

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 <http://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, how the product will be applied, restrictions, precautions and the hazard rating.

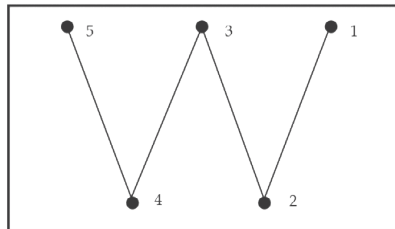
Pre-harvest Interval

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.

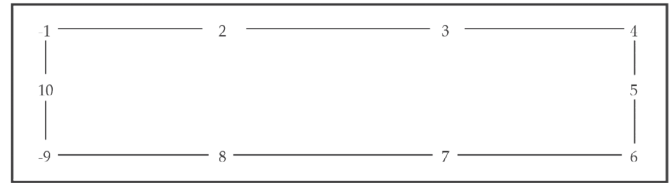
To properly scout for insect pests, you must know when they occur, where they live, what they look like, and how to find and count them. The number of locations to assess in a field will depend on the field



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 pest distribution and field configuration.

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



- **Pattern 2:** Used when pests 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 pests 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 % defoliation for many crops.

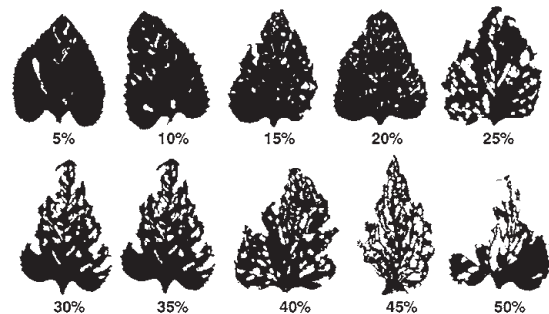


Photo courtesy of North Dakota State University Extension

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	3	-	<3 hours
Beleaf	3	-	<1
Moderately to Highly Hazardous to Bees (see label for precautions to bees)			
Fulfill	2-3	2	<1
Assail	1-2	-	<1
Delegate	1-2	1	3 hours
Closer	-	-	3 hours
Decis/Poleci	1-2	1-2	<8 hours
Rimon	1-2	2	1
Lannate	1-2	1-2	<1 - 1.5
Success/Entrust	1-2	1	<1 - >1
Admire/Alias	1	1-2	<1 - >1
Matador/Silencer	1	1	>1
Oberon	1-2	1	-
Movento	1	-	-
Agri-mek	1-3	2	<1 - 3
Orthene	1	1	2.5 - 3
Mako/UP-Cyde/Ship	1	1	<1 - >3
Dibrom	1-2	1-2	<1 - 4.5
Ambush/Pounce/Perm-UP	1	1	<1 - 5
Imidan	1	1	1 - 5
Malathion	1-2	1	2 (Honey Bee), 6 (Leafcutter Bee)
Lorsban/Pyrinex/Nufos/Citadel/ Warhawk/MPOWER Krypton/Sharda chlorpyrifos	1	1	2-6
Sevin	1-2	1-2	>1-7
Cygon/Lagon	1	1	3 - 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: <http://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 on crops 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 (i.e. 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 following 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 page 600) 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 pages 7 and 8 for full description)

