a soil application with a foliar application.
- **Potato seed piece treatment:** Choose the appropriate rate from the chart on label, based on seeding rate. Apply only in areas with adequate ventilation or in areas that are equipped to remove mist or dust. Best results are obtained if potatoes are planted immediately after *Actara 240SC* is applied to seed. When transporting cut and treated seed ensure the seed is covered. DO NOT apply a subsequent treatment of in-furrow or foliar application of thiamethoxam or other Group 4 insecticide following seed piece treatment with *Actara 240SC*.
- **Foliar application:** *Actara* may be applied by ground or air. For ground application use a minimum of 40 L per acre unless otherwise indicated on label. A maximum of 2 foliar applications of *Actara* may be made per season. DO NOT exceed a total of 88 grams per acre. Allow at least 7 days between applications. DO NOT use a foliar application of *Actara* following in-furrow or soil application of *Actara*.

How it Works:

Actara is a systemic (taken up into the plant foliage after application), neonicotinoid insecticide.

Restrictions:

- **Rainfastness:** *Actara* is rainfast once spray has dried on treated plants.
- **Pre-harvest Interval:** DO NOT harvest within 7 days of application.
- **Re-Entry:** DO NOT re-enter treated areas for 12 hours after foliar application.
- **Re-cropping:** No restrictions following the harvest of sorghum, wheat, barley, canola, potatoes or cover crops. For all other crops 120 day plant-back interval is required.
- **Tank mix:** Potatoes - *Actara 240SC* can be mixed with *Quadris® Flowable* fungicide and *Ridomil® Gold 480SL* fungicide (or *Ridomil Gold 480EC* fungicide).
- **Buffer Zones:** Buffer zones are required for the protection of terrestrial and freshwater habitats. Refer to specific label for buffer zones required.

Environmental Hazards:

Bees: *Actara* is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. To minimize exposure to bees from foliar application, DO NOT apply this product to flowering crops or weeds if bees are visiting the treatment area.

Aquatic Organisms: Toxic to aquatic organisms. To reduce runoff from treated areas into aquatic habitats, avoid application to areas with a moderate to steep slope, compacted soil, or clay. Avoid application when heavy rain is forecasted.

Others: Toxic to certain beneficial insects.

Hazard Rating:

Actara 240SC: Caution – Poison

Actara 25WG: Caution – Eye and Skin Irritant

Refer to the Introduction for an explanation of the symbols.

Admire 240

Insecticide Group 4A

Company:

Bayer (*Admire 240* – PCP#24094)

Formulation:

240 g/L imidacloprid formulated as a suspension concentrate.

Insects Controlled and Registered Crops:

Crop	Insect
Potato	Colorado potato beetle, aphids, potato leafhopper, potato flea beetle

Application:

Imidacloprid

- **Seed piece treatment:** (*Admire 240*) Refer to Imidacloprid in the seed treatments product pages.
- **Foliar application:** (*Admire 240*) Apply only if insect populations exceed recommended economic thresholds. For optimum control, good coverage of the foliage is needed. A maximum of 2 foliar applications may be made per crop per season. Scout fields and retreat if needed. For aphids, two applications at least 7 days apart may be required to achieve control. DO NOT make a foliar application following a seed treatment of the product in the same crop. Allow at least 7 days after the last application and before harvesting the crop.

How it Works:

Imidacloprid is a neonicotinoid, systemic (within the plant) insecticide that works by contact or ingestion. Control period may vary due to climate and soil conditions

Restrictions:

- DO NOT apply by air.
- DO NOT apply following a soil, in-furrow or seed treatment application of a Group 4 Insecticide.
- **Re-cropping:** Acceptable plant-back intervals for:
  - ***Cereal grains (wheat, barley, oats)*** – minimum 30 days
  - ***Peas and beans*** – 9 months
  - ***All other food and feed crops*** – 12 months
  - ***Green manure and other cover crops*** – can be grown without plant-back intervals but cannot be grazed or harvested for food or feed.
- DO NOT apply in fields where *imidacloprid* has been used during the previous season. DO NOT apply through any irrigation system.
- DO NOT apply this product or allow it to drift to blooming crops or weeds if bees are visiting the treatment area.

Precautions:

DO NOT re-enter treated areas for 24 hours after foliar application. Avoid application when heavy rain is forecast.

DO NOT apply product or plant treated seed pieces within 15 metres of well-heads or aquatic systems, including marshes, ponds, ditches, reservoirs, streams, lakes, etc.

DO NOT mix, load or clean spray equipment within 30 metres of well-heads or freshwater habitats.

For application with air-blast equipment, DO NOT apply within 40 metres of well-heads or aquatic systems.

The use of this chemical may result in contamination of groundwater particularly in areas where soils are permeable (e.g. sandy soil) and/or where the water table is shallow.

Storage: DO NOT store in or around the home. Store unused product in a cool, ventilated, dry, locked area and avoid cross-contamination with other pesticides, fertilizers, food and feed.

DO NOT use treated seed pieces for food, feed or fodder.

If this product is to be applied to a product destined for export to the United States, contact 1-866-375-4648 or **www.croplife.ca**.

Environmental Hazards:

Bees: This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds.

Aquatic Invertebrates: This product is highly toxic to aquatic invertebrates.

Birds: This product is toxic to birds. Any spilled or exposed seeds must be incorporated into the soil or otherwise cleaned-up from the soil surface.

Aquatic organisms: Highly toxic to aquatic invertebrates.

Hazard Rating:

Caution – Poison

Refer to the introduction for an explanation of the symbols.

Agri-Mek SC

Insecticide Group 6

Company:

Syngenta Canada (PCP#31607)

Formulation:

84 g/L abamectin formulated as a suspension concentrate.

- Container size - 2 L containers

Insects Controlled and Registered Crops:

Crop	Insect
Potatoes	Potato psyllid and spider mites

Application:

Agri-Mek

- Can be applied by ground only. Apply when potato psyllids and spider mites first appear. Make first application after approximately 50 per cent of the egg masses of Colorado potato beetle have hatched and larvae are present. If two applications are required, limit them to a single Colorado potato beetle generation per crop. Apply in sufficient in solution to ensure thorough coverage of plant foliage. Avoid application when heavy rain is forecast.

How it Works:

Agri-Mek interferes with neuro-transmission in insects and mites resulting in paralysis, cessation of feeding and eventually death of the pest.

Restrictions:

- DO NOT apply by air.
- **Buffer zone:** DO NOT apply within 30 metres of freshwater habitats.
- Allow 7 days between application.
- DO NOT make more than 2 applications per growing season. DO NOT apply more than 800 mL per acre of *Agri-Mek* per season. DO NOT graze treated crop.
- DO NOT enter or allow entry into treated areas for 12 hours following application.
- **Pre-harvest interval:** 14 days
- **Storage:** Store product in original container only, away from food or feed. Keep container closed.

Precautions:

DO NOT contaminate water, food or feed by storage or disposal.

If *Agri-Mek* is to be used on a commodity that may be exported to the United States and you require information on acceptable residue levels in the United States, visit CropLife Canada's website at **www.croplife.ca** or contact Syngenta Canada Inc. at 1-877-964-3682.

Environmental Hazards:

Bees: *Agri-Mek* is highly toxic to bees exposed to direct treatment or residues on flowering crops and weeds. DO NOT apply this product or allow drift to flowering crops and weeds if bees are visiting the treatment area.

Aquatic organisms: Toxic to aquatic organisms and wildlife. A buffer zone of 30 metres is required between the last point of direct application and the closest downwind end of sensitive freshwater habitats. Avoid application when heavy rain is forecast.

Hazard Rating:

 Warning – Poison

Refer to the introduction for an explanation of the symbols.

Bioprotec CAF/Bioprotec PLUS

Insecticide Group 11

Company:

AEF Global Inc. (PCP#26854)

Formulation:

Bacillus thuringiensis subspecies kurstaki, strain EVB113-19, in a water based formulation. Potency - Bioprotec CAF: 11,400 cabbage looper units (CLU)/mg of product (equivalent to 12.7 billion CLU/L) - Bioprotec PLUS: 17,500 Cabbage Looper Units (CLU) per mg of product (equivalent to 20 billionCLU per liter).

- Container size - 10 L

Insects Controlled and Registered Crops:

Crop	Insect
Quinoa	European corn borer, beet webworm (Bioprotec CAF)
Timothy	Essex skipper
Sunflower	Sunflower moth
Corn	European corn borer

Application:

Bioprotec CAF/Biotprotec PLUS

- Use the higher rate for heavy infestations. If egg hatch is extended or re-infestation occurs, repeat applications. Apply every 7 to 10 days.
- Apply at first signs of infestations when larvae are small. Repeat applications, according to economic threshold, as necessary to maintain control. Consult provincial recommendations and regional advisors for monitoring procedures, treatment thresholds, and timing of applications. Monitor for the pest and apply at hatching, before larvae bore into plant tissues. Apply Bioprotec CAF with a high volume sprayer in a minimum of 300 L of water per hectare.
- Apply in sufficient water volume to ensure thorough coverage. A minimum of 121.4 L per acre is recommended. Begin application at hatching before larvae bore into plant tissues. Use diluted spray mixtures within a 12-hour period.
- Bioprotec CAF/Biotprotec PLUS should be applied by aerial equipment undiluted. Dilute with minimal quantities of water only when required to improve deposit. Best results can be expected when Bioprotec CAF is applied to dry foliage with calibrated aircraft capable of obtaining droplet sizes below 300 microns and preferably in the range of 50 to 150 microns.

How it Works:

Bioprotec CAF/Biotprotec PLUS is selectively toxic to some species of lepidopteran larvae. It is a stomach intoxicant only; to be effective, deposits must be ingested by susceptible larvae. Thorough coverage of target foliage where larvae are feeding is essential. In general, larvae should be treated when they are newly hatched and actively feeding. After ingestion of a sufficient dose, larvae cease feeding within a few hours and death occurs in 2 to 5 days.

Restrictions:

- Maximum of 6 applications per year with a 5 to 10 day interval between applications.
- **Pre-harvest Interval:** 0 days
- **Storage:** *Bioprotec CAF/Biotprotec PLUS* should be stored in the original container between 4°C and 20°C. Product should be used within 18 months of the date of manufacture. Re-Entry Interval: When the product is dry.

Precautions:
DO NOT allow the pilot to mix product to be loaded onto the aircraft. However, loading of premixed product with a closed system is permitted. Keep out of reach of children. Avoid contact with skin, eyes or clothing. Avoid breathing dust/spray mist. Wear a long-sleeved shirt, long pants, waterproof gloves, shoes plus socks, eye goggles and a NIOSH-approved respirator with any N-95, R- 95, or P-95 filter for biological products when handling, mixing/loading or applying the product and during all cleanup/repair activities

Hazard Rating:
Caution – Eye Irritant
Potential Sensitizer

BioTitan WP

Insecticide Group

Company:
Anatis Bioprotection (PCP#33923)

Formulation:
Beauveria bassiana strain ANT-03 as a wettable powder. At least 1 x1010 spores (conidia)/g
- Container size - 500 g to 25 kg

Insects Controlled and Registered Crops:

Crop	Insects controlled
Potatoes	Colorado potato beetle

Application:
Minimum water volume: Use spray volume sufficient to cover foliage infested with insect pests. Crop size and spray equipment will determine spray volume needed. Depending on crop treated, 500 to 1000 L of spray volume will typically be required for 1 ha.

How it Works:
Thorough coverage of infested plant parts is necessary for effective control. BioTitan WP acts via contact and does not have systemic activity. Infection begins with the attachment of conidia to the insect cuticle, followed by germination and penetration of the fungi inside the insect body. Once inside, *B. bassiana* kills the host and if conditions are adequate, it will sporulate outside the insect's body after a few days and produce newly infective conidia.

Effects of Weather on Performance or Safe Use
Apply only when the potential for drift to areas of human habitation or areas of human activity such as houses, cottages, schools and recreational areas is minimal. Take into consideration wind speed, wind direction, temperature inversions, application equipment and sprayer settings. Do not apply in extremely hot weather. On sunny days, apply later in the afternoon; do not apply at mid-day when temperatures are highest and the sun is most intense. For foliar applications, do not apply when heavy rain is forecast.

Tank Mixes
Do not mix with fungicide. If a fungicide must be used, make the application of the fungicide at least 4 days before the BioTitan WP application or at least 2 days after the BioTitan WP application.

Restrictions
- **Rainfast period:** Avoid application when heavy rain is forecast.
- **Re-entry interval:** DO NOT re-enter or allow re-entry into treated areas for 4 hours or until sprays have dried, unless wearing appropriate personal protective equipment including long-sleeved shirt, long pants, waterproof gloves, socks and shoes.
- **Pre-harvest interval:** 0 days
- **Other restrictions:** To reduce runoff from treated areas into aquatic habitats avoid application to areas with a moderate to steep slope, compacted soil, or clay. Contamination of aquatic areas as a result of runoff may be reduced by including a vegetative filter strip between the treated area and the edge of the water body. Do not apply in extremely hot weather. On sunny days, apply later in the afternoon; do not apply at mid-day when temperatures are highest and the sun is most intense.
- **Buffer zones:** Apply only when the potential for drift to areas of human habitation or areas of human activity such as houses, cottages, schools, and recreational areas is minimal. Take into consideration wind speed, wind direction, temperature inversions, application equipment and sprayer settings.

- **Storage:** Store in a cool, dry place. Can be stored up to 18 months if in the refrigerator at 4°C. Can be stored up to 6 months at 21°C in an unopened package. If the package is open, this product can be stored up to 3 months at 21°°C. Tightly reclose the container of unused product to prevent decrease of the efficacy. The BioTitan WP contains live spores of the naturally occurring fungus, *B. bassiana*. Spores may be damaged by storage at high temperatures (higher than 25°C) or contact with water for more than 24 hours. To prevent contamination, store this product away from food or feed.

Environmental Hazards

Beauveria bassiana strain ANT-03 is considered safe for beneficial insects, although it is recommended to avoid spraying directly in areas where bees are actively foraging. If bees are contacted directly, they can bring fungal spores back to the hive and infect the susceptible brood. Beauveria bassiana strain ANT-03 is toxic and/or pathogenic to daphnia (aquatic invertebrate).

Hazard Rating (Mammalian Toxicity)

Potential sensitizer.
Warning - eye irritant.
Warning - poison

Carbine/Beleaf

Insecticide Group 29

Company:

FMC of Canada - Carbine - (PCP#36459), Beleaf 50SG - (PCP#29796)

Formulation:

50% flonicamid formulated as a water dispersible granule.

- Container size - Beleaf - 6 x 0.68 kg jug per case, Carbine - 4 x 1.587 kg

Insects Controlled and Registered Crops:

Crop	Beleaf 50WG	Carbine
Dry beans, faba beans, chickpea, lentil, field pea	Aphids, reduces the numbers of Lygus bugs including tarnished plant bug	Aphids, reduces the numbers of Lygus bugs including tarnished plant bug
Alfalfa (seed production)	Aphids, tarnished plant bug	Aphids, tarnished plant bug
Alfalfa (forage), clover (Trifolium spp., Melilotus spp.), lupin, sainfoin, trefoil, vetch (crown, milk)	Aphids, tarnished plant bug	Aphids, tarnished plant bug
Potato	Potato aphid, psyllid (suppression)	

Application:

- Thorough spray coverage of plant foliage is essential for optimum control. Apply in sufficient water volumes to ensure good coverage. Use a minimum of 38 litres per acre of water. Rates and finished spray volumes should be increased under extreme pest populations or dense plant foliage.
- For applications to control aphids, use higher rate under extreme pest populations and/or dense plant foliage.
- Scout fields and reapply if necessary.

How it Works:

Flonicamid insecticide is a member of Insecticide Group 29 and controls target pests by contact and ingestion provoking rapid and irreversible feeding cessation. There is translaminar movement in the plant.

Tank Mixes:

Coragen® MaX Insecticide. FMC of Canada Ltd. may support tank mixes that are not on the Carbine™ Insecticide label. Check with the distributor for the products they support. Mixes must be applied according to the most restrictive use limitations for all products.

Restrictions:

- DO NOT apply by air.
- DO NOT use seed or forage for human or animal consumption.
- Allow a minimum of 7 days between applications. DO NOT make more than 3 applications per year.
- **Preharvest interval:**
  - DO NOT apply within 7 days of harvest.
- DO NOT apply more than 121 grams per acre per application. DO NOT apply more than 243 grams per acre per season.
- DO NOT use in home gardens.
- **Re-cropping:** There are no plant-back restrictions for any crop listed on the label. All other crops may be planted 30 days after the last application of *Beleaf*.

Precautions:

Avoid overnight storage of spray mixture. Prepare only enough spray mixture required for immediate application. DO NOT use liquid fertilizer as a carrier.

Beleaf insecticide should not be used with spray adjuvants. Avoid application of Beleaf or Carbine Insecticide when heavy rain is forecast.

DO NOT enter or allow entry into treated areas for 12 hours after application.

Storage: Store product in original container, in a secured, dry place separate from other pesticides, fertilizer, food or feed. Avoid the overnight storage of spray mixtures.

If this product is to be applied to a commodity destined for export, visit Crop Life Canada's website **www.croplife.ca** for information on acceptable residue limits.

Environmental Hazards:

Toxic to certain beneficial insects. Minimize spray drift to reduce harmful effects on beneficial insects in habitats next to the application site such as hedgerows and woodland. Toxic to non-target terrestrial plants. Observe spray buffer zones specified on the label. To reduce runoff from treated areas into aquatic habitats avoid application to areas with a moderate to steep slope, compacted soil, or clay.

Hazard Rating:

 Caution – Eye Irritant

Refer to the introduction for an explanation of the symbols.

Cimegra

Insecticide Group 30

Company:

BASF Canada Inc. (PCP#33666)

Formulations:

Broflanilide formulated as a suspension concentrate (100 g/L)

- Container size - 2 x 3 L

Insects Controlled and Registered Crops:

Crop	Insect
Potato	Wireworm, Colorado potato beetle
Corn	Wireworm, corn rootworm

MRLs will be established for potatoes across North America (pending registration in the United States), and BASF has submitted for other key markets but is awaiting approvals. Discuss with your potato processor for more information.