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)
		Lannate	methomyl	contact/ingestion
1B	Organophosphates	Malathion	malathion	contact
		Orthene	acephate	contact/ingestion
		Dibrom	naled	contact/ingestion
		Imidan	phosmet	
		Lorsban, Pyrinex, Nufos, Citadel, Warhawk, MPOWER Krypton, Pyrifos, Sharda chlorpyrifos	chlorpyrifos	contact/ingestion/inhalation
		Lagon, Cygon	dimethoate	contact/ingestion
		Thimet 20-G	phorate	ingestion
3A	Pyrethroids	Decis, Poleci	deltamethrin	contact/ingestion
		Mako, UP-Cyde, Ship	cypermethrin	contact/ingestion
		Matador, Silencer	lambda-cyhalothrin	contact/ingestion
		Ambush, Pounce, Perm-UP	permethrin	contact/ingestion
		Capture	bifenthrin	
		Tempo	cyfluthrin	
4A	Neonicotinoids	Helix, Cruiser Actara 240SC Actara 25WG	thiamethoxam	ingestion ingestion contact/ingestion
		Admire, Alias, Gaucho, Raxil ProShield, Sombbrero, Stress Shield 600	imidacloprid	contact/ingestion (flowable formulations) ingestion (seed treatments)
		Assail	acetamiprid	contact/ ingestion
		Prosper, Poncho, Nipsit, Titan, Clutch	clothianidin	ingestion
4C	Sulfoximines	Closer	sulfoxaflor	contact/ingestion
4D	Butenolides	Sivanto Prime	flupyradifurone	contact/ingestion
5	Spinosyns	Success, Entrust	spinosad	contact/ingestion
		Delegate	spinetoram	contact/ingestion
6	Avermectins, Milbemycins	Agri-mek	abamectin	contact/ingestion
9B	Pyridine azomethine derivatives	Fulfill	pymetrozine	ingestion mainly, some contact activity
9D	Pyropenes	Sefina	Afidopyropen	contact
11	Microbial disruptors of insect midgut membranes	Dipel	<i>Bacillus thuringiensis</i> <i>var. Kurstaki</i>	ingestion
15	Benzoylureas	Rimon	novaluron	ingestion/ contact
23	Tetronic and tetramic acid derivatives	Movento	spirotetramat	
		Oberon	spiromesifen	contact
24A	Phosphides	Phostoxin	aluminum phosphide	inhalation (fumigant)
28	Diamides	Coragen	chlorantraniliprole	ingestion/ contact
		Lumiderm, Verimark, Fortenza, Exirel	cyantraniliprole	ingestion
29	Flonicamid	Beleaf	flonicamid	contact/ ingestion

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: <http://www.irac-online.org/modes-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/sweep; 4 alfalfa plant bugs/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 seedlings 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:** 100-200 aphids/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 – 1 larva/stem; <40 cm – 2 larvae/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/ft²) will require insecticide application.
 - **Alfalfa Seed:** 20 to 30 3rd or 4th instar larvae/sweep (90° = straight sweep) or 35 to 50% 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/Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD ₅₀ (Mammalian Toxicity) ²
Sap or Fluid Feeders					
Lygus bugs	Beleaf 50 SG (F)	81-121 g	7	G	>2,000
	Assail (seed production only) (N)	35-69 g	1	G	1,064
	Rimon (Seed Production only) (SB)	338 ml	14	G	>5,000
	Matador/Silencer (P)	34 ml	Do not apply within 3 days of livestock foraging.	A or G (Matador) G (Silencer)	64-110
	Decis 5EC/Poleci (seed production only) (P)	80-100 ml (Decis) 162-202 ml (Poleci)	20	G	395
	Malathion 500 (OP)	0.80-1.21 L	7	A or G	4302
	Malathion 85E (OP)	0.445-0.544 L	7	A or G	5,500
	Dibrom (OP)	0.42-0.85 L	4	A or G	345
	Cygon 480 EC/Cygon 480- AG (OP) (seed and forage production)	0.17 L	10	A or G	60-450

Insect	Insecticide (and insecticide group ¹)	Rate/Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD ₅₀ (Mammalian Toxicity) ²
Lygus bugs, continued	Lagon/Cygon 480 EC/Cygon 480-AG (OP) (seed production only)	0.44 L	28	A or G	60-450
Alfalfa plant bug	Assail (seed production only) (N)	35-69 g	1	G	1,064
	Cygon 480 EC (OP) (seed and forage production)	0.17 L	10	A or G	60-450
	Lagon /Cygon 480 EC /Cygon 480-AG (OP) (seed production only)	0.44 L	28	A or G	60-450
Potato leafhopper	Sivanto Prime (B)	202-304 ml	7	G	>2,000
	Matador/Silencer (P)	34 ml	Do not apply within 3 days of livestock foraging.	A or G (Matador) G (Silencer)	64-110
	Malathion 500 (OP)	0.80-1.21 L	7	A or G	4302
	Malathion 85E (OP)	0.445-0.544 L	7	A or G	5,500
	Dibrom (OP)	0.42-0.85 L	4	A or G	345
	Lagon/Cygon 480 EC/ Cygon 480-AG (OP)	0.17 L	10	A or G	60-450
Spittlebugs	Malathion 85E (OP) (adults)	0.445-0.544 L	7	A or G	5,500
Pea Aphid	Beleaf 50 SG (F)	49-65 g	7	G	>2,000
	Sivanto Prime (B)	202-304 ml	7	G	>2,000
	Matador/Silencer (P)	34 ml	Do not apply within 3 days of livestock foraging.	A or G Matador) G (Silencer)	64-110
	Malathion 500 (OP)	0.80-1.21 L	7	A or G	4302
	Malathion 85E (OP)	0.445-0.544 L	7	A or G	5,500
	Dibrom (OP)	0.42-0.85 L	4	A or G	345
	Lagon/Cygon 480 EC/ Cygon 480-AG (OP)	0.17 L	10	A or G	60-450
Spider mites	Malathion 85E (OP)	0.445-0.544 L	7	A or G	5,500
	Oberon (TT)	0.202-0.405 L		A or G	>2,000
Defoliators					
Grasshoppers	Spreadable Bran Baits				
	Nolo Bait (M)	Minimum of 0.45 kg		A or G	
	Eco bran (C)	0.8-1.6 kg	2	G	N/A
	Sprays				
	Coragen	51-101 ml	0	G	>5,000
	Matador/Silencer (P)	25-34 ml (Ground) 34 ml (Aerial)	Do not apply within 3 days of livestock foraging.	A or G	64-110
	Decis 5EC (seed production only) (P)	40-61 ml	20	G	395
	Malathion 500 (OP)	0.80-1.21 L	7	A or G	4302
	Malathion 85E (OP)	0.445-0.544 L	7	A or G	5,500
	Lagon/ Cygon 480 EC/Cygon 480-AG (OP)	0.22 L (nymphs) 0.34-0.36 L (adults)	10 (Lagon, Cygon 480 EC) 28 (Cygon 480-AG)	A or G	60-450

Insect	Insecticide (and insecticide group ¹)	Rate/Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD ₅₀ (Mammalian Toxicity) ²
Alfalfa weevil	If alfalfa has reached the bud or early bloom stage, immediate cutting will kill many alfalfa weevil larvae.				
	Coragen (D) (suppression only)	152-202 ml	0	G	>5,000
	Matador/Silencer (P)	34 ml	Do not apply within 3 days of livestock foraging.	A or G (Matador) G (Silencer)	64-110
	Decis 5EC/Poleci (seed crops only) (P)	80-100 ml (Decis) 162-202 ml (Poleci)	20	G	395
	Malathion 500 (OP)	0.80-1.21 L	7	A or G	4302
	Malathion 85E (larvae only) (OP)	0.445-0.544 L	7	A or G	5,500
	Imidan (OP)	0.65 kg	7	G	285
	Lagon/ Cygon 480 EC/Cygon 480-AG (OP) (reduction only)	0.17 L	10	A or G	60-450
Alfalfa looper	Dibrom (OP)	0.42-0.85 L	4	A or G	345
Leafminers					
Alfalfa blotch leafminer	Malathion 85E (OP)	0.544 L	7	A or G	5,500
	Imidan (OP)	0.65 kg	7	G	285
	Lagon/Cygon 480 EC/ Cygon 480-AG (OP)	0.22 L	10	A or G	60-450

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, C=carbamates, OP=organophosphates, TT=tetronic and tetramic acid derivatives.