Application:

- For *Cimegra* insecticide to be most effective, apply in-furrow or as a T-band at planting. Apply as a dilute concentrate in sufficient water to get good coverage of the seed furrow. DO NOT apply *Cimegra* to the soil surface.
- **Instructions for In-furrow Use to Control Wireworm in Potatoes:**
  - Use 250 mL per hectare of *Cimegra* insecticide in-furrow to control wireworm in potato. Apply at planting as a dilute spray in water. Apply the in-furrow spray to uniformly cover the seed pieces and surrounding soil. The spray pattern should be a 10 to 20 cm (4 to 8 inch) band that is applied to the open seed piece furrow prior to being covered with soil.
  - Dilute *Cimegra* insecticide product in a minimum of 50 L of water per hectare and apply the dilute mixture into the furrow. Use sufficient water to ensure thorough coverage of the seed piece and surrounding seed furrow.

- **Instructions for In-furrow:** Use to control wireworm and corn rootworm in corn.
  - Use 250 mL per hectare of *Cimegra* insecticide in furrow to control wireworm and corn rootworm (*Diabrotica virgifera virgifera* and *Diabrotica barberi*) in corn. Apply at planting as an in-furrow or T-band spray by directing spray pattern to uniformly cover seed and surrounding soil.
    - **In-furrow:** Apply through spray nozzles or microtubes into the open seed furrow, between the planter furrow openers and press wheels.
    - **T-band:** Apply in a 10 to 20 cm (4 to 8 inch) band over the top of the open seed furrow, between planter furrow openers and press wheels. DO NOT T-band over the top of a closed furrow.
- **Instructions for foliar application to control Colorado potato beetle in potato:**
    - Cimegra is not systemic so recommend higher water volume to ensure thorough coverage of the plant.

How it Works:

Broflanilide is a Group 30 insecticide that is a GABA-gated chloride channel moderator that controls listed pest species through contact and ingestion. Broflanilide binds to a specific site of action upon contact that impacts the central nervous system. Causes rapid, irreversible hyperactivity of nerves and muscles leading to convulsions, paralysis and death.

Effects of Weather:

Avoid application when heavy rain is forecast.

Restrictions:

- **Re-entry interval:** 12 hours.
- **Pre-harvest interval:** 14 days.
- **Re-cropping:** Immediate plant-back is permitted for all labelled crops. A plant-back interval of 30 days is required for all crops not on the label.
- **Storage:** Prevent from freezing; however, in the instance that the product freezes, allow to thaw at room temperature for 24 hours and agitate well prior to use. To prevent contamination, store this product away from food and feed. Store in original tightly closed container in a cool, dry, locked, well-ventilated area without floor drain.
- **Other restrictions:** Do not apply more than 2 foliar applications per year. Do not apply more than 50g active ingredient per hectare per year (20g per acre) total. This includes all application types (infurrow, foliar, etc.)
- **Buffer zones:**

Application method	Buffer Zones (metres†) Required for the Protection of:	
	Aquatic Habitats of Depths	
	Greater than 1 m	Greater than 1 m
Field sprayer	5	3

Precautions:

Wear a long-sleeved shirt, long pants, chemical-resistant gloves, shoes and socks during mixing, loading, application, clean-up and repair. Gloves are not required during application within a closed cab. Wash hands before eating, drinking, smoking or using the toilet. Change out of work clothes and take a bath or shower after handling or spraying the product. Launder protective clothing before re-use.

Environmental Hazards:

Bees: Toxic to bees. Avoid application during crop blooming period. If applications must be made during the crop blooming period, restrict applications to evening when most bees are not foraging. However, this product is not systemic and when used according to label directions, minimal exposure or risk is expected.

Aquatic organisms: Toxic to aquatic organisms. To reduce runoff from treated areas into aquatic habitats avoid application to areas with a moderate to steep slope, compacted soil, or clay. Avoid application when heavy rain is forecast. Contamination of aquatic areas as a result of runoff may be reduced by including a vegetative filter strip between the treated area and the edge of the water body.

Hazard Rating:


Warning – Contains the Allergen Soy

Refer to the introduction for an explanation of the symbols.

Closer

Insecticide Group 4C

Company:
Corteva Agriscience (PCP#30826)

Formulation:
240 g/L sulfoxaflor formulated as a suspension concentrate.
- Container size - case contains 12 x 1 L containers

Insects Controlled and Registered Crops:

Crop	Insect
Corn	Aphids
Potato	Aphids, leafhoppers, tarnished plant bug
Quinoa	Lygus bugs

Application:
Closer
- May be applied by ground or air in corn and potatoes. Use low rates for light infestations of target pests and higher rates for moderate to heavy infestations. Apply in sufficient in sufficient solution to ensure thorough coverage of plant foliage. For ground application use a minimum spray volume of 40 L per acre. For aerial application use a minimum spray volume of 12 L per acre.

How it Works:
Closer is a systemic (within the plant) insecticide that causes blockage in the insect's nervous system resulting in paralysis and eventually death, through contact or stomach action.

Restrictions:
- DO NOT make more than 2 applications per growing season. DO NOT apply more than 121 mL per acre per growing season. DO NOT make applications less than 7 days apart (potato and corn). DO NOT make applications less than 14 days apart (quinoa). DO NOT apply within 7 days of harvest (potato and corn forage). DO NOT apply within 14 days of harvest (quinoa, corn grain and stover).
- DO NOT apply through an irrigation system.
- **Plant back interval:** A period of 30 days must elapse between treatment of primary crops and the planting of secondary crops not on the *Closer* label.
- **Restricted Entry Interval:** 12 hours.
- **Storage:** Store product in original container only, away from food or feed. Keep container closed.

Precautions:
DO NOT store or ship with food, feeds, drugs or clothing.

DO NOT contaminate irrigation or drinking water supplies or aquatic habitats by cleaning of equipment or disposal of wastes.

If *Closer* is to be used on a commodity that may be exported to the United States and you require information on acceptable residue levels in the United States, visit CropLife Canada's website at **www.croplife.ca**.

Environmental Hazards:
Bees: Toxic to bees exposed to direct treatment, drift, or residues on flowering crops or weeds. Apply early in the morning or late in the evening when bees are not active.
Aquatic organisms: The use of this chemical may result in contamination of groundwater, particularly in areas where soil is permeable (e.g. sandy soil) and/or the depth to the water table is shallow. Avoid application of *Closer* if heavy rain is forecast.
Others: Toxic to certain beneficial insects.

Hazard Rating:
None specified

Clutch

Insecticide Group 4A

Company:
Valent Canada Inc. (PCP#29382) Distributed by Nufarm Agriculture Inc.

Formulation:
50% clothianidin formulated as a water dispersible granule

Insects Controlled and Registered Crops:

Crop	Insect
Potato	Colorado potato beetle, aphids, leafhoppers

Application:
Clutch
- **In-furrow application:** Apply as a narrow band in-furrow at planting. For best results, direct spray on the seed pieces or seed potatoes. Use sufficient water volume to ensure uniform coverage and optimal uptake. Use higher rate when extended control is needed. DO NOT apply *Clutch* more than once per season as an in furrow treatment.
- **Foliar application:** May be applied by air or ground. Maximum of 3 foliar applications may be made per crop per season. Application intervals must be at least 10 days apart and must be rotated with an insecticide from a different chemical family. Use sufficient water volume to ensure uniform coverage. Use higher rate when insect populations are high.

How it Works:
Clothianidin is in the neonicotinoid class of insecticides and works by contact or ingestion, with systemic properties that provide residual control. Residual control will depend on environmental factors, plant growth, dosage rate and level of insect infestation.

Restrictions:
- DO NOT follow a soil or in furrow application of *Clutch* with a foliar application of *Clutch* or any Group 4 or 4A insecticide.
- DO NOT make a foliar application of *Clutch* following a seed piece treatment or in furrow application of *Clutch*, any product containing clothianidin or other neonicotinoid class (Group 4 or 4A) insecticides.
- **Re-cropping:** Acceptable plant-back intervals for:
  - ***Canola, corn, potato*** – no restrictions
  - ***Soybeans*** – 30 days.

Precautions:
Clothianidin is persistent and may carry over. It is recommended that any products containing clothianidin not be used in areas treated with this product during the previous season.

DO NOT enter or allow entry into treated areas for 12 hours after application. DO NOT graze treated fields or feed treated forage or hay to livestock.

Storage: DO NOT store in or around the home. Store unused product in a cool, ventilated, dry, secure area, away from food and feed.

DO NOT use treated seed pieces for food, feed or fodder.

Clothianidin is toxic to beneficial insects, aquatic organisms, birds, small wild mammals and non-target terrestrial plants. Observe buffer zones for sensitive areas (e.g. aquatic habitats, forested areas) as specified on label directions.

If this product is to be applied to a commodity destined for export to the United States, visit Crop Life Canada's website **www.croplife.ca** for information on acceptable residue limits.

Environmental Hazards:
Bees: Toxic to bees exposed to direct treatment, drift, or residues on flowering crops or weeds. DO NOT apply this product to flowering crops or weeds if bees are visiting the treatment area.

Aquatic organisms: Toxic to aquatic organisms. To reduce runoff from treated areas into aquatic habitats avoid application to areas with a moderate to steep slope, compacted soil, or clay. Avoid application when heavy rain is forecast. The use of this chemical may result in contamination of groundwater particularly in areas where soils are permeable (e.g. sandy soil) and/or the depth to the water table is shallow.

Others: Toxic to birds and small wild mammals. Toxic to certain beneficial insects.

Hazard Rating:

Caution – Poison
Eye Irritant

Refer to the introduction for an explanation of the symbols.

Concept

Insecticide Group
3A, 4A

Company:
Bayer (PCP#29611)

Formulation:
75 g/L imidacloprid and 10 g/L deltamethrin formulated as a suspension concentrate.
- Container size - 5.26 L jug

Insects Controlled and Registered Crops:

Crop	Insect
Potato	Colorado potato beetle, aphids, leafhoppers, potato flea beetle, tarnished plant bug, European corn borer (suppression only)
Soybean	Soybean aphid

Application:
Concept
- Ground application only.
- Apply when target pest has reached economic threshold levels. Repeat application if pest populations reach economic thresholds.
- Use sufficient water volumes for thorough coverage (e.g. minimum of 40 to 80 L of water per acre).
- For control of tarnished plant bug it is recommended to use *Concept* insecticide only when timing of application coincides with the timing for another pest on the label for potatoes.

How it Works:
Concept insecticide works through contact and systemic activity. Insecticide components: Imidacloprid is a neonicotinoid, systemic (within the plant) insecticide that works by contact or ingestion. Deltamethrin is a non-systemic pyrethroid insecticide that works through contact and ingestion.

Restrictions:
- Allow a minimum of 5 days between applications.
- DO NOT make more than 3 applications of *Concept* in a year.
- DO NOT apply *Concept* through any type of irrigation equipment.
- DO NOT apply *Concept* following a seed treatment or soil application of any Group 4 (neonicotinoid class) insecticide.
- A buffer zone of 8 metres is required between the downwind point of application and the closest edge of aquatic habitats.
- **Re-cropping:** Treated areas may be replanted with any crop specified on an imidacloprid label, or any crop for which a tolerance exists for the active ingredient, as soon as practical following the last application.
- **Acceptable plant-back intervals for:**
  - ***Cereal grains (wheat, barley, oats)*** – 30 days
  - ***Pea and bean (including faba bean, soybean and dry common bean)*** – 9 months
  - ***All other food and feed crops*** – 12 months
  - ***Green manure and other cover crops not intended for human or animal consumption*** – no plant-back interval required following treatment.
- DO NOT graze or harvest cover crops for food or feed.

Precautions:
DO NOT enter or allow entry into treated areas for a period of 24 hours after application of *Concept*.
DO NOT apply *Concept* within 15 metres of well-heads or aquatic systems. DO NOT mix, load or clean equipment within 30 metres of well-heads or aquatic systems.
If this product is to be applied to a commodity destined for export to the United States, visit Crop Life Canada's website **www.croplife.ca** for information on acceptable residue limits.
Storage: DO NOT use or store in or around the home. Store unused product away from feeds, seeds, fertilizer, plants and foodstuffs.
Concept cannot be stored below freezing.
If stored for one year or longer, shake well before using.

Environmental Hazards:
Bees: This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. DO NOT apply this product to flowering crops or weeds if bees are visiting the treatment area.
Aquatic organisms: Highly toxic to fish and other aquatic organisms. DO NOT apply where runoff is likely to occur. Runoff from treated areas may be hazardous to aquatic organisms in neighbouring areas. Avoid application when heavy rain is forecast.

Hazard Rating:

Warning – Eye Irritant

Deltamethrin: Danger – Poison

Imidacloprid: Caution – Poison

Refer to the Introduction for an explanation of the symbols.

Coragen/Coragen MaX

Insecticide Group 28

Company:

FMC Corporation

Formulation:

***Coragen* (PCP#28982):** 200 g/L chlorantraniliprole formulated as a suspension.

- Container sizes - 3.79 L, 6.0 L

***Coragen MaX* (PCP#34385):** 600 g/L chlorantraniliprole formulated as a suspension.

- Container sizes - 4 x 2 L

Insects Controlled and Registered Crops:

Crop	Insect
Alfalfa, sweet clover	Alfalfa weevil (suppression only), grasshoppers, cutworms
Bean, chickpea, lentil, pea, soybean	Armyworm, corn earworm, cutworm, European corn borer, grasshoppers
Borage	Grasshoppers
Buckwheat	Cutworm, grasshoppers
Canola, mustard, rapeseed, camelina	Bertha armyworm, cutworm, diamondback moth, grasshoppers, cabbage looper
Corn	Armyworm, fall armyworm, black cutworm, variegated cutworm, corn earworm, European corn borer, grasshoppers
Flax	Bertha armyworm, cutworm, grasshoppers
Forage grasses (for feed)	Armyworm, grasshoppers, cutworms (Coragen MaX only)
Millet	Armyworm, cutworm, European corn borer, grasshoppers
Pastures	Grasshoppers, cutworms (Coragen MaX only)
Potato	Armyworm, Colorado potato beetle, corn earworm, black cutworm, variegated cutworm, European corn borer, cabbage looper, grasshoppers (Coragen MaX only)
Sunflower (seed)	Cutworm, banded sunflower moth, grasshoppers
Safflower	Grasshoppers, cutworm
Wheat, barley, oats, rye, triticale	Armyworm, cutworm, grasshoppers

Application:

Coragen/Coragen Max

- May be applied by air or ground equipment.
- Begin application when treatment thresholds have been reached. Thorough coverage is essential for optimal control. Use the high rate under heavy pest pressure and/or when larger larvae are present.
- ***Spray Volume for Potatoes:*** Apply in a minimum finished spray volume of 40 L per acre by ground. Apply in a minimum finished spray volume of 20 L per acre by air.

How it Works:

Chlorantraniliprole disrupts muscle activity in the insects, resulting in paralysis. Treated pests stop feeding quickly after ingestion, become lethargic and lose mobility. Insect death may take several days.

Tank Mixes:

FMC Corporation supports the following mixes that are not on the *Coragen* and *Coragen MaX* labels. Apply mixes according to the most restrictive use limitations for either product.

- **Herbicides:** *Assure II, Barricade II, Refine M, Refine SG, Travallas*, 2,4-D Ester, 2, 4-Amine, glyphosate, *Liberty 150 SN*, MCPA Ester, MCPA Amine, *Muster Toss-N-Go, XtendiMax, Predicade, Roundup Xtend, Engenia*
- **Fungicides:** *Acapela*
- **Insecticides:** *Pounce(R) 384EC insecticide*

Restrictions:

- DO NOT make more than 4 applications per season on bean, chickpea, lentil, pea, soybean, potatoes, corn, and forage grasses. DO NOT exceed a total of 455 mL of *Coragen* or 152 mL of *Coragen MaX* per acre per season.
- DO NOT make more than 1 application per cutting on alfalfa and sweet clover.
- **Potatoes, bean, chickpea, lentil, pea, soybean:** DO NOT apply more than once every 3 days.
- **Canola, rapeseed, mustard, flax, sunflower:** DO NOT make more than 3 applications per season. DO NOT apply more than once every 5 days.
- **Corn:** DO NOT apply more than once every 7 days.
- **Wheat, barley, oats, buckwheat, millet:** DO NOT make more than 3 applications per season. DO NOT exceed a total of 455 mL of *Coragen* or 152 mL of *Coragen MaX* per acre per season.
- Forage (grass), fodder or hay may be fed to livestock.
- DO NOT make a foliar application of FMC *Coragen* insecticide for a minimum of 60 days following an in-furrow or soil application or planting of seed or seed pieces treated with any Group 28 insecticide.
- **Restricted Entry Interval:** 12 hours
- **Storage:** Store product in original container only, away from other pesticides, fertilizer, food or feed. Not for use or storage in or around the home. Keep container closed.

Precautions:

DO NOT contaminate irrigation or drinking water supplies or aquatic habitats by cleaning of equipment or disposal of wastes.

Environmental Hazards:

Aquatic organisms: Toxic to aquatic organisms. To reduce runoff from treated areas into aquatic habitats avoid application to areas with a moderate to steep slope, compacted soil, or clay. Avoid application when heavy rain is forecast.
Beneficial insects: May cause harm to some generalist predators, but not harmful to some beneficial insects such as parasitic Hymenoptera.

Hazard Rating:

Very low toxicity to mammals. Keep out of reach of children.

Cormoran

Insecticide Group 4A, 15

Company:
Adama Canada (PCP#33353)

Formulations:
Acetamiprid and Novaluron formulated as an emulsifiable concentrate. (Acetamiprid – 80 g/L; Novaluron – 100 g/L)
- Container size - 10.08 L

Insects Controlled and Registered Crops*:

Crop	Insect
Potato	Colorado potato beetle, armyworm, cabbage looper, leafhoppers, aphids, European corn borer
Seed alfalfa	Alfalfa plant bug, Lygus bugs

***Refer to label.**

Application:
- Apply in a minimum finished spray volume of 200 L per hectare by ground.
- For Colorado potato beetle, DO NOT apply more than twice to a single generation and DO NOT apply to successive generations.
- For seed alfalfa, apply prior to bloom up to the time when 50 percent of seed pods are ripe. Begin when adults and/or 4th to 5th instar nymphs have reached economic threshold levels for your area.
- Minimum re-application interval of 7 days.
- Apply when insect numbers exceed economic threshold levels and use sufficient water for good coverage. Use higher rates for mature insect stages or severe infestations.

How it Works:
Acetamiprid is a neonicotinoid insecticide that works by contact or ingestion. It has an anti-feedant effect that can prevent pest damage to host plants prior to the death of the insect. Novaluron is an insect growth regulator that must be absorbed by eggs or ingested by insect larvae to be fully effective. The primary mode of action is by disrupting cuticle formation and deposition occurring when insects change from one developmental stage to another, resulting in death at molting.

Effects of Weather:
Drift potential is lowest between wind speeds of 3 to 16 kilometres per hour. However, many factors, including droplet size and equipment type, determine drift potential at any given speed. Application should be avoided below 2 miles per hour due to variable wind direction and high inversion potential. When making applications in low relative humidity, set up equipment to produce larger droplets to compensate for evaporation. Droplet evaporation is most severe when conditions are both hot and dry. Applications should not occur during a temperature inversion because drift potential is high. Avoid application when heavy rain is forecast.

Restrictions:
- **Storage:** Keep in original container during storage. DO NOT contaminate or store near foodstuffs. Store in cool, dry, locked, well-ventilated area without floor drain. Keep away from fire or open flame, or other sources of heat.
- **Restricted Entry Interval:** 12 hours
- **Buffer zones:**

Application method	**Crop**	**Buffer Zones (metres†) Required for the Protection of:**		
		Aquatic Habitats of Depths		Terrestrial Habitat
		Less than 1 m	Greater than 1 m	
Field sprayer	Potato	45	25	2
	Seed alfalfa	55	25	3

† Distance measured as metres from the downwind edge of the spray boom to sensitive habitat.
- DO NOT apply directly to water or where runoff could occur to adjacent aquatic sites.

- **Pre-harvest Interval:** 7 days

Precautions:
Wear a long-sleeved shirt, long pants, chemical-resistant gloves, socks and shoes during mixing, loading, application, clean-up and repair. Wash the outside of gloves before removing.

Environmental Hazards:

Bees: Toxic to bees exposed to direct treatment, drift, or residues in 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 application site.
Aquatic organisms: Toxic to aquatic organisms and **Non**-target terrestrial plants.

Hazard Rating:

No specific hazard rating specified.

Cypermethrin

Insecticide Group 3A

Company:

UPL AgroSolutions Canada Inc. (*UP-Cyde 2.5 EC* – PCP#28795)
Sharda CropChem Limited (*Ship 250 EC* – PCP#32563)

Formulation:

Cypermethrin formulated as an emulsifiable concentrate (*UP-Cyde 2.5 EC* – 250 g/L, *Ship 250 EC* – 250 g/L).

- Container sizes - 1, 3.79, 5, 10 L

Insects Controlled and Registered Crops*:

Crop	Insect
Wheat, barley (*Up-Cyde* only)	Grasshoppers, cutworm
Canola, rapeseed, mustard	Grasshoppers, flea beetles, bertha armyworm
Roadsides, headlands, summerfallow (*Up-Cyde* only)	Grasshoppers
Sunflower	Sunflower beetle, Sunflower seed weevils
Corn	European corn borer, cutworm, corn earworm
Potato	Colorado potato beetle, flea beetle, leafhoppers, tarnished plant bug, cutworm

***Refer to labels: *Ship* is not registered in wheat, barley, roadsides, headlands, summerfallow, or for grasshoppers or cutworm in any of the crops listed.**

Application:

Cypermethrin

- May be applied by ground application only for control of immature (up to 4th instar) grasshoppers on wheat, barley, roadsides, headlands and canola; for flea beetle control on canola and mustard; and for control of cutworm. After application for cutworm leave soil surface undisturbed for 5 days.
- May be applied by ground or air for flea beetles (aerial application for *Up-cyde* and *Ship 250 EC* only – one aerial application per year) and bertha armyworm in canola, sunflower beetle, sunflower seed weevil in sunflower, corn earworm, European corn borer in corn and Colorado potato beetle, flea beetle, leafhoppers and tarnished plant bug on potatoes.
- Apply when insect numbers exceed economic threshold levels and use sufficient water for good coverage. Use higher rates for mature insect stages (grasshoppers) or severe infestations.

How it Works:

UP-Cyde and *Ship* are pyrethroid insecticides that work as a contact and stomach poison.

Effects of Weather:

Activity of cypermethrin on grasshoppers is reduced as soil temperature increases. Application for grasshopper control should be made at temperatures below 25°C. Spraying for grasshoppers should be delayed until evening if daytime temperatures are above 25°C.

Restrictions:

- **Grazing:** Treated crops must not be grazed or cut for hay except field corn silage derived from corn treated with *Up-Cyde* at the recommended rate and pre-harvest interval may be fed to lactating dairy cattle and beef cattle.
- **Storage:** Keep in original container during storage. DO NOT contaminate or store near foodstuffs.
- **Restricted Entry Interval:** 12 hours

- **Buffer zones:**

Crop	Application method		Buffer Zones (metres†) Required for the Protection of:	
			Freshwater Habitat Depths:	
			Less than 1 m	Greater than 1 m
Corn	Ground		20	10
Canola			15	5
Sunflower			5	3
Potato			15	5
Corn	Aerial	Fixed Wing	800	625
		Rotary	800	500
Canola		Fixed Wing	775	475
		Rotary	425	200
Sunflower		Fixed Wing	750	450
		Rotary	350	175
Potato		Fixed Wing	800	600
		Rotary	725	325

See introduction for an explanation of the different habitats.

† **Distance measured as metres from the downwind edge of the spray boom to sensitive habitat.**

- ***Canola, Rapeseed, Mustard*** – Cypermethrin must be applied by ground for grasshoppers.
  - DO NOT apply Cypermethrin more than once per season by air. DO NOT apply *Up-Cyde* to mustard by air.
- ***Corn*** – DO NOT apply more than a maximum of 3 applications by ground. DO NOT make more than 2 aerial applications per season. Repeat as necessary with 4 to 7 day intervals between applications.
- ***Potatoes*** – Ground – Apply as required with 10 to 12 day intervals up to a maximum of 3 applications per season. Air – up to 2 applications per season.
- ***Sunflower*** – Ground – Apply when required with a 5 day interval between applications. A maximum of 2 applications per season. Air – 1 aerial application is permitted per season.
- **Pre-harvest intervals:**
  - ***Barley*** – 45 days
  - ***Canola, Rapeseed, Mustard*** – 30 days
  - ***Corn*** – 5 days
  - ***Potatoes*** – 7 days
  - ***Sunflower*** – 70 days
  - ***Wheat*** – 30 days

Precautions:

Harmful or fatal if swallowed. May be harmful if absorbed through skin. Severely irritating to eyes. Causes skin irritation and sensitization. Wear longsleeved protective clothing and gloves when handling or applying. Wear face shield or goggles when mixing.

Environmental Hazards:

Bees: Very toxic to bees. Avoid spraying when bees are foraging. Spray deposit should be dry before bees commence foraging in treated crop.

Aquatic organisms: Very toxic to aquatic organisms and fish, and overspray or drift into sensitive areas such as sloughs, streams, rivers, dugouts and wetlands must be avoided.

Hazard Rating:

 Caution – Poison

Refer to the introduction for an explanation of the symbols.

Delegate

Insecticide Group 5

Company:
Corteva Agriscience (PCP#28778)

Formulation:
25% spinetoram formulated as wettable granules.
- Container size - 840 g

Insects Controlled and Registered Crops:

Crop	Insect
Corn***	European corn borer
Potato*	Colorado potato beetle (time for egg hatch or small larvae), European corn borer (time to coincide with peak egg hatch)
Wheat, barley, oats, rye**	Armyworm (when economic thresholds dictate)
Soybean***	Armyworm

* Maximum 3 applications per year with a minimum retreatment interval of 7 days.
** Maximum 3 applications per year with a minimum retreatment interval of 5 days.
*** Maximum of 3 applications per year, with a minimum of 5 days between applications.

Application:
- Aerial application in potatoes and corn only. Apply in sufficient water volume to cover the entire plant using a combination of nozzles and pressure designed to deliver thorough, even coverage with ***ASABE fine classification*** droplets. DO NOT apply through irrigation systems.
- Spinosyns require a spray solution pH between 6 to 8. This is important for the efficacy of the product. It is recommended that growers test the pH of the spray solution prior to adding a spinosyn to the spray tank.

How it Works:
Delegate is derived from the fermentation of the bacterium *Saccharopolyspora spinosa*, which is then chemically modified to create the active ingredient. Spinetoram affects the insect nervous system. It does not interact with the known binding sites of other classes of insecticides. It works through ingestion or contact with the target insects. Target insects cease feeding within a few minutes, although death may take a few days.

Tank Mixes:
Acapela (Fungicide) is a registered tank mix on corn.

Restrictions:
- **Re-entry:** DO NOT enter treated field for 12 hours.
- **Pre-harvest:** DO NOT harvest within 21 days of application for wheat (spring and durum, barley, oats and rye), within 7 days for potato or within 28 days for corn or soybean.
- **Forage/Grazing:** DO NOT apply within 28 days of stover harvest or with 7 days of forage harvest.
- **Aerial Application:**
  - ***Potatoes and Corn (field, sweet, seed and popcorn):*** Use a minimum spray volume of 12.1 L per acre. Recommended spray volume is 12.1 to 20.2 L per acre.
- **Storage:** Store in a cool, dry place. Keep from freezing.
- **Buffer Zones:** 1 m required between the point of direct application and the closest downwind edge of sensitive terrestrial habitats (such as grasslands, forested areas, shelter belts, woodlots, hedgerows, riparian areas and shrublands).

Tank Cleaning:
Refer to Introduction.

Environmental Hazards:
Bees: Toxic to bees exposed to direct treatment, drift, or residues on flowering crops or weeds. DO NOT apply this product to flowering crops or weeds if bees are visiting the treatment area.
Aquatic organisms: Avoid application when heavy rain is forecast to reduce runoff into aquatic habitats.
Others: Toxic to small wild mammals. May be toxic to certain beneficial insects.

Hazard Rating:
No specific hazard rating specified.

Deltamethrin

Insecticide Group 3A

Company:

Bayer (*Decis 100 EC* – PCP#33700)
Sharda Cropchem Limited (*Poleci 2.5 EC Western* – PCP#32447)
Advantage Crop Protection Inc. (*Advantage Deltamethrin 5 EC* – PCP#34043)

Formulations:

deltamethrin formulated as an emulsifiable concentrate.
(*Decis 100 EC* – 100 g/L, *Poleci 2.5 EC* – 25 g/L, *Advantage Deltamethrin 5 EC* – 50g/L)

- Container sizes – *Decis 100 EC* (1.2 L jug, 4.8 L jug), *Poleci 2.5 EC* (4.8 L jugs), *Advantage Deltamethrin 5 EC* (4 x 4.8 L)

Insects Controlled and Registered Crops:

Crop	Insect
Alfalfa (seed crops only)	Alfalfa weevil, Lygus bugs, grasshoppers (*Decis* only)
Field and sweet corn	European corn borer
Potato	Colorado potato beetle, potato flea beetle, Lygus bugs, leafhoppers, European corn borer, potato aphid, buckthorn aphid (*Decis* only)
Canola, rapeseed, mustard (condiment and oilseed quality *Brassica juncea* varieties)	Beet webworm, bertha armyworm, cabbage seedpod weevil (adults only), clover cutworm, diamondback moth, flea beetles, grasshoppers, Lygus bugs
Sunflower	Sunflower beetle
Wheat, barley, oats, lentils	Cutworm, grasshoppers
Rangeland, pastures, roadside, fence row	Grasshoppers
Flax	Cutworm, beet webworm, grasshoppers, Lygus bugs, bertha armyworm, clover cutworm
Red clover (seed production only)	Lesser clover leaf weevil (suppression only)
Dry beans, faba beans, chickpeas, lentils and field peas (*Decis* only)	Grasshoppers, suppression of pea leaf weevil, cutworm, Lygus bugs

Application:

Deltamethrin

- May be applied by air or ground equipment to all crops with the exception of alfalfa, red clover and corn, which require ground application only. Apply when insects exceed economic threshold numbers with sufficient water for good coverage. Use higher rates for severe infestations, on dense foliage or when a number of insect growth stages are present.
- Alfalfa (seed production) - Use higher rates if alfalfa weevil present.

Tank Mixes:

When in a tank-mix the spray mixture must be constantly agitated throughout application. DO NOT allow the spray mixture to stand in the spray tank for more than 4 hours after mixing.

Deltamethrin may be tank mixed with the following herbicides: *Pardner, Buctril M, Banvel*, MCPA, 2,4-D, *Puma Advance*. **Tank mixes with *Puma Advance* and *Buctril M* are for use in spring and durum wheat only.**

Bayer also supports the following mixes that are not on the *Decis* label. Apply mixes according to the most restrictive use limitations for either product:

- **Herbicides** – *Glyphosate, Odyssey* and *Solo*
- **Fungicides** – *Headline, Lance, Tilt*

When a tank mix is used the labels of the tank mix partners are to be consulted.

How it Works:

Deltamethrin is a non-systemic, synthetic pyrethroid which works by contact and ingestion.

Effects of Weather:

DO NOT spray under a strong temperature inversion, or when temperature exceeds 25°C as this will result in a reduction in control. Best control will be achieved when deltamethrin is applied during cooler periods of the day. DO NOT apply within 1 hour of rain.

Restrictions:

- ***Alfalfa seed production*** – DO NOT apply more than once per year.
- ***Canola*** – *Decis*: Maximum application of 3 applications per season with maximum seasonal load of 500 mL per hectare (202 mL per acre) or 25 g ai/ha. If 3 applications are used, only the first or second application can be at 200 mL per hectare. Allow a 7 day interval between treatments by ground application. Maximum of ONE (1) APPLICATION/YEAR via aerial application.
- ***Corn (field and seed)*** – DO NOT apply more than 3 times per year; ground application only.
- ***Potato*** – (Ground) DO NOT apply more than 3 times per year. (Aerial) DO NOT apply more than 2 times per year. May be used only once per season on high organic (muck) soils.
- ***Red clover*** – DO NOT apply by air. DO NOT make more than 2 applications per year. DO NOT use treated crop for feed or forage. Restricted entry interval – 12 hours
- ***Wheat, barley, oats, flax, lentil*** – (Ground) DO NOT apply more than 3 times per year. (Aerial) DO NOT apply more than 2 times per year.
- ***Dry beans, faba beans, chickpeas, lentils, and field peas (*Decis *only)*** – DO NOT apply more than 3 times per year (field and seed).
- ***Rangeland, pastures:*** Maximum 3 applications per year; only 2 of these may be by air.
- **Pre-harvest Intervals (Days):** alfalfa (20), barley (40), canola (7), flax (40), lentils (30), mustard (7), shelled pea and beans (*Decis* only) (7), oats (31), potatoes (3), sunflower (70), wheat (40), sugar beets (100).
- **Storage:** DO NOT store below freezing. DO NOT store near feed, food, seeds or fertilizer. Keep away from heat, sparks and open flames. If stored for 1 year or longer, shake well before using. Insecticides and fungicides should be segregated from herbicides to prevent the possibility of cross-contamination.
- **Others:** DO NOT apply *deltamethrin* by air when the wind speed exceeds 8 kilometres per hour. In soils with high organic content (muck soils), *deltamethrin* should be applied only once during each crop year, prior to August 1.
- **Buffer zones:**

Decis 5 EC and *Decis 100 EC*

Application method		Crop	Buffer Zones (metres) Required for the Protection of:				
			Aquatic Habitats of Depths			Terrestrial Habitat	
			Less than 1 m		Greater than 1 m		
			Decis 5 EC	*Decis 100 EC*		*Decis 5 EC*	*Decis 100 EC*
Ground		Alfalfa (seed production only), potato, established red clover (for seed production only), shelled pea and bean (except soybean), wheat, barley, oats, sugarbeets, field corn	1		1	1	
Aerial	**Fixed wing**	Shelled pea and bean (except soybean)	90	80	25	10	
	Rotary wing		55	65	20	10	
	Fixed wing	Wheat, barley, oats, sugarbeets	55	50	15	1	10
	Rotary wing		35	45	10	1	10
	Fixed wing	Canola, rapeseed, mustard (condiment and oilseed quality *Brassica juncea* varieties), flax	70	65	20	10	
	Rotary wing		45	50	15	10	
	Fixed wing	Potato, pasture, rangeland	40	35	10	1	
	Rotary wing		25		10	5	1
	Fixed wing	Sunflower	10		5	0	
	Rotary wing		10		5	0	

Poleci 2.5 EC Western

Application method		Crop	Buffer Zones (metres) Required for the Protection of:		
			Aquatic Habitats of Depths		Terrestrial Habitat
			Less than 1 m	Greater than 1 m	
Ground		Alfalfa (seed production only), potato, established red clover (for seed production only), shelled pea and bean (except soybean), wheat, barley, oats, sugarbeets, field corn	1	1	1
		Canola, mustard, rapeseed, sugar beet, barley, flax, lentil, oat, wheat, rangeland, pasture	1	1	0
Aerial	**Fixed wing**	Potato, wheat, barley, oat, flax, pasture, rangeland	40	10	1
	Rotary wing		25	10	5
	Fixed wing	Canola, mustard, rapeseed, oilseed mustard, wheat, barley, oat, flax, lentil, sugarbeet	20	10	1
	Rotary wing		15	10	1
	Fixed wing	Canola, mustard, rapeseed, oilseed mustard, flax, shelterbelt, potato (high organic muck soils)	15	10	1
	Rotary wing		10	5	1
	Fixed wing	Sunflower	10	5	0
	Rotary wing		10	5	0

- ***Advanced Deltamethrin:*** Observe 100 metre setback between crop and any body of water or sensitive zones for aerial applications.

Precautions:

Deltamethrin is of high mammalian toxicity and is a severe eye and skin irritant. Avoid contacting or breathing spray mist. Wear protective clothing, including goggles and respirator, when handling or spraying. DO NOT contaminate or store near feed or foodstuffs. Wash thoroughly after using *deltamethrin*.

Environmental Hazards:

Bees: Toxic to bees. Avoid spraying when bees are foraging.
Aquatic organisms: Toxic to fish and aquatic organisms. Avoid contamination of aquatic systems during application.