² LD₅₀ values represent the relative toxicity of a pesticide. They represent the dose (in mg/kg body weight) that will kill 50% of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD₅₀.

Barley – See Small Grain Cereals

Scouting for insects in Beans (Dry Beans)

Belowground Feeders and Cutworms

- **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.
- **Cutworms**
 - **When and How to Monitor:** To find cutworms, 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 trifoliolate.
 - **Economic Threshold:** Unifoliolate stage – 0.25 leafhoppers per trifoliolate; second trifoliolate stage – 0.5 leafhoppers per trifoliolate; fourth trifoliolate stage – 1.0 leafhopper per trifoliolate; first bloom – 2.0 leafhoppers per trifoliolate.

Defoliators

- **Grasshoppers**
 - **Economic Threshold:** Substantial yield loss does not occur until up to 35% defoliation occurs before bloom and 15% 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 Maxx Vibrance Beans (N)	A seed treatment combining Cruiser Maxx Beans and Vibrance 500FS.			
	Cruiser 5FS (N)	83 ml/100 kg seed	Must be applied in commercial seed treatment facilities.		
	Stress Shield 600 (N)	104ml/100kg of seed	Seed Treatment		
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 Maxx Vibrance Beans (N)	A seed treatment combining Cruiser Maxx Beans and Vibrance 500FS.			
	Cruiser 5FS (N)	50-83 ml/ 100 kg seed	Must be applied in commercial seed treatment facilities.		
Cutworms	Coragen (D)	101 ml	1	A or G	>5,000
	Matador/Silencer (P)	34 ml	14 (Matador) 21 (Silencer)	A or G	64-110
Sap or Fluid Feeders					
Lygus Bugs	Beleaf 50 SG (F)	81 g	7	G	>2,000
	Matador/Silencer (P)	34 ml	14 (Matador) 21 (Silencer)	A or G	64-110
	Sevin XLR (C)	2.12-2.59 L	5	G	699
	Cygon 480-AG (OP)	0.28-0.40 L	7	A or G	450
Potato Leafhopper	Matador/Silencer (P)	34 ml	14 (Matador) 21 (Silencer)	A or G	64-110
	Sevin XLR (C)	1.01 L	5	G	699
	Cygon 480-AG (OP)	0.28-0.40 L	7	A or G	450
Aphids	Beleaf 50 SG (F)	49 – 65 g	7	G	>2,000
	Movento (TT)	75-111 ml	7	G	>2,000
	Matador (P)	34-94 ml	14	A or G	64-110
	Voliam Xpress (D+P)	91-223 ml	14	A or G	98
	Malathion 500 (OP)	0.56-1.21 L	1	A or G	4302
	Malathion 85E (OP)	0.297-0.544 L	3	G	5,500
	Dibrom (OP)	0.42-0.85 L	4	A or G	345
	Cygon 480-AG (OP)	0.28-0.40 L	7	A or G	450
Spider mites	Oberon (TT)	202-243 ml	10	A or G	>2,000
	Cygon 480-AG (OP)	0.28-0.40 L	7	A or G	450
Defoliators and Borers					
Grasshoppers	Spreadable Bran Baits				
	Eco bran (C)	0.8-1.6 kg	5	G	N/A
	Sprays				
	Coragen (D)	51-101 ml	1	A or G	>5,000
European Corn Borer	Coragen (D)	101-152 ml	1	A or G	>5,000
	Matador /Silencer (P)	34 ml	14 (Matador) 21 (Silencer)	A or G	64-110
	Voliam Xpress (D+P)	202 ml	14	A or G	98

Insect	Insecticide (and insecticide group ¹)	Rate/Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD ₅₀ (Mammalian Toxicity) ²
Alfalfa looper	Dibrom (OP)	0.42-0.85 L	4	A or G	345

ALWAYS CONSULT THE INSECTICIDE LABEL BEFORE APPLYING ANY INSECTICIDE.