Hazard Rating:


Danger – Poison

Refer to the introduction for an explanation of the symbols.

Dimethoate

Insecticide Group 1B

Company:

FMC Corporation (*Cygon 480-Ag* – PCP#25651)
Loveland Products Canada (*Lagon 480E* – PCP#9382)
Sharda Cropchem Limited (Diamante 4- PCP#34413)
Different trade names refer to different companies. Note that products may have different label recommendations. Check your label for more information.

Formulation:

Cygon/Lagon/Diamante 4 – 480 g/L dimethoate formulated as an emulsifiable concentrate.

- Container size - 10 L

Insects Controlled and Registered Crops:

Crop	*Cygon 480-Ag* Insect	*Lagon 480E* Insect	*Diamante 4*
Peas	Aphids	Aphids	Aphids
Potatoes (ground application only)	Aphids, leafhoppers	Aphids, leafhoppers, Lygus bugs	Aphids leafhoppers
Alfalfa* (rates vary for seed and forage production)	Aphids, leafhoppers, Lygus bugs, plant bugs, alfalfa blotch leafminer, grasshoppers, reduction of alfalfa weevil larvae	Aphids, leafhoppers, alfalfa blotch leafminers, grasshoppers, reduction of alfalfa weevil larvae, Lygus bugs, plant bugs	Aphids, blotch leafminer, grasshoppers, leafhoppers, Lygus bugs, plant bugs, sweet clover weevil, reduction of alfalfa weevil larvae
Canaryseed, canarygrass for human consumption (*Cygon 480-Ag* and *Lagon 480E*)	Aphids	Aphids	
Canola/rapeseed	Aphids, leafhoppers, grasshoppers, Lygus bugs	Aphids, leafhoppers, grasshoppers	Aphids, leafhoppers, grasshoppers
Dry beans	Aphids, leafhoppers, lygus bugs, spider mites		Aphids, leafhoppers, Lygus bugs, mites,
Forage crops	Lygus bugs, plant bugs, grasshoppers	Grasshoppers, aphids (suppression only of Russian wheat aphid), Lygus bugs and plant bugs	Grasshoppers, leafhoppers, Lygus bugs, plant bugs
Sweet clover, red clover, alsike clover	Sweet clover weevil	Aphids, grasshoppers, sweet clover weevil	Sweet clover weevil
Pastures, waste areas	Grasshoppers	Grasshoppers	Grasshoppers
Wheat	Aphids (suppression only of Russian wheat aphid), wheat midge, thrips	Thrips, grasshoppers, wheat midge, Russian wheat aphid (suppression only)	Wheat midge, aphids, thrips
Barley, oats	Aphids, thrips	Thrips, grasshoppers,	Aphids, thrips
Flax	Aphids	Aphids	Potato aphid
Rye		Grasshoppers	
Soybeans	Aphids, leafhoppers, lygus bugs, spider mites	Aphids, leafhoppers, Lygus bugs, spider mites	Spider mites

Application:

Dimethoate

- May be applied by air or ground equipment (unless otherwise specified). If adult midges are present (1 midge / 4-5 wheat heads), sprays should be applied when 25 percent of the wheat head has fully emerged from the boot but before flowering has begun. At this stage, wheat first becomes susceptible to attack by the egg-laying females. Applications should be made in the late afternoon or evening when temperatures exceed 15°C and the wind speed is less than 10 km/h. High volume sprays will improve penetration of the crop. Proper timing of application is essential for control. Will not control midge larvae.

How it Works:

Dimethoate is a broad spectrum, systemic (within the plant) and contact, organophosphate insecticide and acaricide.

Restrictions:

- **Grazing:** Remove cattle prior to spraying. Read label carefully to determine livestock re-entry period.
- **Storage:** Store at temperatures between 4°C and 30°C and in areas away from feed and food.
- **Others:** DO NOT treat when bees are foraging. For alfalfa, canola, safflower and clovers, DO NOT apply during the crop blooming period or during the 5 day period before the crop blooms. Wait at least 10 days before placing leafcutter bees in treated fields. DO NOT make more than 2 applications per season. *Canary seed* - Minimum application interval is 30 days. *Beans*, *Peas*, - Minimum application interval is 14 days (7 for *Beans* with *Lagon*). Other listed crops - Minimum application interval is 7 days.

Precautions:

Wear a respirator, goggles, rubber gloves, rubber boots and coveralls when handling concentrate. Avoid contact with skin and eyes. DO NOT inhale spray mist.

Environmental Hazards:

Bees: Toxic to bees. Avoid applications when bees are foraging in the treatment area or in groundcover containing blooming weeds. For applications on crops that are highly attractive to pollinators (alfalfa, clovers, canola, safflower, etc.) DO NOT apply during the crop blooming period or during the 5 day period before the crop blooms.

Aquatic organisms: Toxic to aquatic organisms. Avoid application of this product when heavy rain is forecast.

Others: Toxic to birds, mammals, and certain beneficial insects.

Hazard Rating:

Lagon, Cygon 480 AG, Diamante 4: Warning – Poison

Refer to the introduction for an explanation of the symbols.

Dipel 2X DF

Insecticide Group 11

Company:
Valent Canada (PCP#26508)

Formulation:
Bacillus thuringiensis var. kurstaki strain ABTS-351 fermentation solids, spores and insecticidal toxins - 57.0% Potency: 32,000 cabbage looper units (CLU) per mg (32 billion CLU per Kg)

Insects Controlled and Registered Crops:

Crop	Insect
Sunflower	Sunflower moth
Timothy	Essex (European) skipper
Corn	European corn borer larvae
Potato	Cabbage looper
Quinoa	European corn borer

Application:
Dipel

- Treat when larvae are young (early instars) before the crop is damaged. A spreader sticker such as *Triton B1956* should be used to give thorough foliage coverage.

How it Works:
Dipel is a biological stomach insecticide resulting in the larvae ceasing to eat in a few hours, with death usually occurring within 1 to 3 days.

Restrictions:
- **Storage:** Store at temperatures between 0° and 25°C (cooler temperatures preferable).
- **Others:** DO NOT allow diluted spray to stand in tank for more than 12 hours. Use product within 24 months of date of manufacture if stored at cool temperatures. Final spray solution for *Dipel* should have a pH of 5-7.

Precautions:
Harmful if swallowed, inhaled, or absorbed through the skin. Avoid breathing dust or spray mist. Avoid contact with skin, eyes, or clothing. In case of contact with eyes or skin, immediately flush eyes or skin with plenty of water.

Environmental Hazards:
Aquatic organisms: DO NOT contaminate irrigation or drinking water supplies.

Hazard Rating:
Warning – Contains the Allergen Soy

Caution – Eye Irritant, Skin Irritant, Potential Sensitizer

Eco Bran

Insecticide Group 1A

Company:
Peacock Industries (PCP#25815)

Formulation:
Wheat bran infused with carbaryl insecticide (carbaryl 2%).
- Container sizes - 20 kg bag, 1kg bottle

Insects Controlled and Registered Crops:

Crop	Insect
Beans, canola, pastures, rangelands, forage grasses, field borders, headlands, rights-of-way, roadsides, wastelands	Grasshoppers

Pre-harvest Intervals and Livestock Re-entry Periods:

Crop	Pre-harvest Interval/ Livestock re-entry period
Beans	5
Canola	Treat only seedlings
Field borders, headlands, rights-of-way, roadsides, wastelands	0
Entry of beef cattle or other livestock to pastures, rangelands or forage grasses	1
Entry of dairy cattle to pastures or rangelands, harvest of forage crops	2

Application:
Eco Bran
- For ground application only. DO NOT apply by air.
- Broadcast evenly over treatment area. Use gloves and wash thoroughly following application. More information on application and applicators can be found at: **http://www.grasshoppercontrol.com**.

Restrictions:
- DO NOT apply within 50 metres of sloughs, ponds, streams, dugouts or open water. Apply when winds are between 3 to 8 kilometres per hour and do not favour drift.
- May be used in pastures while beef cattle are grazing.

Precautions:
Harmful if inhaled or swallowed. Avoid breathing dust or vapour from bait. Use only in well-ventilated areas. May cause eye irritation. Avoid contact with eyes and skin. Wash thoroughly after handling and before eating or smoking. Avoid contamination of feed and foodstuffs. Keep away from heat, sparks and open flame.

Environmental Hazards:
Bees: Presence of product on flowering crops such as alfalfa and clover will not harm foraging honey or leafcutter bees.
Aquatic Organisms: Toxic to aquatic organisms. Avoid application when heavy rain is forecast.

Entrust

Insecticide Group 5

Company:
Corteva Agriscience (PCP#30382)

Formulation:
Spinosad 240 g/L formulated as a suspension concentrate.
- Container size - 1 L

Insects Controlled and Registered Crops:

Crop	Insect
Potato	Colorado potato beetle larvae and European corn borer larvae

Application:
Entrust
- Apply as a foliar spray by ground only. Apply when scouting indicates the target pest species have reached economic threshold levels. For Colorado potato beetle larvae, target eggs at hatch or small larvae. For control of European corn borer, time the application to coincide with peak egg hatch. Use higher application rate for higher pest pressure or when extended egg hatch is anticipated. If pest populations persist, a repeat application 7 to 10 days after the initial application may be necessary.
- Spinosyns require a spray solution pH between 6 to 8. This is important for the efficacy of the product. It is recommended that growers test the pH of the spray solution prior to adding a spinosyn to the spray tank.

How it Works:
Entrust is in the spinosine class of insecticides. It is a contact and stomach insecticide. It is derived from the fermentation of *Saccharpolyspora spinosa*.

Effects of weather:
This product has the potential for run-off. DO NOT spray immediately after a rainfall or if rain is forecast within 48 hours after application.

Restrictions:
- **Storage:** Avoid freezing. DO NOT store or ship with food, feeds, drugs or clothing.
- **Others:** DO NOT make more than 2 applications per season (maximum of 60 grams per acre).
- **Pre-harvest Interval:** DO NOT apply *Entrust Insecticide* within 7 days of potato harvest.

Precautions:
Buffer Zones: A buffer zone of 2 metres (early season) or 1 metre (late season) is required between downwind edge of spray boom and sensitive aquatic habitats.

Avoid contact with eyes, skin, and clothing.

DO NOT enter or allow worker entry into treated areas for a period of 12 hours after application.

Environmental Hazards:
Bees: Highly toxic to bees exposed to direct treatment, drift or residues on blooming plants. DO NOT apply this product or allow it to drift to blooming plants if bees are visiting the treatment area.

Aquatic organisms: This product is highly toxic to aquatic invertebrates. Avoid application of this product when heavy rain is in the forecast, or immediately after a rainfall.

Others: Harmful to parasitoids and predatory mites and slightly harmful to foliage-dwelling predators.

Hazard Rating:
No specific hazard rating specified.

Exirel

Insecticide Group 28

Company:
FMC Corporation (PCP#30895)

Formulation:
Cyantraniliprole 100 g/L, formulated as a suspension.
- Container sizes - 0.5, 3.79, 100 L

Insects Controlled and Registered Crops:

Crop	Insect
Potatoes	Colorado potato beetle
	Aphids
	European corn borer, variegated cutworm
	Armyworm
	Potato flea beetle

Application:
- Applied as a foliar spray, using ground or aerial application. *Exirel* insecticide is mixed with water for application. Time applications to the most susceptible insect pest stage, typically at egg hatch and/or newly hatched larvae or nymphs, before populations reach damaging levels. When pest populations are high, use the highest listed application rate for that pest. Use the higher rate and high spray volumes for large plants or dense foliage.

How it Works:
Exirel insecticide is a member of the anthranilic diamide class of insecticides which act on insect ryanodine receptors. Although *Exirel* insecticide has contact activity, it is most effective through ingestion of treated plant material. After exposure to *Exirel* insecticide, affected insects will rapidly stop feeding, become paralyzed, and typically die within 1 to 3 days.

Effects of Weather:
Avoid application when heavy rain is forecast.

Restrictions:
- **Storage:** Store product in original container only, away from other pesticides, fertilizer, food or feed.
- **Application interval:** DO NOT apply more than once every 5 days.
  - ***Ground:*** Apply in a minimum finished spray volume of 40 L per acre by ground. Minimum finished spray volume of 40 L per acre. DO NOT apply during periods of dead calm. Avoid application of this product when winds are gusty.
  - ***Air:*** Apply in a minimum finished spray volume of 20 L per acre by air. Minimum finished spray volume of 20 L per acre. DO NOT apply during periods of dead calm. Avoid application of this product when winds are gusty.
- **Pre-harvest interval:** 7 days.
- **Others:** DO NOT make more than 4 applications per season. DO NOT exceed a total of 1.8 litres *Exirel* insecticide per ac per season. DO NOT make a foliar application of *Exirel* insecticide for a minimum of 60 days following an in-furrow or soil application or planting of seed or seed pieces treated with any Group 28 insecticide.

Precautions:
Causes skin irritation. DO NOT get on skin.

Buffer Zones:

Application Method	Crop		Freshwater Habitat of Depths:		Terrestrial habitat
			Less than 1 m	Greater than 1 m	
Ground	Potatoes		2 m	1 m	1 m
Aerial	Potatoes	Fixed wing	5 m	1 m	15 m
		Rotary wing	2 m	1 m	15 m

Environmental Hazards:

Bees: Toxic to bees. DO NOT apply this product to blooming crops or weeds while bees are actively visiting the treatment area. Apply early in the morning or late in the evening when bees are not active. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.

Aquatic organisms: This product is highly toxic to aquatic organisms. To reduce runoff from treated areas into aquatic habitats avoid application to areas with a moderate to steep slope, compacted soil, or clay. Contamination of aquatic areas as a result of runoff may be reduced by including a vegetative strip between the treated area and the edge of the water body.

Others: Toxic to non-target terrestrial plants. 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.

Hazard Rating:

Warning – Skin Irritant

Potential Skin Sensitizer

Refer to the introduction for an explanation of the symbols.

Harvanta 50 SL

Insecticide Group 28

Company:

ISK Biosciences Corporation (PCP#32889)
Distributed in Canada by Belchim Crop Protection Canada

Formulation:

Cyclaniliprole 50 g/L formulated as a suspension.

- Container size - 4 x 3.79 L

Insects Controlled and Registered Crops:

Crop	Insect
Potatoes	Colorado potato beetle, Cabbage looper, Bertha armyworm, Fall armyworm, Potato psyllid (suppression), Leafminers (Liriomyza species), Western flower thrips (suppression)

Application:

- Minimum water volume:
  - ***Ground:*** 200 L per hectare.
- Avoid application during the crop blooming period.

How it Works:

Harvanta 50 SL is effective through contact with the insect and ingestion and has translaminar properties.

Effects of Weather:

Avoid application when heavy rain is forecast.

Restrictions:

- **Storage:** Store product in cool, dry, well ventilated place. To prevent contamination, store this product away from food or feed.
- **Restricted Entry Interval:** 12 hours
- **Pre-harvest interval:** 7 days
- **Others:** Max 3 applications per crop per year. Minimal interval between treatments is 5 days.
- **Buffer Zones:**

Application method	**Buffer Zones (metres) Required for the Protection of:**		
	Aquatic Habitats of Depths		Terrestrial habitat
	Less than 1 m	Greater than 1 m	
Ground	1	0	n/a
Aerial	1	0	n/a

See introduction for an explanation of the different habitats.

Precautions:
Avoid contact with eyes. Avoid prolonged contact with skin. Wash exposed areas of skin thoroughly with soap and warm water after handling or using. Remove contaminated clothing and wash before re-use. Wear a long-sleeved shirt, long pants, chemical-resistant gloves, socks and shoes during mixing, loading, application, clean-up and repair. In addition, wear protective eyewear (goggles or face shield) during mixing and loading. DO NOT enter or allow worker entry into treated areas during the restricted entry interval of 12 hours.

Environmental Hazards:
Bees: Toxic to bees.
Aquatic organisms: Very toxic to aquatic organisms. To reduce runoff from treated areas into aquatic habitats, avoid application to areas with a moderate to steep slope, compacted soil, or clay.
Others: Toxic to certain beneficial insects.

Hazard Rating:


Warning – Combustible liquid. Very toxic to aquatic life. Toxic to aquatic life with long lasting effects.

Refer to the introduction for an explanation of the symbols.

Imidan WP Insecticide

Insecticide Group 1B

Company:
Gowan Canada (PCP#29064)

Formulation:
70% phosmet formulated as a wettable powder in water soluble sachets.

Insects Controlled and Registered Crops:

Crop	Insect
Potato	Colorado potato beetle, potato flea beetle, potato leafhopper, potato aphid

Application:
Imidan
- Apply by ground only.
- *Imidan WP* Insecticide is packaged in water soluble sachets that are to be dropped into the spray tank unopened. DO NOT use in low-volume, gear-type spray equipment.

How it Works:
Imidan is an organophosphate insecticide.

Restrictions:
- **Storage:** Keep sachets dry and DO NOT allow sachets to contact any moist surface prior to adding to spray tank. Keep water soluble sachets in the protective container and store in a cool, dry place. DO NOT store at temperatures below 0°C or above 40°C.
- Buffer zones required for the protection of freshwater habitat: 35 metres for depth of less than 1 metre and 10 metres for depths greater than 1 metre.
- DO NOT apply within 7 days of harvest.
- DO NOT make more than 5 applications per season.
- **Re-entry Interval (REI):** Hand set/handline irrigation related activities involving foliar contact – 33 days; roguing – 26 days; scouting – 2 days; all other activities 0.5 days.

Precautions:
Harmful if swallowed, inhaled or absorbed through the skin. Wear protective clothing, including rubber gloves and goggles, during mixing, loading and spraying.

Environmental Hazards:
Bees: Toxic to bees. Bees may be exposed through direct spray, spray drift, and residues on leaves, pollen and nectar in flowering crops and weeds. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site. Avoid applications when bees are foraging in the treatment area in ground cover containing blooming weeds.
Aquatic organisms: Toxic to aquatic organisms. Avoid application when heavy rain is forecast.
Others: Toxic to birds and small wild mammals. Toxic to certain beneficial insects.

Hazard Rating:

Danger – Poison

Refer to the introduction for an explanation of the symbols.

Intrepid

Insecticide Group 18

Company:

Corteva Agriscience (PCP#27786)

Formulation:

240 grams per litre methoxyfenozide

Insects Controlled and Registered Crops:

Crop	Insect
Corn (field and sweet)	European corn borer
Beans (dry)	European corn borer

Application:

- ***Ground application:*** Thorough uniform coverage of all foliage and fruit is essential for good insect control. Apply in sufficient spray volume to ensure uniform coverage of the treated crop. A minimum of 300 L of water per hectare is generally recommended for ground application.
  - ***Corn*** – Apply at the first signs of feeding damage before the insect enters the fruit. 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 to 10 days if required based on population monitoring. Use the higher rate for heavy infestations, or larger crop canopies
  - ***Beans*** – Apply at the first signs of feeding damage before the insect enters the pods. Repeat applications after 7 to 14 days if required based on population monitoring. Use the higher rate for heavy infestations or advanced growth stages of the target pest.

How it Works:

Intrepid belongs to the diacylhydrazine class of insecticides and mimics the action of the molting hormone of larval Lepidoptera. Upon ingestion, larvae undergo an incomplete and developmentally premature molt which is ultimately lethal. This process interrupts and rapidly halts their feeding. Feeding typically ceases within hours of ingestion although complete mortality of the larvae may take several days. Affected larvae often become lethargic and develop discoloured areas or bands between segments.

Restrictions:

- DO NOT apply during periods of dead calm. Avoid application of this product when winds are gusty. DO NOT apply with spray droplets smaller than the ***ASAE fine*** classification. Boom height must be 60 cm or less above the crop or ground.
- ***Corn:*** Apply a maximum of 3 applications per year.
- ***Beans:*** Apply a maximum of 3 applications per year.
- **Restricted Entry Interval:** 12 hours
- **Pre-harvest interval:**
  - ***Corn*** – DO NOT apply within 3 days of harvest for sweet corn. DO NOT apply within 21 days of harvest for field corn and popcorn.
  - ***Beans*** – DO NOT apply within 7 days of harvest.
- **Storage:** Keep product in original container during storage. To prevent contamination, store this product away from food or feed.
- **Buffer Zones:**

Application method	Buffer Zones (metres) Required for the Protection of Freshwater Habitats of Depths:	
	Less than 1 m	Greater than 1 m
Ground (field sprayer)	2	1

Precautions:

DO NOT apply using aerial application equipment Avoid contact with eyes, skin or clothing. Avoid breathing spray mist. Apply only when the potential for drift to areas of human habitation or areas of human activity such as houses, cottages, schools and recreational areas is minimal. Take into consideration wind speeds, wind direction, temperature inversions, application equipment and sprayer settings.

Environmental Hazards:

Avoid application when heavy rain is forecast. Methoxyfenozide is persistent and will carryover; it is recommended that *Intrepid* not be used in areas treated with this product during the previous season. The use of this chemical may result in contamination of groundwater, particularly in areas where soils are permeable (e.g., sandy soil) and/or the depth to the water table is shallow.
Aquatic organisms: Toxic to aquatic organisms. Observe buffer zones specified under directions for use.
Others: Insecticide use should be based on an IPM program that includes scouting, record keeping, and considers cultural, biological and other chemical control practices. This product is harmful to certain beneficial arthropods.

Hazard Rating:

None listed.

Lambda-cyhalothrin

Insecticide Group 3A

Company:

ADAMA Canada (*Silencer 120 EC* – PCP#29052, *Zivata* – PCP#32427)
Sharda Cropchem Limited (*Labamba* – PCP#33576)
Syngenta Canada (*Matador* – PCP#24984)

Formulation:

120g/L lambda-cyhalothrin formulated as an emulsifiable concentrate.

- Container sizes - 4 x 3.79 L, 4.08 L (Zivata)

Insects Controlled and Registered Crops:

Crop	Insect
Potatoes	Armyworm, Colorado potato beetle, European corn borer, Lygus bugs, potato flea beetle, potato leafhopper, tuber flea beetle, variegated cutworm
Canola, mustard	Crucifer flea beetle, grasshoppers, Lygus bugs, cabbage seedpod weevil (adults), cabbage looper, diamondback moth larvae, imported cabbageworm, bertha armyworm, cutworms (*Matador* only)
Wheat, barley, oats	Grasshoppers, armyworm
Summerfallow (*Labamba* and *Matador* only)	Grasshoppers
Flax	Grasshoppers, cutworms (*Matador* only)
Alfalfa (*Matador* – Ground or Air) (*Silencer* – Ground only)	Alfalfa weevil, Lygus bugs, pea aphid, potato leafhopper, grasshoppers
Corn	European corn borer, corn earworm, cutworm, fall armyworm, armyworm
Beans	Cutworm, corn borer, potato leafhopper, Lygus bugs
Chickpeas	Grasshoppers, potato leafhopper, cutworm
Faba beans (broad beans)	Lygus bugs, potato leafhopper, pea aphid
Lentils	Cutworm, grasshoppers, Lygus bugs, pea aphids, potato leafhopper
Peas	Cutworm, grasshoppers, pea aphids, pea leaf weevil
Soybeans	Cutworm, grasshoppers, Lygus bugs, aphids
Timothy (for seed production only)	Grasshoppers

Application:

Lambda-cyhalothrin

- **Aerial:**
  - Apply in spray volume of 10 to 40 L per hectare
  - ***Canola, mustard, sunflower, flax, alfalfa*** – DO NOT make more than 1 application at the 33.2 mL per acre rate per year.
  - ***Corn, wheat, barley, oats, potatoes, soybean, dry edible bean, pea, chickpea, lentil, favabean*** – DO NOT make more than 2 applications at the 33.2 mL per acre rate per year.
  - ***Matador and Labamba***: *Summerfallow* - DO NOT make more than 1 application at the 33.2 ml/acre rate per year.
- **Ground:**
  - Apply in 100 to 200 L per hectare
  - ***Canola, mustard, sunflower, flax, alfalfa, summerfallow (Labamba* and *Matador), corn, wheat, barley, oats*** – DO NOT make more than 3 applications per year at the 33.2 mL per acre rate. DO NOT cut treated fields for hay or forage; do not graze treated fields.
  - ***Potatoes*** – DO NOT make more than 3 applications per year at the 33.2 mL per acre rate. DO NOT make more than 2 applications per year if using the 50 mL per acre rate. DO NOT exceed 100 mL per acre of lambda-cyhalothrin per year.
  - ***Beans, chickpeas, favabeans, lentils, peas, soybeans*** – DO NOT make more than 3 applications per year. DO NOT graze or harvest treated forage straw or hay for livestock feed.
  - ***Timothy*** – For seed production only.
  - ***Alfalfa*** – Seed from treated crops is not to be used for production of 'alfalfa sprouts' for human consumption.

Timing:

For potato insects, timing of application should be based on the presence of vulnerable pest developmental stages and significant populations as determined by local monitoring.

For sunflower beetles, use the high rate to control adults.

For flea beetles, to prevent migration of over-wintering adults throughout the field, spray a 15 metre strip around the field at the first sign of flea beetle feeding.

For grasshoppers, apply the low rate when grasshoppers are up to the 3rd nymphal stage (up to 1 cm in length) or when insect numbers are low. Apply the high rate when insects are larger, up to but not including, winged adults or when insect numbers are high.

For corn borer control apply before the larva bores into the plant stalk or pods.

How it Works:

Lambda-cyhalothrin is a synthetic pyrethroid insecticide. It is a fast acting stomach and contact insecticide effective against a broad spectrum of foliar pests. It has no fumigant or systemic activity.

Effects of Weather:

For best results, apply *Lambda-cyhalothrin* during the early morning before temperatures rise, and during the evening, past the heat of the day.

Tank Mixes:

Herbicides: (Ground only)

- *Horizon*
- Tralkoxydim$^{\Delta}$ *(Matador* and *Silencer*)

Fungicides: (Tank mixes on legumes (bean, chickpea, lentil, pea, soybean), corn, barley, oats and wheat may be applied by ground or air). Refer to label for other crops.

- Propiconazole$^{\Delta}$ (*Matador* and *Silencer*)
- *Allegro* in dry bean (*Matador* and *Silencer*)
- *Quadris* (*Matador* only)
- *Quilt* (*Labamba* and *Matador*). Refer to the, *Labamba, Matador* and *Quilt* labels for diseases and insects controlled as well as specific application instructions and precautions.
- *Headline* (*Silencer* and *Zivata*) on dry field pea to control insects and diseases listed on the label of each product. Read carefully and follow all use directions and use precautions on both the *Silencer 120 EC* and *Headline EC* Fungicide labels. Failure to follow the rates of use and timing of application as recommended for each product will result in unsatisfactory control of target pest.
- *Touchdown Total* and *Traxion* (*Matador* and *Silencer*)

$^{\Delta}$ **Manufacturers may only support specific mixes. Contact the manufacturer for more information.**

Restrictions:

- DO NOT apply to flowering crops or weeds if bees are visiting treatment area.
- **Grazing:** DO NOT cut treated fields for hay/forage. DO NOT graze treated fields. DO NOT feed treated crops to livestock. DO NOT feed seed screenings and aftermath to livestock. Corn - DO NOT cut treated fields for silage/forage, do not graze treated fields.
- Alfalfa seed from treated crops is not to be used for production of "alfalfa sprouts" for human consumption.

- **Storage:** Store above 0°C. Storage below 0°C will not impair the effectiveness of *Lambda-cyhalothrin*. However, following such storage, agitate well before use.
- **Others:** Allow a 7day interval between applications. DO NOT apply within 15 metres of productive fisheries, water or waterfowl habitat.
- **Restricted Entry Interval:** 24 hours
- **Buffer Zones:**

Application method	Crop	Buffer Zones (metres†) Required for the Protection of:	
		Aquatic Habitats of Depths	
		Less than 1 m	Greater than 1 m
Fixed wing or rotary airplane	Potatoes, oilseed crops, cereal crops, alfalfa, summerfallow	100	20
Fixed wing airplane	Corn	225	20
Rotary wing airplane		250	15
Fixed wing airplane	Legume vegetables	600	25
Rotary wing airplane		300	20

See introduction for an explanation of the different habitats.

- Buffer zones can be reduced by 70 percent when using shrouds and by 30 percent when using cones mounted less than 12 inches from the crop canopy.
- For tank mixes, consult the labels of the tank mix partners and observe the largest (most restrictive) buffer zone of the products involved in the tank mixture.

† Distance measured as metres from the downwind edge of the spray boom to sensitive habitat.

Precautions:

As a result of the completed re-evaluation of lambda-cyhalothrin by the Pest Management Regulatory Agency (PMRA), effective April 29, 2023, changes will affect how all lambda-cyhalothrin-based products may be used in Canada.
Lambda-cyhalothrin has potential for skin and eye irritation. Avoid splashing in eyes or on skin, particularly the face. If hands are contaminated, wash with soap and water before touching other areas of skin.

Environmental Hazards:

Bees: 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. Spray deposits should be dry before bees commence foraging in treated crop.
Aquatic organisms: Toxic to aquatic organisms. Avoid application when heavy rain is forecast.

Hazard Rating:

 Danger – Poison

Refer to the introduction for an explanation of the symbols.

Malathion

Insecticide Group 1B

Company:
Loveland Products Canada (*Malathion 85E* – PCP#8372)

Formulations:
Malathion 85E – 85% malathion formulated as an emusifiable concentrate.

Insects Controlled and Registered Crops:

Crop or Structure	Insect
Alfalfa	Grasshoppers, aphids, lygus bugs, alfalfa weevil larvae, leafhoppers, alfalfa blotch leafminer, spider mites, spittlebugs
Clover	Aphids, grasshoppers, leafhoppers, spider mites
Canola, mustard	Flea beetles, diamondback moth, grasshoppers
Wheat, barley, oats, rye	Grasshoppers, aphids, armyworm, cereal leaf beetle
Potatoes	Colorado potato beetle, leafhoppers, aphids, spider mites
Canaryseed (for seed) (85E only)	Aphids
Sweet clover	Sweet clover weevil
Flax, lentils, hay, pasture	Grasshoppers
Corn (grain, forage)	Earworms, European corn borers
Beans, peas	Aphids, leafhoppers, spider mites
Empty bin spray (grain bins, grain elevators, grain box cars, flour mills)	Confused flour beetles, flat grain beetles, granary weevils, grain mites, Indian meal moths, lesser grain borers, red flour beetle, rice weevils, rusty grain beetles, saw-toothed grain beetle

Application:
Malathion

- May be applied by air or ground equipment. Apply when insect numbers exceed economic threshold levels using sufficient water for good coverage. Use higher rates for heavy infestations, dense canopy or mature stages of insects.

How it Works:
Malathion is a non-systemic, contact, organophosphate insecticide and acaricide of brief to moderate persistence.
Generally non-phytotoxic.

Effects of Weather:
For best results apply when daytime temperatures are above 20°C.

Restrictions:

- **Grazing:** When spraying forages and pastures, cattle should be removed and returned after spraying.
- **Storage:** DO NOT store near food or feed. Store in a cool dry place but not below -10°C. Protect from heat.
- **Others:** Maximum of 2 applications per season. DO NOT apply to any plant in bloom. Apply to crops when bees are absent from field. Avoid contact with automobile paint and wash immediately if exposure occurs.
- **Restricted Entry Interval:** 12 hours

Note: Some commodities, such as canola, should not be stored in facilities recently treated with malathion. *Malathion* residue can linger in bins for up to six months after treatment and can be transferred from the bin to canola seed. Canola found with malathion residues is unacceptable for export customers.

The Pest Management Regulatory Agency (PMRA) has advised that any malathion products over one year old should not be used and should be returned as part of provincial pesticide recycling programs.

Precautions:
Malathion has a low acute mammalian toxicity. Wear protective clothing to reduce skin and eye exposure.

Environmental Hazards:

Bees: Toxic to bees exposed to direct treatment, drift, or residues on flowering crops or weeds. DO NOT apply this product to flowering crops or weeds if bees are visiting the treatment area.

Aquatic organisms: Toxic to aquatic organisms. Avoid application of this product when heavy rain is forecast.

Others: Toxic to birds. Toxic to certain beneficial insects.

Hazard Rating:

 Warning – Poison

Refer to the introduction for an explanation of the symbols.

Minecto Duo 40WG

Insecticide Group 4A and 28

Company:

Syngenta Canada Inc. (PCP#30900)

Formulation:

20% thiamethoxam and 20% cyantraniliprole formulated as a wettable granule.

- Container size - 2 x 3.04 kg jugs

Insects Controlled and Registered Crops:

Crop	Insect
Potato	Aphids, Colorado potato beetle, flea beetles, potato leafhopper

Application:

Minecto Duo

- Can be applied by ground only. Apply by closed cab groundboom only.
- Apply as an in-furrow spray at seeding depth or in a narrow surface band above the seedline during planting.
- Apply in sufficient water volume to ensure uniform application and incorporation into the soil. Add half of the required amount of water to the mix tank. With agitator running add the *Minecto Duo* to the tank. Continue agitation while adding the remaining water. Apply once the *Minecto Duo* has completely dispersed into the water mix. Maintain agitation until all the mixture has been applied.

How it Works:

Minecto Duo contains two active ingredients. Thiamethoxam is a neonicotinoid insecticide and cyantraniliprole is a diamide insecticide. Both components have systemic (within the plant) properties and interfere with neuro-transmission in insects. Mode of action is through contact or ingestion.

Restrictions:

- DO NOT apply by air.
- DO NOT use a foliar application of a product containing a Group 4 (neonicotinoid) or Group 28 (diamide) insecticide following in-furrow or soil application of *Minecto Duo*.
- **Restricted Entry Interval:** DO NOT enter or allow worker entry into treated areas for 12 hours.
- **Storage:** Store product in original container only, in a cool, dry place and away from food or feed. Keep container closed.

Precautions:

If *Minecto Duo* is to be used on a commodity that may be exported to the United States and you require information on acceptable residue levels in the United States, visit CropLife Canada's website at **www.croplife.ca**.

Environmental Hazards:

Bees: Toxic to bees. This product is systemic and bees can be exposed to product residues in flower, leaves, pollen and/or nectar resulting from soil applications.

Aquatic organisms: Toxic to aquatic organisms. Avoid application of this product when heavy rain is forecast. The use of this chemical may result in contamination of groundwater particularly in areas where soils are permeable (e.g. sandy soil) and/or the depth to the water table is shallow.

Hazard Rating:

 Warning – Poison

Refer to the introduction for an explanation of the symbols.

Minecto Pro

Insecticide Group 6 and 28

Company:
Syngenta Canada Inc. (PCP#33023)

Formulation:
Abamectin and cyantraniliprole formulated as a soluble concentrate.
- Container size - 3.78 L

Active Ingredient(s)	Guarantee	Resistance Group
Abamectin	28.5 g/L	Group 6
Cyantraniliprole	135 g/L	Group 28

Insects Controlled and Registered Crops:

Crop	Insects
Potatoes	European corn borer
	Spider mites, potato psyllids, and flea beetle
	Colorado potato beetle

Application:
- ***Minimum water volume:*** 200 L per hectare, 80 L per acre. Apply with 0.1 to 0.5 percent v/v non-ionic surfactant (NIS).

How it Works:
Minecto Pro is a non-neonicotinoid insecticide that delivers rapid activity through two complementary active ingredients – abamectin (Group 6) and cyantraniliprole (Group 28). Both active ingredients use translaminar movement within the plant to achieve excellent coverage of the crop, providing a reservoir of activity for extended residual control of targeted pests.

Tank Mixes:
There are no registered tank mixes for this product. Application of unlabelled tank mixes is permitted by PMRA (Pest Management Regulatory Agency) as long as both products are registered and being used within their registered use pattern (e.g. application rate, application timing, number of applications per season, pre-harvest interval, pest claim, etc.).