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

² LD₅₀ values represent the relative toxicity of a pesticide. They represent the dose (in mg/kg body weight) that will kill 50% of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD₅₀.

Buckwheat 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					
Cutworms	Coragen (D)	101 ml	1	A or G	>5,000
Defoliators					
Grasshoppers	Coragen (D)	51-101 ml	1	A or G	>5,000

ALWAYS CONSULT THE INSECTICIDE LABEL BEFORE APPLYING ANY INSECTICIDE.

¹ Insecticide Group: D=diamides

² LD₅₀ values represent the relative toxicity of a pesticide. They represent the dose (in mg/kg body weight) that will kill 50% of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD₅₀.

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% of the stems prior to the soft dough stage.

Canaryseed 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
Sap Feeders					
Aphids	Lagon/Cygon 480 EC/Cygon 480-AG (OP)	0.20 L	21	A or G	60-450
	Malathion 85E (OP)	0.277 L	14	A or G	5,500

ALWAYS CONSULT THE INSECTICIDE LABEL BEFORE APPLYING ANY INSECTICIDE.

¹ Insecticide Group: OP=organophosphates

² LD₅₀ values represent the relative toxicity of a pesticide. They represent the dose (in mg/kg body weight) that will kill 50% of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD₅₀.

Field Scouting in Canola

Scouting Calendar

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

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

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

• 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 cutworms, 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.

Cutworms will sometimes be most abundant in patches or a specific area of a field.

- **Nominal Threshold:** 25-30% 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:** 10-18 lygus bugs/10 sweeps from when flowering is complete and seeds are enlarging in the lower pods to when seeds in the lower pods are full size and translucent; and 15-25 lygus bugs/10 sweeps when seeds in the lower pods are green. Controls are not recommended when seeds are ripening (yellow or brown). 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.

- A table of specific economic thresholds for various expected values of canola seed and costs of control for lygus bugs in canola can be found at: <http://www.gov.mb.ca/agriculture/crops/insects/fad12s00.html>.

• Aphids

- **Economic Threshold:** Control aphids in canola if densities exceed 25 aphids/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 degrees) 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/m² in immature to flowering plants. 200 to 300 larvae/m² in plants with flowers and pods.
 - Note that these threshold numbers are based on stands averaging 150-200 plants/m². In areas where stands are thinner, the economic threshold should be lowered accordingly. A nominal threshold of 25-33% 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 m² (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/acre for each larva/m² can be expected. Multiplying 0.058 X average number of larvae per m² X expected seed value (dollars/bushel) will determine the economic loss (in dollars/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/bushel, the economic threshold will be between about 20 and 34 larvae/m², depending on control costs. At an expected seed value of \$8/bushel, the economic threshold will be between about 15 and 26 larvae/m², 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/Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD ₅₀ (Mammalian Toxicity) ²
Belowground and Surface Feeders					
Root maggots	<ul style="list-style-type: none"> • 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 (D)	A seed treatment that can be combined with Helix Vibrance.			
	Lumiderm (D)	A seed treatment that can be combined with either Prosper EverGol or Helix Vibrance.			
	Foliar Sprays				
	Coragen (D)	101 ml	1	A or G	>5,000
	Matador (P)	34 ml	7	A or G	64-110
	Pounce/Perm-UP (P) Ambush (P)	73-158 ml 57-121 ml	Treat prior to 5-leaf stage	A or G (see labels) G	1276
	Chlorpyrifos (OP)	0.354-0.486 L	21	A or G	205-418
Sap and Fluid Feeders					
Lygus Bugs	Decis 5EC/Poleci (P)	60 ml (Decis) 121 ml (Poleci)	7	A or G	395
	Matador/Silencer (P)	34 ml	7	A or G	64-110
	Voliam Xpress (D+P)	91 ml	7	A or G	98
	Chlorpyrifos (OP)	0.202 - 0.405 L	21	A or G	205-418
Turnip aphid	Lagon/Cygon 480-AG (OP)	0.34-0.36 L	21	A or G	60-450
Aster leafhopper	Lagon/Cygon 480-AG (OP)	0.34-0.36 L	21	A or G	60-450
Swede midge	Coragen (D)	101 ml	1	A or G	>5,000
	Decis 5EC (P)	61-81 ml	7	A or G	395
	Matador/Silencer (P)	34 ml	7	A or G	64-110
Defoliators					
Crucifer Flea beetle and/ or striped flea beetle	Seed Treatments				
	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.			
	Lumiderm (D)	Applied combined with either Helix Vibrance or Prosper EverGol.			
	Fortenza (D)	Applied combined with Helix Vibrance or Visivio.			
	Visivio (N+S)	Seed treatment containing Helix Vibrance and Rascendo (sulfoxaflor). Visivio can also be combined with Fortenza if cutworm control is needed.			
	Nipsit Inside (N)	250-666 ml / 100 kg seed	Seed Treatment		3,044
	Gaucho Canola System (N)	0.833 L / 100 kg of seed	Seed Treatment		N/A
	Gaucho Platinum (N)	1.667L / 100 kg of seed	Seed Treatment		N/A
	Sombrero (N)	0.67-1.33 L / 100 kg seed	Seed Treatment		N/A