Restrictions:
- DO NOT apply by air.
- **Rainfast period:** Once dry on leaf. Avoid application if heavy rainfall is forecast.
- **Restricted Entry Interval:** 12 hours
- **Pre-harvest interval:** 14 days
- **Storage:** Store product in original container only, in a cool, dry place and away from food or feed. Keep container closed.
- **Other Restrictions:** For European corn borer, spider mites, potato psyllids and flea beetle, DO NOT make a foliar application of *Minecto Pro* for a minimum of 60 days following an in-furrow or soil application or planting of seed pieces treated with any Group 28 insecticide. For Colorado potato beetle, DO NOT apply *Minecto Pro* for Colorado potato beetle control if any Group 28 was used at planting as an in-furrow, soil or seed-piece treatment.
- **Buffer Zones:**

Application method	Buffer Zones (metres†) Required for the Protection of:		
	Aquatic Habitats of Depths		Terrestrial habitat
	Less than 1 m	Greater than 1 m	
Ground	15	20	1
Aerial	N/A	N/A	N/A

Environmental Hazards:
Bees: Toxic to bees exposed to direct treatment or residues on blooming crops or weeds. DO NOT apply this product or allow drift to blooming crops or weeds if bees are visiting the treatment area.
Aquatic organisms: Toxic to aquatic organisms. Contamination of aquatic areas as a result of runoff may be reduced by including a vegetative strip between the treated area and the edge of the water body.

Hazard Rating:

Danger – Poison. Hazard to humans and domestic animals. Fatal or poisonous if swallowed. Harmful if inhaled. Avoid breathing spray mist.

Refer to the introduction for an explanation of the symbols.

Movento 240 SC

Insecticide Group 23

Company:

Bayer (PCP#28953)

Formulation:

240 g/L spirotetramat formulated as a suspension concentrate.

Insects Controlled and Registered Crops:

Crop	Insect
Potato	Aphids
Beans, chickpea, lentil, peas, soybean	Aphids

Application:

Movento 240 SC

- Ground application only in potatoes and soybeans. Ground or air application for beans, chickpea, lentil and peas. Apply in adequate water for uniform coverage, a minimum of 120 L per acre. If needed repeat application with a minimum of 7 to 10 day interval. DO NOT exceed a maximum of 292 mL per acre per season.
- For best results apply when insect populations begin to build and before a damaging population becomes established. Select the appropriate rate depending on the development stage of the insect and level of infestation.

How it Works:

Movento is a systemic, tetramic acid insecticide. Following application to plant foliage *Movento* moves through phloem and xylem to all plant tissues including new shoot, leaf and root growth. Mode of action is primarily by ingestion by immature insect life stages. Insect death occurs due to the inability to progress to the next development stage. Adults produce less offspring following exposure.

Restrictions:

- DO NOT apply this product directly to freshwater habitats (such as lakes, rivers, sloughs, ponds, creeks, marshes, streams, reservoirs and wetlands). DO NOT apply during periods of dead calm. Avoid application when winds are gusty. DO NOT apply droplets smaller that ***American Society of Agricultural Engineers (ASABE) fine*** classification. Boom height must be 60 cm or less above ground.
- **Re-Entry:** DO NOT enter or allow worker entry into treated areas for a period of 12 hours.
- **Re-cropping:** A plant back interval of 30 days is required for all crops not on the label.

Environmental Hazards:

Bees: Toxic to bee brood. Bee brood may be exposed to residues in/on pollen and nectar brought back to the hive by bees foraging on flowering crops and weeds. DO NOT apply this product during crop flowering period or when flowering weeds are present in the treatment area.

Aquatic organisms: Toxic to aquatic organisms. Avoid application when heavy rain is forecast.

Others: Toxic to certain beneficial insects.

Hazard Rating:

Caution – Poison

Refer to the introduction for an explanation of the symbols.

Nolo Bait

Insecticide Group
Biological Insecticide

Company:
M&R Durango, Inc. (PCP#29197)

Formulations:
Wheat bran coated with spores of the protozoan *Nosema locustae*.
Minimum of 2.2 x 10^6 spores of *Nosema (Paranosema) locustae* Canning per gram.

Insects Controlled and Registered Crops:

Crop	Insect
Crop and Rangeland	Grasshoppers

Rates:
- Apply at a minimum rate of 0.45 kg per acre.
- Consumption of a higher number of spores per grasshopper will increase product efficacy and decrease the amount of time required to kill grasshoppers. Where greater efficacy or faster population reduction is required, this may be achieved through multiple applications or a higher application rate to increase the amount of bait available to each grasshopper.

Application:
Nolo Bait
- For best results, apply when most grasshoppers are in the 3rd instar (12 to 19 mm long).
- Apply by hand, seed spreader, turbine spreader or airplane. Concentrate the application in areas of heaviest grasshopper infestation.

How it Works:
Nolo Bait must be consumed by the target insect to be effective. It infects the fat bodies of most species of grasshoppers and some crickets. Infection and sickness of the grasshopper begins upon ingestion of the bait by the grasshopper. As the *Nosema locustae* population increases inside the grasshopper it becomes lethargic, reduces its feeding and has lowered reproductive capacity. Grasshopper death will begin in 3 to 6 weeks. The pathogen may remain in the grasshopper population for several years following treatment.

Restrictions:
- **Pre-harvest interval:** 0 days
- **Storage:** Store product in original container in a cool, dry location (preferably at or below 20°C). Use within 13 weeks from the date of manufacture.

Precautions:
May cause sensitization. Avoid contact with skin, eyes, or clothing. Avoid breathing dust or spray mist.

Environmental Hazards:
Aquatic organisms: DO NOT contaminate irrigation or drinking water supplies or aquatic habitats by cleaning of equipment or disposal of wastes.

Hazard Rating:
Warning – Contains the Allergen Wheat


Caution – Potential Sensitizer

Refer to the introduction for an explanation of the symbols.

Oberon

Insecticide Group 23

Company:
Bayer (PCP#28905)

Formulation:
240 g/L spiromesifen formulated as a suspension concentrate.
- Container size - 2 L jug

Insects Controlled and Registered Crops:

Crop	Insect
Alfalfa (seed production only)	Twospotted spider mite
Corn	Banks grass mite, twospotted spider mite
Dry beans	Spider mites

Application:
Oberon
- May be applied by ground or air.
- Apply as soon as mite populations reach threshold levels. Repeat application if pest populations recover and reach economic thresholds. A minimum interval of 7 days between applications is required.
- Thorough coverage of all plant parts is important for optimum performance. Use sufficient water volumes for thorough coverage - e.g. minimum of 40 to 80 L of water per acre.
- Avoid application when heavy rain is forecast.

How it Works:
Spiromesifen is in the Tetronic acid class of insecticides and works by contact, inhibiting lipid biosynthesis in the insect. *Oberon* has strong adhesion to the leaf surface, and also some translaminar activity providing residual control through contact or ingestion. *Oberon* has activity on all mite developmental stages. Immature mite stages tend to be more susceptible to *Oberon* than adults.

Restrictions:
- Alfalfa – DO NOT exceed 3 applications per season. Keep a minimum interval of 7 days between applications. DO NOT exceed a maximum of 1200 mL per acre of *Oberon* per season. Corn – DO NOT exceed 2 applications per season. DO NOT exceed 240 mL per acre per 14 day interval. DO NOT exceed 480 mL per acre per season.
- DO NOT enter or allow entry into treated areas for a period of 12 hours after application.
- *Oberon* is toxic to aquatic organisms and beneficial insects such as pollinators. DO NOT apply this product directly to freshwater habitats such as lakes, rivers, sloughs, ponds, creeks, marshes, streams, reservoirs, ditches and wetlands.
- **Buffer Zones:**

Application method			**Buffer Zones (metres†) Required for the Protection of:**		
			Aquatic Habitats of Depths		Terrestrial habitat
			Less than 1 m	Greater than 1 m	
Alfalfa	**Ground**		10	3	2
	Aerial	**Fixed wing**	800	100	85
		Rotary	675	85	65
Corn	**Ground**		5	2	1
	Aerial	**Fixed wing**	225	30	35
		Rotary	200	25	35

Application method			Buffer Zones (metres†) Required for the Protection of:		
			Aquatic Habitats of Depths		Terrestrial habitat
			Less than 1 m	Greater than 1 m	
Dry beans	**Ground**		5	2	1
	Aerial	**Fixed wing**	250	40	50
		Rotary	300	35	45

See introduction for an explanation of the different habitats.

- Buffer zones can be reduced by 70 percent when using shrouds and by 30 percent when using cones mounted less than 12 inches from the crop canopy.

† Distance measured as metres from the downwind edge of the spray boom to sensitive habitat.

- DO NOT mix, load or clean equipment within 30 metres of wellheads or aquatic systems.
- **Rotational plant-back intervals for:**
  - ***Field corn*** – immediate plant back
  - ***Wheat, barley and alfalfa*** – 30 days
  - ***All other crops*** – 12 months

Precautions:

Storage: Store in a cool, dry place in such a manner to prevent cross contamination with other pesticides, fertilizers, food and feed. DO NOT store below freezing.

Environmental Hazards:

Bees: 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. To minimize potential exposure to bees, avoid application if bees are visiting the treatment area.
Aquatic organisms: Toxic to aquatic organisms. Avoid application of this product when heavy rain is forecast.
Others: Toxic to certain beneficial insects.

Hazard Rating:


Caution – Poison
Eye Irritant

Refer to the introduction for an explanation of the symbols.

Permethrin

Insecticide Group 3A

Company:

FMC Corporation (*Pounce 384 EC* – PCP#16688)
UPL AgroSolutions Canada Inc. (*Perm-UP* – PCP#28877)
AMVAC (*Ambush 500 EC*– PCP#14882)
Interprovincial Cooperative Limited (*IPCO Syncro* – PCP#33838)

Formulations:

Pounce 384 EC – 384 g/L permethrin formulated as an emulsifiable concentrate.

- Container sizes - 12 x 1 L, 2 x 10 L

IPCO Synchro – 384 g/L permethrin formulated as an emulsifiable concentrate.

- Container sizes - 2 x 10 L, 12 x 1 L, 4 x 6 L, 2 x 7.5 L

Perm-UP - 384 g/L permethrin formulated as an emulsifiable concentrate.

- Container sizes - 12 x 1L, 4 x 6L

Ambush 500 EC – 500 g/L permethrin formulated as an emulsifiable concentrate.

- Container size - 3.8 L

Insects Controlled and Registered Crops:

Crop	Insect
Cereals, corn, flax, lentil, pea, potato, sunflowers (up to 5 leaves)	Cutworm
Canola, rapeseed (up to 5 leaves)	Cutworm, crucifer flea beetle, striped flea beetle (*Ambush* and *Pounce*)
Potato	Colorado potato beetle, potato flea beetle, potato leafhopper, tarnished plant bug, variegated cutworm, European corn borer

Application:

Permethrin

- May be applied by ground or air. Apply when insects exceed economic threshold numbers and use sufficient water for good coverage. Use higher rates for heavy infestations, adult insects and dense foliage. For cutworm control application should be made under warm, moist conditions in the evening or at night. Use high rates if larvae are near maturity or soil conditions are dry. DO NOT disturb soil surface for 5 days after treatment.

How it Works:

Permethrin is a synthetic pyrethroid insecticide. It is a stomach and contact insecticide with no systemic or fumigant effects.

Tank Mixes:

Pounce 384EC Insecticide is registered to tank-mix with Coragen(R) Insecticide. FMC supports the following mixes that are not on the *Pounce 384 EC* label. Apply mixes based on the most restrictive use limitations for either label: Glyphosate (up to 5 leaf stage canola), *Liberty 150 SN Herbicide* (up to 5 leaf stage canola), *Liberty 150 SN Herbicide + Centurion* (up to 5 leaf stage canola).

AMVAC supports the following mixes that are not on the *Ambush 500 EC* label. Apply mixes according to the most restrictive use limitations for either label.

- **Canola (up to the 5 leaf stage):** Glyphosate, *Liberty 150 SN*, *Liberty 150 SN + Centurion*, *Liberty 150 SN + Assure II*.

Restrictions:

- **Grazing:** Cover crops or crops treated with *permethrin* should not be used as a green feed for animals.
- **Pre-harvest interval:**
  - ***Corn*** – 30 days
  - ***Sweet corn*** – 1 day
  - ***Lentils, peas, wheat, barley, oats, rye*** – 7 days
  - ***Potatoes*** – 1 day
- **Storage:** Store above -12°C.
- A 16 yard (15 metres) setback distance for ground and 110 yard (100 metres) setback distance by air near water bodies or other sensitive areas.
- **Buffer Zones:** To reduce risk to aquatic organisms from run-off, a vegetative filter strip of at least 10 metres wide between the field edge and adjacent, downhill aquatic habitats must be observed. See label for more details.

Application method			**Buffer Zones (metres) Required for the Protection of:**	
			Aquatic Habitats of Depths	
			Less than 1 m	Greater than 1 m
Canola, barley, field corn, flax, oats, pea, rye, sunflower, wheat, lentil	**Ground**		10	5
Potato			35	15
Barley, field corn, flax, oats, peas, potato, rye, sunflower, triticale, wheat, canola, lentils	**Aerial**	**Fixed wing**	800	800
		Rotary	700	475

Precautions:

Permethrin is of low acute mammalian toxicity.

Environmental Hazards:

Bees: very toxic to bees; avoid spraying when bees are foraging. Spray deposit should be dry before bees commence foraging in treated crop.

Aquatic organisms: Highly toxic to fish and aquatic organisms. DO NOT contaminate ponds, lakes, streams or rivers during sprayer filling or rinsing operations or while spraying.

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. *Permethrin* may impact predatory and parasitic arthropod species used in IPM programs within the treatment area. Unsprayed refugia for beneficial species of at least 1 metre from treatment area will help maintain beneficial arthropod populations.

Hazard Rating:


Caution – Poison

Refer to the introduction for an explanation of the symbols.

Plutex

Insecticide Group 31

Company:
Andermatt Canada Inc. (PCP# 34785)

Formulation:
Plutella xylostella granulovirus (PlxyGV) isolate GV-0020. Minimum of 2.5 x 1013 occlusion bodies (OBs)/L.
- Container size - 100mL-1000L

Insects Controlled and Registered Crops:

Crop	Insect
Canola	Diamondback moth

Application:
- *Plutex* is for ground application only.
- Spray on plants infested with eggs or 1st instar larvae. To be effective, larvae must ingest foliage or fruits with deposits of *Plutex*.
- Apply as a full coverage spray using enough water to sufficiently cover the crop without excess run-off, minimum 200 L/ha. Re-apply every 4-8 days. Within the stated range, use the shorter re-application interval and higher application rate under high pest pressures.
- Dissolve product in the required amount in water. The pH of the solution should range between 5 and 8.5. Depending upon weather conditions and the persistence of the pest infestation, the applications may be repeated every 6-8 days. Between 2 to 5 applications may be required per generation. The use of pheromone traps is recommended to optimize application timing.

How it Works:
The active ingredient in Plutex is a naturally occurring virus of the diamondback moth (*Plutella xylostella*). It is a highly selective pathogen of the diamondback moth. It infects larvae by ingestion and passage through the digestive organs. Topical application has no effect

Tank Mixes:
This product may be tank mixed with registered pest control products, whose labels also allow tank mixing, provided the entirety of both labels, including Directions For Use, Precautions, Restrictions, Environmental Precautions, and Spray Buffer Zones are followed for each product. In cases where these requirements differ between the tank mix partner labels, the most restrictive label must be followed. Do not tank mix products containing the same active ingredient unless specifically listed on this label.In some cases, tank mixing pest control products can result in reduced pesticide efficacy or increased host crop injury. The user should contact Andermatt Canada Inc. at 1-888-870-6444 for information before applying any tank mix that is not specifically recommended on this label. The tank mix pH must be between 5 and 8.5. It is recommended that Plutex be added last to the tankmix.

Restrictions:
- **Restricted Entry Interval:** 4 hours or until sprays have dried unless wearing waterproof gloves, long-sleeved shirt, long pants, socks and shoes
- **Pre-harvest interval:** Plutex can be used up to and including the day of harvest. PHI=0 days
- As this product is not registered for the control of pests in aquatic systems, DO NOT use to control aquatic pest.
- DO NOT apply in greenhouses.
- DO NOT apply this product by any type of irrigation system.
- DO NOT contaminate irrigation or drinking water supplies or aquatic habitats by cleaning of equipment or disposal of wastes.
- DO NOT apply by air.
- **Storage:** Plutex® can be stored in the refrigerator (<5°C) for two years from the date of manufacture. Store container upright and keep tightly closed when not in use. Shake vigorously to re-suspend contents immediately prior to addition in water

Environmental Hazards:
To reduce runoff from treated areas into aquatic habitats, avoid application to areas with a moderate to steep slope, compacted soil or clay.
Avoid application when heavy rain is forecast.
Contamination of aquatic areas as a result of runoff may be reduced by including a vegetative filter strip between the treated area and the edge of the water body.

Hazard Rating:
Not Classified; No hazardous components.

Rimon 10 EC

Insecticide Group 15

Company:
UPL AgroSolutions Canada Inc. (PCP#28881)

Formulation:
10% novaluron formulated as an emulsifiable concentrate.
- Container size - 2 x 10L

Insects Controlled and Registered Crops:

Crop	Insect
Alfalfa (for seed)	Lygus bug nymphs
Potato	Colorado potato beetle, European corn borer

Application:
Rimon 10 EC
- For ground application only.
- A minimum spray volume of 40 L per acre for potatoes, a minimum spray volume of 80 L per acre for alfalfa. Higher water volumes will provide better coverage and product performance. Re-application interval of 10 to 14 days in potatoes and 7 to 10 days in alfalfa.
- Use hollow cone, disc-core hollow cone or twin jet nozzles suitable for Insecticide spraying. Drop nozzles may be required to obtain uniform coverage against certain insect pests that develop down in the canopy. Use higher application rates and spray volumes for higher insect pressure.
- Lygus bugs – application should be made when lygus bugs appear
- Colorado potato beetle – Application should be made when the majority of the population is at egg hatch to the second instar of larval development.
- European corn borer – Scout for European corn borer to monitor egg-laying and egg hatch to determine timing of application. The first application should be made just prior to egg hatch.
- Re-application on a 10 to 14 day interval will be required to protect new growth or if monitoring indicates that it is necessary to keep pest populations below economic thresholds.

How it Works:
Rimon 10 EC is an insect growth regulator that must be absorbed by eggs or ingested by insect larvae to be fully effective. The primary mode of action is by disrupting cuticle formation and deposition occurring when insects change from one developmental stage to another, resulting in death at molting. Due to this mode of action, *Rimon 10EC* does not have any effect on adult stages of insects that have completed larval development.