Insect	Insecticide (and insecticide group ¹)	Rate/Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD ₅₀ (Mammalian Toxicity) ²
Crucifer Flea beetle and/or striped flea beetle <i>continued</i>	Foliar Sprays				
	Decis 5EC/Poleci (P)	40 -60 ml (Decis) 81-121 ml (Poleci)	7	A or G	395
	Mako (P)	20 ml	30	G	242-542
	UP-Cyde/Ship (P)	56.6 ml	30	A or G	355
	Matador/Silencer (P)	34 ml	7	A or G	64-110
	Pounce (P) Ambush (P)	36-73 ml 28-57 ml		A or G	1276
	Voliam Xpress (D+P)	91 ml	7	A or G	98
	Malathion 500 (OP)	0.44 L	7	A or G	4302
	Malathion 85E (OP)	0.217-0.346 L	7	A or G	5,500
	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 (P)	34 ml	7	A or G	64-110
	Decis 5EC /Poleci (for control of adults only) (P)	80 ml (Decis) 162 ml (Poleci)	7	A or G	395
	Voliam Xpress (D+P)	91 ml	7	A or G	98
Diamondback moth	Coragen (D)	51 ml	1	A or G	>5,000
	Decis 5EC/Poleci (P)	40-60 ml (Decis) 81-121 ml (Poleci)	7	A or G	395
	Matador/Silencer (P)	34 ml	7	A or G	64-110
	Voliam Xpress (D+P)	91 ml	7	A or G	98
	Malathion 500 (OP)	0.22-0.34 L	7	A or G	4302
	Malathion 85E (OP)	0.109-0.168 L	7	A or G	5,500
	Chlorpyrifos (OP)	0.405-0.607L	21	A or G	205-418
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 (D)	51 - 152 ml	1	A or G	>5,000
	Decis 5EC/Poleci (P)	40-60 ml (Decis) 81-121 ml (Poleci)	7	A or G	395
	Mako (P)	28 ml (ground) 36 ml (air)	30	A or G	242-542
	UP-Cyde/Ship (P)	81-113 ml	30	A or G	355
	Matador/Silencer (P)	34 ml	7	A or G	64-110
	Voliam Xpress (D+P)	91 ml	7	A or G	98
	Lannate (C)	87.4-206.4 g	8	A or G	30-34
	Chlorpyrifos (OP)	0.304-0.405 L	21	A or G	205-418
Alfalfa looper	Lannate (C)	87-206 g	8	A or G	30-34
	Chlorpyrifos (OP)	0.304-0.405 L	21	A or G	205-418
Cabbage looper	Coragen (D)	101 ml	1	A or G	>5,000
Beet webworm	Decis 5EC/Poleci (P)	40-60 ml (Decis) 81-121 ml (Poleci)	7	G	395
	Lannate (C)	87.4-206.4 g	8	A or G	30-34