Restrictions:
- DO NOT make more than 2 applications per year per crop per season. DO NOT apply more than 664 mL of *Rimon 10 EC* per acre per season in potatoes. DO NOT apply more than 676 mL of *Rimon 10 EC* per acre per season in alfalfa. DO NOT apply within 14 days of harvest (Pre-harvest interval).

Precautions:
- **Restricted Entry Interval:** DO NOT re-enter treated areas for a period of 12 hours after application.
- **Buffer Zone:** An untreated buffer zone between the last spray swath and the edge of aquatic systems (such as rivers, streams, lakes, and other water bodies) must be established. Refer to label for specific buffer zone requirements.
- **Storage:** To prevent contamination, store this product away from food or feed.

If this product is to be applied to a product destined for export to the United States, information on acceptable residue levels are available at **www.croplife.ca**.

Environmental Hazards:
Bees: May be toxic to bee colonies exposed to direct treatment, drift, or residues on flowering crops or weeds. Avoid applying this product to flowering crops or weeds if bees are visiting the treatment area.
Aquatic organisms: Toxic to aquatic organisms. Avoid application of this product when heavy rain is forecast. DO NOT apply directly to water or to areas where surface water is present.
Others: *Rimon 10 EC* is toxic to immature insects. Minimize spray drift in habitats next to the application site (e.g. hedgerows and woodlands) to reduce harmful effects on beneficial insects.

Hazard Rating:


Warning – May cause substantial but temporary eye injury. Harmful if absorbed through skin. DO NOT get on eyes or clothing.

Keep out of reach of children.

Refer to the introduction for an explanation of the symbols.

Scorpio Ant and Insect Bait

Insecticide Group 5

Company:

W. Neudorff GmbH KG (PCP#33306)
Distributed in Canada by Belchim Crop Protection Canada

Formulation:

0.07% spinosad formulated as an emulsifiable concentrate.

- Container size - 1 to 800 kg

Insects Controlled and Registered Crops:

Crop	Insect
Potato	Black cutworm, reduces damage caused by wireworm
Dry bean, faba, chickpea, lentil, field pea, soybean	Black cutworm, reduces damage caused by wireworm

Application:

- Granular Bait – Spreader. DO NOT place in piles.
- To reduce damage caused by wireworm: Incorporate into the soil at planting to a depth of 10 to 20 cm at a rate of 25 to 50 kg per hectare (2.5 to 5.0 g per square metre). Use the high rate when wireworm pressure is expected to be high.
- Black cutworm – Reapply after heavy rain or watering. Reapply as the bait it is consumed or every 4 weeks.

How it Works:

Scorpio Ant and Insect Bait in the spinosyn class of insecticides. It is a stomach insecticide.

Effects of Weather:

Avoid application when heavy rain is forecast.

Restrictions:

- **Pre-harvest Interval:**
  - ***Potatoes*** – 7 days
  - ***Dry bean, faba bean, chickpea, lentil, field pea, soybean*** – 28 days
- **Storage:** To prevent contamination store this product away from food and feed.
- **Other:** Maximum of 2 applications per year. DO NOT apply by air.

Precautions:

Avoid contact with eyes, skin and clothing. DO NOT allow adults, children or pets in treatment areas during application. Wash immediately after using this product. Wear long-sleeved shirt, long pants, chemical-resistant gloves, shoes plus socks during loading, application, clean-up and repair.

Environmental Hazards:

Bees: Toxic to bees.

Aquatic organisms: Toxic to aquatic organisms. To reduce runoff from treated areas into aquatic habitats avoid application to areas with a moderate to steep slope, compacted soil, or clay. Avoid application when heavy rain is forecast. Contamination of aquatic areas as a result of runoff may be reduced by including a vegetative strip between the treated area and the edge of the water body.

Others: Toxic to certain beneficial insects.

Hazard Rating:


Warning – May be harmful if swallowed. May be harmful in contact of skin. Causes mild skin irritation. Causes eye irritation. May be harmful if inhaled.

Refer to the introduction for an explanation of the symbols.

Sefina

Insecticide Group 9

Company:
BASF (PCP#33265)

Formulation:
50 g/L afidopyropen formulated as a dispersible concentrate.
- Container size - 2 x 3.24 L jug

Insects Controlled and Registered Crops:

Crop	Insect
Soybean	Soybean aphid
Potato	Potato aphid, green peach aphid, suppression of potato leafhopper
Alfalfa, clover (*Trifolium* spp., *Melilotus* spp.), lupin, sainfoin, trefoil, vetch (crown, milk)	Pea aphid, spotted alfalfa aphid, potato leafhopper (suppression only)
Grass forage, fodder, hay	Pea aphid, blue alfalfa aphid (suppression), spotted alfalfa aphid (suppression), potato leafhopper (suppression)

Application:
Sefina
- May be applied by ground or air.
- Apply *Sefina* at rates listed in the crop specific application rate tables when insect thresholds are reached. Ensure adequate water volumes are used for optimum coverage.
- **Soybean and Potato:**
  - ***Ground*** – Apply in a minimum of 40.5 to 81 L of water per acre.
  - ***Air*** – Apply in a minimum of 20.2 L of water per acre.

How it Works:
Sefina is classified as an IRAC Group 9D insecticide with no known cross resistance to other chemistries. It is a contact insecticide that stops aphid feeding quickly and can provide control for up to 21 days.

Effects of Weather:
Apply only when meteorological conditions at the treatment site allow for complete and even crop coverage. DO NOT apply during periods of dead calm. Avoid application of this product when winds are gusty. This product has the potential for run-off. Avoid application when heavy rain is forecast.

Restrictions:
- **Restricted Entry Interval:** DO NOT enter or allow worker entry into treated areas for a period of 12 hours after application.
- Allow a minimum of 7 days between applications.
- **Storage:** Store the leftover product in original, tightly closed container. DO NOT ship or store the product near food, feed, seed and fertilizers. Store the product in cool, dry, locked, well-ventilated area without floor drain.
- **Others:**
  - DO NOT apply more than a maximum seasonal rate of 1 L per acre (potato), 0.16 L per acre (soybean), or 0.5 L per acre (alfalfa, clover, lupin, sainfoin, trefoil, vetch).
  - DO NOT apply within 7 days of harvest.
  - DO NOT feed or graze soybean hay or forage.
  - DO NOT apply less than 7 days before harvest for potato and soybean.
  - DO NOT apply more than 2 applications per year (soybean), or 4 applications per year (potato, alfalfa, clover, lupin, sainfoin, trefoil, vetch
  - DO NOT make more than 2 sequential applications of *Sefina* insecticide before using an insecticide with a different mode of action.

Precautions:

Wear a long-sleeved shirt, long pants, chemical-resistant gloves, socks and shoes during mixing, loading, application, clean-up and repair. Gloves are not required during application within a closed cab and/or cockpit. Wash hands before eating, drinking, smoking or using the toilet. Change out of work clothes and take a bath or shower after handling or spraying the product. Launder protective clothing before re-use.

A Vegetative Filter Strip (VFS) of at least 10 metres wide must be observed. The VFS is required between the field edge and adjacent, downhill aquatic habitats to reduce risk to aquatic organisms from run-off. The VFS is to be composed of grasses and may also include shrubs, trees, or other vegetation.

Allow a minimum of 7 days between applications.

- **Buffer Zones:**

Application method	**Crop**		**Buffer Zones (metres) Required for the Protection of:**	
			Freshwater Habitat of Depths:	
			Less than 1 m	Greater than 1 m
Ground*	Soybean		1	1
	Potato		3	2
	Alfalfa, clover, lupin, sainfoin, trefoil, vetch		2	1
Aerial	Soybean	Fixed wing	10	1
		Rotary wing	10	1
	Potato	Fixed wing	75	25
		Rotary wing	65	20
	Alfalfa, clover, lupin, sainfoin, trefoil, vetch	Fixed wing	25	10
		Rotary wing	20	10

Environmental Hazards:

Bees: Application during the crop blooming period may be made only in the evening when most bees are not foraging. Minimize spray drift to reduce exposure to bees in habitats close to the application site.

Aquatic organisms: Toxic to aquatic organisms. Observe buffer zones and vegetative filter strips specified under directions for use.

Hazard Rating:

 Caution – Poison

Refer to the introduction for an explanation of the symbols.

Sevin XLR

Insecticide Group 1A

Company:
Tessenderlo Kerley, Inc. (PCP#27876)

Formulation:
466 g carbaryl per litre formulated as a liquid suspension.

Insects Controlled and Registered Crops:

Crop	Insect
Beans	Leafhoppers, lygus bugs, climbing cutworm
Canola	Flea beetles
Forage grasses	Grasshoppers
Ditchbanks, field borders, headlands, pastures, rangelands, rights-of-way, wastelands	Grasshoppers
Peas	Alfalfa looper
Potato	Colorado potato beetle, flea beetle, leafhopper, European corn borer, climbing cutworm

Application:
- Ground application only, except for canola.
- For grasshoppers, lower rates can be used for nymphs or sparse vegetation, and higher rates for adults and application to dense vegetation.
- In canola, applications can be made up to 4 weeks following plant emergence.

How it Works:
Sevin XLR is a carbamate insecticide that works by contact and ingestion.

Restrictions:
- **Storage:** DO NOT store in areas where temperatures frequently exceed 38°C. Store in original container in a cool dry area out of reach of children and animals and away from food and feed.
- **Restricted-Entry Intervals:**
  - ***Beans*** – 7 days for high contact activities such as scouting
  - ***Canola*** – 0.5 days
  - ***Forage grasses and pastures*** – 2 days
  - ***Potatoes*** – 0.5 to 6 days depending on the activity (see label).
- **Number of applications per year:** maximum of 2 applications per year in canola, beans, and potatoes.

Environmental Hazards:
Bees: This product is highly toxic to honey bees exposed to direct treatment on blooming crops or weeds. For applications on crops that are highly attractive to pollinators DO NOT apply during the crop blooming period.

Aquatic organisms: Toxic to aquatic organisms. Avoid application of this product when heavy rain is forecast.

Plants: To avoid possible injury to tender foliage, do not apply to wet foliage or when rain or high humidity is expected during the next 2 days. *Sevin XLR* injures Boston ivy, Virginia creeper and Maidenhair fern.

Others: Toxic to birds and mammals.

Hazard Rating:
 Warning – Poison

Refer to the introduction for an explanation of the symbols.

Sivanto Prime

Insecticide Group 4D

Company:
Bayer (PCP#31452)

Active Ingredient:
Flupyradifurone

Formulation:
200 g Flupyradifurone per litre formulated as a liquid suspension.
- Container size - 2 L

Insects Controlled and Registered Crops:

Crop	Insect
Potato	Aphids, leafhoppers, Colorado potato beetle
Corn	Aphids
Chickpea, dry bean, faba bean, field pea, lentil, soybean, alfalfa (forage, silage and hay production only)	Aphids, leafhoppers

Application:
- Apply once the target pest population has reached economic threshold according to local recommendations.
- DO NOT apply within 1 hour of rain. Avoid application when heavy rain is forecast.
- **Potato:**
  - ***Application interval*** – 10 days
    - *Ground* – Apply as a directed foliar spray ensuring thorough coverage. Minimum 40 L per acre.
    - *Air* – Minimum 8 L per acre. DO NOT apply during periods of dead calm. Avoid application of this product when winds are gusty.
  - ***Pre-harvest interval*** – 7 days
  - ***Grazing interval*** – DO NOT graze.
- **Corn:**
  - ***Application interval*** – 7 days
    - *Ground* – Apply as a directed foliar spray ensuring thorough coverage. Minimum 40 L per acre.
    - *Air* – Minimum 8 L per acre. DO NOT apply during periods of dead calm. Avoid application of this product when winds are gusty.
  - ***Pre-harvest interval*** – 7 days (sweet corn, forage, silage, hay cutting); 21 days (grain, stover)
  - ***Grazing interval*** – 7 days
- **Chickpea, dry bean, faba bean, field pea, lentil, soybean:**
  - ***Application interval*** – 10 days
    - *Ground* – Apply as a directed foliar spray ensuring thorough coverage. Minimum 40 L per acre.
    - *Air* – Minimum 8 L per acre. DO NOT apply during periods of dead calm. Avoid application of this product when winds are gusty.
  - ***Grazing interval*** – 7 days
- **Alfalfa (forage, silage and hay production only):**
  - ***Application interval*** – 10 days
    - *Ground* – Minimum 40 L per acre
  - ***Pre-harvest interval*** – 7 days, except – soybean grain 21 days
  - ***Grazing interval*** – 7 days

How it Works:
Sivanto Prime is a broad spectrum systemic insecticide that works by contact and ingestion.

Restrictions:
- **Storage:** Store in cool, dry place and in such a manner as to prevent cross contamination with other pesticides, fertilizers, food, and feed
- **Restricted-Entry Intervals:** 12 hours.
- **Number of applications per year:** maximum of 809 mL per acre per year.

Tank Mixes:

DO NOT tank mix with azole fungicides during bloom.

Buffer Zones:

Application method	Crop		Buffer Zones (metres) Required for the Protection of:			
			Freshwater Habitat of Depths:		Estuarine/Marine Habitats of Depths:	
			Less than 1 m	Greater than 1 m	Less than 1 m	Greater than 1 m
Ground*	Chickpea, dry bean, faba bean, field pea, lentil, soybean, potatoes, corn, alfalfa		1	1	1	1
Aerial	Chickpea, dry bean, faba bean, field pea, lentil, soybean, potatoes and corn	Fixed wing	10	1	5	1
		Rotary wing	5	1	1	1

For tank mixes, consult the labels of the tank-mix partners and observe the largest (most restrictive) buffer zone of the products involved in the tank mixture and apply using the coarsest spray (ASAE) category indicated on the labels for those tank mix partners.

Environmental Hazards:

Bees: Toxic to adult bees in laboratory studies via oral exposure; however, not toxic to bees through contact exposure, and field studies conducted with this product have shown no effects on honeybee colony development. Minimize spray drift to reduce exposure to bees in habitats close to the application site. Application during the crop blooming period, and when flowering weeds are present may only be made in the early morning and the evening when most bees are not foraging. Toxic to 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.

Aquatic organisms: Toxic to aquatic organisms. The buffer zones for this product can be modified based on weather conditions and spray equipment configuration by accessing the Buffer Zone Calculator on the Pest Management Regulatory Agency website.

Others: *Sivanto Prime* is of low acute mammalian toxicity. Toxic to certain beneficial insects.

Hazard Rating:

 Warning – May cause an allergic skin reaction. Harmful if inhaled.

Refer to the introduction for an explanation of the symbols.

Sluggo Professional

Molluscicide – no group

Company:
Belchim Crop Protection (PCP#30025)

Formulation:
0.76% ferric phosphate in a granular formulation.
- Container sizes - 5, 25 kg bags

Insects Controlled and Registered Crops:

Crop	Insect
Field crops	Slugs and snails

Rates:
Apply bait evenly at a rate of 4.9 to 20.2 kg / acre (1.2 to 5 g per square metre).

Application:
Sluggo
- Apply in the evening as slugs and snails travel and feed mostly at night or early morning. DO NOT place in piles. For best results the ground should be moist but with little or no standing water.
- For broadcast application, standard broadcast spreaders may be used. For row application, standard granular spreaders may be used.
- At seeding and later stages, apply the bait between rows and around the perimeter of the field. Treating around the perimeter of crop areas may intercept slugs or snails migrating from daytime refuge sites.
- Apply at the higher rate within the recommended rate range if the infestation is severe, if the area is heavily watered or after long periods of heavy rain.
- Re-apply as the bait is consumed or at least every two weeks if slugs and snails continue to be a problem.

How it Works:
Sluggo must be consumed by the slugs or snails to be effective. After ingesting the bait, slugs and snails stop feeding providing immediate protection to plants. Affected slugs and snails die within 3 to 6 days.

Precautions:
Avoid contact with eyes. May cause eye irritation.
Wear chemical resistant gloves during mixing and loading activities and when applying by hand.

Environmental Hazards:
Aquatic organisms: This product may be toxic to fish and other aquatic organisms. Avoid direct application to ponds, streams and lakes.

Hazard Rating:
 Warning – Contains the Allergen Wheat
Refer to the introduction for an explanation of the symbols.

Success 480 SC

Insecticide Group 5

Company:
Corteva Agriscience (PCP#26835)

Formulation:
480 g/L spinosad formulated as a suspension concentrate.
- Container size - 1 L jug

Insects Controlled and Registered Crops:

Crop	Insect
Potato	Colorado potato beetle larvae and European corn borer larvae

Application:
Success 480 SC
- Apply as a foliar spray by ground only. DO NOT apply by air. Apply when scouting indicates the target pest species have reached economic threshold levels. For Colorado potato beetle, target eggs at hatch or small larvae. For control of European corn borer, time the application to coincide with peak egg hatch. Use higher application rate for higher pest pressure or when extended egg hatch is anticipated. If pest populations persist, a repeat application 7 to 10 days after the initial application may be necessary.
- Spinosyns require a spray solution pH between 6 to 8. This is important for the efficacy of the product. It is recommended that growers test the pH of the spray solution prior to adding a spinosyn to the spray tank.

How it Works:
Success 480 SC is in the spinosyn class of insecticides. It is a contact and stomach insecticide. It is derived from the fermentation of *Saccharpolyspora spinosa*.

Effects of Weather:
This product has the potential for run-off. DO NOT spray immediately after a rainfall or if rain is forecast within 48 hours after application.

Restrictions:
- **Restricted Entry Interval:** DO NOT enter or allow worker entry into treated areas for a period of 4 hours after application.
- **Storage:** Avoid freezing. DO NOT store or ship with food, feeds, drugs or clothing.
- **Others:**
  - ***Potatoes*** – DO NOT apply more than a maximum seasonal rate of 100 mL per acre. DO NOT apply within 7 days of harvest.

Precautions:
May cause eye and skin irritation.
Buffer Zones: A buffer zone of 2 metres (early season) or 1 metre (late season) is required between downwind edge of spray boom and sensitive aquatic habitats. Avoid contact with eyes, skin, and clothing.

Environmental Hazards:
Bees: Highly toxic to bees exposed to direct treatment, drift or residues on blooming plants. DO NOT apply this product or allow it to drift to blooming plants if bees are visiting the treatment area.
Aquatic organisms: Highly toxic to aquatic invertebrates. DO NOT contaminate aquatic habitats, such as lakes, rivers, sloughs, ponds, coulees, prairie potholes, creeks, marshes, streams, reservoirs, and wetlands, when cleaning and rinsing spray equipment or containers.
Others: Harmful to parasitoids and predatory mites and slightly harmful to foliage-dwelling predators.

Superior 70 Oil

Insecticide Group
NA

Company:
Loveland Products Canada Inc. (*Superior 70 Oil* – PCP#14981)
N.M. Bartlett Inc. (*Superior "70" Oil* – PCP#9542)

Formulation:
Mineral Oil, 99%, emulsifiable concentrate.
- Container sizes - 10 L, 200 L and 1000 L

Insects Controlled and Registered Crops:

Crop	Pest	Application Timing:
Potato	Reduce the spread of Potato Virus Y (PVY) transmitted by aphids.	Maximum 10 applications when aphids first appear; Pre-harvest interval: 14 days.

Application:
Superior 70 Oil
- Ground application only. DO NOT apply by air.
- DO NOT use the spray mixture before the oil has been properly emulsified. Spray at one week intervals as soon as aphid vectors are present.
- Thorough coverage of the plants is essential. Apply at a 10 percent rate (e.g. 10 L per 1000 L water). Boom height must be 60 cm or less above ground or crop canopy.

How it Works:
The mineral oil reduces the spread of potato virus Y (PVY) disease vectored by aphids. The mineral oil does not kill the aphids.

Tank Mixes:
None registered. DO NOT mix with dinitro compounds, fungicides such as Captan, Maestro, Folpet, Karathane, Morestand, Wettable Sulphur or any other product containing sulphur, or the insecticide Sevin.

Effects of Weather:
Avoid application when heavy rain is forecast.
DO NOT apply on drought stressed plants, in hot sun or when there is a risk of freezing temperatures.
DO NOT apply during periods of dead calm. DO NOT apply when winds are gusty or wind speed is greater than 16 km/h.

Restrictions:
- **Maximum number of applications:** 10 per season
- **Restricted Entry Interval:** DO NOT re-enter treated areas within 12 hours of application.
- **Pre-harvest interval:** 14 days
- **Storage:** Store in original tightly closed container in a cool dry, well-ventilated area away from feed and foodstuffs. DO NOT store below 0°C.

Precautions:
DO NOT use within 30 days before or after using Sulfur.

Environmental Hazards:
Aquatic organisms: DO NOT contaminate irrigation or drinking water supplies or aquatic habitats by cleaning of equipment or disposal of wastes.

Hazard Rating:
Danger – Poison, Eye Irritant

Refer to the introduction for an explanation of the symbols.

Thimet 20G

Insecticide Group 1B

Company:

AMVAC (PCP#29000)
This product is ONLY for retail sale to and use by individuals holding an appropriate provincial pesticide applicator certificate or license.

Formulation:

20% phorate formulated as a granular.

- Container size - 22 kg SmartBox closed loading system

Insects Controlled and Registered Crops:

Crop	Insect
Potato	Reduction of wireworm damage

Application:

Thimet 20G

- Ground application only at seeding time: This is a restricted product and can only be applied with a *SmartBox* pesticide application system properly calibrated to ensure accurate placement and rate. Distribute granules evenly in furrow at planting time only. Use low rate for sandy or light soils and high rate for silt or heavy soils. For use ONLY in potato fields where wireworm populations have been observed.

How it Works:

Phorate is an organophosphate insecticide that works as a systemic poison, with effective initial residual activity on soil and foliar insects.

Restrictions:

- DO NOT apply *Thimet* more than once per season.
- DO NOT apply *Thimet* to saturated soils or in wet conditions that may prevent the equipment from covering pesticide granules. DO NOT apply while precipitation is occurring and conducive to run-off from treated areas. DO NOT apply if intense or sustained precipitation is forecast to occur within 48 hours as this will favour run-off.
- Leave a 20 metre (66 feet) buffer area if used on highly erodable land adjacent to aquatic bodies. DO NOT apply within 15 metres (50 feet) of any drinking water well.
- **Storage:** DO NOT store in or around the home. Store away from food or feed. All SmartBox containers must be returned per instructions provided.
- **Others:** DO NOT use in muck soils. DO NOT apply later than at planting time. Will provide reduction of wireworm damage.
- DO NOT use on muck soils.
- A plant-back interval of 6 months is required for all crops except potatoes is required. There is no plant-back restriction for potatoes.
- DO NOT enter or allow workers to enter into treated areas for a period of 48 hours. DO NOT harvest potatoes before 90 days after planting time.

Precautions:

Thimet is of high acute mammalian toxicity. DO NOT allow product to contact eyes and skin. Poisonous by skin contact, inhalation or swallowing. DO NOT breath dust. Repeated inhalation or skin contact with *Thimet 20G*, other organophosphorus or carbamate insecticides may, without symptoms, progressively increase susceptibility to poisoning. Wear freshly-laundered, long-sleeved work clothing daily. DO NOT handle *Thimet* with bare hands. Use rubber gloves when transferring from package to equipment. Sleeve cuffs should be worn over gloves to prevent granules from falling into the gloves. Rubber gloves should be washed with soap and water after each use. Destroy and replace gloves frequently. In case of contact, immediately remove contaminated clothing and wash skin thoroughly with soap and water.

Environmental Hazards:

Aquatic organisms: Toxic to aquatic organisms. DO NOT apply while precipitation conducive to runoff is occurring or while conditions favor runoff from the treated area. DO NOT apply when forecasted precipitation event favors runoff from treated area.

Others: Toxic to earthworms. 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. One granule is sufficient to kill a small bird or small mammal.

Hazard Rating:

Danger – Poison

Refer to the introduction for an explanation of the symbols.

Vayego 200 SC

Insecticide Group 28

Company:

Bayer (PCP#33711)
This product is ONLY for retail sale to and use by individuals holding an appropriate provincial pesticide applicator certificate or license.

Formulation:

Tetraniliprole at 200 g/L, formulated as a suspension concentrate.

- Container sizes - 0.25 L to 1000 L

Insects Controlled and Registered Crops:

Crop	Insect
Potato	Foliar application: Colorado potato beetle, European corn borer, flea beetles, aphids (suppression) In-furrow (at planting): Colorado potato beetle, flea beetle
Corn	European corn borer, corn earworm, cutworms, armyworms, flea beetles, aphids (suppression)
Soybean	Cutworms, armyworms

Application:

vayego 200 SC

- **Potato**
  - ***Foliar:*** Minimum application volume:
    - *Ground* – 40.5 L per acre
    - *Aerial (potatoes only)* –20.2 L per acre
    - *Maximum foliar application of* vayego 200 SC *per crop season:*
      - *Potatoes, soybean* – 121.4 mL per acre (24.3 g ai/acre)
      - *Corn* – 242.8 mL per acre (48.6 g ai/acre)
  - ***In-furrow (potato at planting):*** Minimum application volume: 20.2 L per acre
    - *Maximum in-furrow application of* vayego 200 SC *per crop season:* 303.5 mL per acre (60.7 g ai/acre)

How it Works:

Tetraniliprole disrupts muscle activity in the insects, resulting in paralysis. Treated pests stop feeding quickly after ingestion, become lethargic and lose mobility.

Restrictions:

- **Foliar application:** DO NOT apply more than twice per year in potatoes or soybean, four times per year in corn.
- **Minimum interval between applications:** 10 days for potatoes, 14 days for corn and soybeans.
- **Rainfast period:** 1 hour
- **Restricted Entry Interval:** 12 hours
- DO NOT graze after treatment.
- **Pre-harvest interval:** 14 days
- **Storage:** To prevent contamination, store this product away from food or feed. Keep in a closed container.
- **Buffer Zones:**

Application method	**Crop**		**Buffer Zones (metres) Required for the Protection of:**		
			Aquatic Habitats of Depths		Terrestrial habitat
			Less than 1 m	Greater than 1 m	
Ground*	Corn		10	5	0
	Potato, soybean		5	3	0
Aerial	Potato	Fixed wing	55	15	0
		Rotary wing	40	15	0

Precautions:
Wear a long-sleeved shirt, long pants, chemical-resistant gloves, socks and shoes during mixing, loading, application, clean-up and repair. Gloves are not required during application within a closed cab and/or cockpit. Follow manufacturer's instructions for cleaning and maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry. Users should wash hands before eating, drinking, chewing gum, using tobacco or using the toilet. Remove clothing immediately if pesticide gets inside, then wash thoroughly and put on clean clothing. Remove PPE immediately after handing this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

Environmental Hazards:
Bees: Toxic to bees. DO NOT apply during crop blooming.

Aquatic organisms: Toxic to aquatic organisms. DO NOT apply while precipitation conducive to runoff is occurring or while conditions favor runoff from the treated area. DO NOT apply when forecasted precipitation event favors runoff from treated area. Observe buffer zones specified under directions for use.

Others: 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.

Hazard Rating:
Low toxicity.

Verimark

Insecticide Group 28

Company:
FMC Corporation (PCP#30892)

Formulation:
Cyantraniliprole at 200 g/L, formulated as a suspension concentrate.
- Container size - 4 x 2.365 L per case

Insects Controlled and Registered Crops:

Crop	Insect	Rate
Potato	Colorado potato beetle, potato flea beetle	In-furrow application: 6.75 to 9 mL/100 m of row (303 to 404 mL/acre based on 90 cm row spacing).

Application:
Verimark
- Apply as a narrow band in-furrow. For best results, direct spray on the seed pieces in the furrow.

How it Works:
The active ingredient cyantraniliprole is a systemic insecticide from the diamides chemical class. Although it has contact activity, it is most effective through ingestion of treated plant material.

Restrictions:
- **Foliar application:** DO NOT make more than 1 soil application per year. DO NOT exceed a total of 0.6 L of *Verimark* per acre per year. Use only a closed treatment system.
- **Minimum interval between applications:** DO NOT make a subsequent foliar application of any Group 28 insecticide for a minimum of 60 days following an in-furrow application of *Verimark* insecticide.
- **Restricted Entry Interval:** 12 hours

Precautions:
Wear a long-sleeved shirt, long pants, chemical resistant gloves, socks and shoes while mixing/loading, applying and during clean up and repair. Follow manufacturer's instructions for cleaning/maintaining personal protective equipment (PPE). If no such instructions for washables are available, use detergent and hot water. Keep and wash PPE separately from other laundry. Users should wash hands before eating, drinking, chewing gum, using tobacco or using the toilet. Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing. Store product in original container only, away from other pesticides, fertilizer, food or feed. DO NOT use or store in or around the home. Keep container closed. To prevent contamination, store this product away from food or feed.

Colorado potato beetle resistance management: DO NOT apply any Group 28 insecticide for Colorado potato beetle control if *Verimark* insecticide was used at planting as an in-furrow treatment.

Environmental Hazards:

Avoid application when heavy rain is forecast. DO NOT contaminate irrigation or drinking water supplies or aquatic habitats by cleaning of equipment or disposal of wastes. To reduce runoff from treated areas into aquatic habitats, avoid application to areas with a moderate to steep slope, compacted soil, or clay. Contamination of aquatic areas as a result of runoff may be reduced by including a vegetative strip between the treated area and the edge of the water body.

Bees: Toxic to bees. This product is systemic, and bees can be exposed to product residues in flower, leaves, pollen and/or nectar resulting from soil applications. However, when this product is applied and used according to label directions, the risk to bees is expected to be negligible.

Aquatic organisms: Toxic to aquatic organisms.

Hazard Rating:

Low toxicity.

Voliam Xpress

Insecticide Group 3A
28

Company:

Syngenta Canada Inc. (PCP#30325)

Formulation:

50 g/L lambda-cyhalothrin and 100 g/L chlorantraniliprole formulated as a suspension concentrate.

- CContainer size – 4 x 3.78 L pack

Insects Controlled and Registered Crops:

Crop	Insect
Bean, chickpea, faba bean, lentil, pea, soybean	Aphids, armyworms, cabbage looper, corn earworm, European corn borer, grasshoppers, Lygus bugs, pea leaf weevil, potato leafhopper
Canola, rapeseed, mustard (seed and condiment)	Flea beetle, lygus bug, cabbage seedpod weevil, imported cabbageworm, diamondback moth, cabbage looper, bertha armyworm, grasshoppers
Corn	Armyworm, corn earworm, European corn borer
Potato	Cutworms, corn earworm, beet armyworm, leafminers, psyllids
Flax	Armyworms, grasshoppers, Lygus bugs

Application:

Voliam Xpress

- May be applied by ground or air.
- Timing of applications should target the pest and when populations are in a damaging life stage and at economic levels. Ensure adequate water volumes are used for optimum coverage.
- **Potatoes and Corn**
  - ***Ground*** – Apply in a minimum of 60 L of water per acre.
  - ***Air*** – Apply in a minimum of 16 L of water per acre.
- **Bean, chickpea, faba bean, lentil, pea, soybean, canola, rapeseed, mustard (seed and condiment), sunflower – Apply when insect feeding is first seen on foliage. Reapply after 7 days if populations reach economic threshold levels.**
  - ***Ground*** – Apply with a minimum of 40 – 80 L water per acre.
  - ***Air*** – Apply with a minimum of 16 L of water per acre.

How it Works:

Voliam Xpress insecticide works through contact and ingestion. It provides rapid knockdown and residual control of Lepidopteran (e.g. moth larvae) and sucking and chewing insects. After foliar application most of the insecticide stays on the leaf surface with a small amount penetrating into the leaf tissue. Initial and residual control is dependent on thorough coverage of the crop. *Voliam Xpress* is most effective against early developmental stages of surface feeding insects and adults of pest that deposit eggs within plant parts. Insecticide components: lambda-cyhalothrin is a synthetic pyrethroid insecticide and chlorantraniliprole is a diamide insecticide.

Restrictions:

- DO NOT make a foliar application of Voliam Xpress for a minimum of 60 days following an in-furrow or soil application or planting of seed treated with any Group 28 insecticide.
- **Bean, chickpea, lentil, pea, soybean**
  - ***Ground*** – DO NOT apply more than 3 times per season
  - ***Air*** – DO NOT apply more than once per season.
  - DO NOT graze or harvest treated forage, straw or hay for livestock feed. A 7 day interval is required between applications. ◦ Pre-harvest interval – 14 days except – Soybean pre-harvest interval – 21 days.
  - DO NOT exceed the following amount of product per season. This includes Voliam Xpress as well as other Group 3 and/or Group 28 insecticides. Consult the label of other products containing these active ingredients prior to treatment to ensure the annual maximum is not exceeded:
    - 90 g chlorantraniliprole per acre by ground or aerial application and; ◦ 30 g lambda-cyhalothrin per acre by ground application or;
    - 10 g lambda-cyhalothrin per acre by air.
- **Canola, rapeseed, mustard (seed and condiment), sunflower**
  - ***Application interval*** – 7 days
  - ***Pre-harvest interval*** – 7 days
  - Make only 1 application per season by either ground or air for cabbage seedpod weevil. DO NOT make more than 3 applications per season by ground application.
  - DO NOT make more than 1 application per season by air
- **Corn**
  - DO NOT make more than 2 applications of Voliam Xpress per year. ◦ Application interval – 7 days
  - ***Pre-harvest interval*** – 14 days if crop is harvested for silage and 21 days for field corn. DO NOT exceed – 90 g chlorantraniliprole per acre by ground or aerial application and; ◦ 27.6 g lambda-cyhalothrin per acre by ground application or;
  - 20 g lambda-cyhalothrin per acre by air.
- **Potato**
  - DO NOT apply Voliam Xpress Insecticide, which contains a Group 28 insecticide, following a seed piece, in-furrow, or soil application of any Group 28 insecticide.
  - DO NOT make more than 2 applications of Voliam Xpress per year.
  - ***Application interval*** – 7 days
  - ***Pre-harvest interval*** – 7 days
- **Buffer Zones:** The buffer zones specified in the table below are required between the point of direct application of *Voliam Xpress* and the closest downwind edge of sensitive freshwater habitats (e.g. lakes, rivers, sloughs, ponds, prairie potholes, creeks, marshes, streams, reservoirs and wetlands). Spray drift buffer zones can be modified based on weather conditions and spray equipment.

Application method	**Crop**		**Buffer Zones (metres) Required for the Protection of:**	
			Aquatic Habitats of Depths	
			Less than 1 m	Greater than 1 m
Ground*	Bean, chickpea, faba bean, lentil, pea, soybean		25	10
	Canola, mustard, flax		10	5
	Corn, potato		20	10
Aerial	Bean, chickpea, faba bean, lentil, pea, soybean	Rotary wing	800	425
		Fixed wing	800	800
	Canola, mustard, flax	Rotary wing	500	275
		Fixed wing	800	275
	Corn, potato	Rotary wing	800	725
		Fixed wing	800	800

- **Storage:** DO NOT use or store in or around the home. Store unused product away from feeds, seeds, fertilizer, plants and foodstuffs. *Voliam Xpress* must be stored above freezing. In pulse crops (pea, lentil, chickpea, beans and faba beans) if applied according to label rates early in the crop year at a vegetative stage or during flowering there is no need for MRL concerns. In cases of later application during pod development or seed fill to maturity (e.g. late season grasshopper control), consult with your exporter/ processor.

Precautions:

As a result of the completed re-evaluation of lambda-cyhalothrin by the Pest Management Regulatory Agency (PMRA), effective April 29, 2023, changes will affect how all lambda-cyhalothrin-based products may be used in Canada.
DO NOT apply during periods of dead calm or when winds are gusty.
Avoid application at temperatures above 25 degrees C. Control of insects may be reduced at higher temperatures. DO NOT enter or allow entry into treated areas for a period of 24 hours after application of *Voliam Xpress*.
If *Voliam Xpress* is to be applied to a commodity destined for export to the United States, visit Crop Life Canada's website HYPERLINK "http://www.croplife.ca/" **www.croplife.ca** for information on acceptable residue limits.

Environmental Hazards:

Bees: 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. Spray deposits should be dry before bees commence foraging in treated crop.
Aquatic organisms: Toxic to aquatic organisms. Avoid application when heavy rain is forecast. The use of this product may result in contamination of groundwater, particularly in areas where soil is permeable (e.g. sandy soil) and/or the depth to the water table is shallow.
Others: Toxic to certain beneficial insects.

Hazard Rating:

 Danger – Poison Potential skin sensitizer.

Refer to the Introduction for an explanation of the symbols.