Insect	Insecticide (and insecticide group ¹)	Rate/Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD ₅₀ (Mammalian Toxicity) ²
Clover cutworm	Decis 5EC/Poleci (P)	40-60 ml (Decis) 81-121 ml (Poleci)	7	A or G	395
	Lannate (C)	87.4-206.4 g	8	A or G	30-34
True armyworm	Chlorpyrifos (OP)	0.304-0.405 L	21	A or G	205-418
Imported Cabbageworm	Coragen (D)	101 ml	1	A or G	>5,000
	Matador/Silencer (P)	34 ml	7	A or G	64-110
	Voliam Xpress (D+P)	91 ml	7	A or G	98
Variegated cutworm	Chlorpyrifos (OP)	0.354-0.486	21	A or G	205-418
Grasshoppers	Spreadable Bran Baits				
	Eco bran (C)	0.8-1.6 kg	Treat only seedlings	G	N/A
	Sprays				
	Coragen (D)	51 - 101 ml	1	A or G	>5,000
	Decis 5EC/Poleci (P)	Decis: 40-60 ml (Ground), 60 ml (Aerial) Poleci: 81-121 ml (ground), 121 ml (air)	7	A or G	395
	Matador /Silencer (young grasshoppers only) (P)	25-34 ml (Ground) 34 ml (Aerial)	7	A or G	64-110
	Mako (P) (young grasshoppers only)	20-28 ml	30	G	242-542
	UP-Cyde (P) (young grasshoppers only)	33-46 ml			355
	Voliam Xpress (D+P)	91 ml	7	A or G	98
	Malathion 500 (OP)	0.45-0.69 L	7	A or G	4302
	Malathion 85E (OP)	0.217-0.346 L	7	A or G	5,500
	Chlorpyrifos (OP)	0.235-0.354 L	21	A or G	205-418
	Lagon/Cygon 480-AG/ Cygon 480 EC (OP)	0.34-0.36 L	21	A or G	60-450
Slugs	Sluggo Professional	10-20 kg		G	>5,000

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

² LD₅₀ values represent the relative toxicity of a pesticide. They represent the dose (in mg/kg body weight) that will kill 50% of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD₅₀.

Chickpea 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 Maxx Vibrance Pulses (N)	A seed treatment containing Cruiser 5FS and Vibrance Maxx RFC.			
	Cruiser 5FS (N)	17-50 ml / 100 kg seed	May be applied on-farm or by commercial seed treaters.		
	Stress Shield 600 (N)	104ml/100kg of seed	Seed Treatment		

Insect	Insecticide (and insecticide group ¹)	Rate/Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD ₅₀ (Mammalian Toxicity) ²
Cutworms	Coragen (D)	101 ml	1	A or G	>5,000
	Matador/Silencer (P)	34 ml	14 (Matador) 21 (Silencer)	A or G	64-110
Sap Feeders					
Pea Aphid	Beleaf 50 SG (F)	49 – 65 g	7	G	>2,000
	Movento (TT)	75-111 ml	7	G	>2,000
	Matador/Silencer (P)	34-94 ml	14 (Matador) 21 (Silencer)	A or G	64-110
	Voliam Xpress (D+P)	91-202 ml	14	A or G	98
Potato Leafhopper	Matador/Silencer (P)	34 ml	14 (Matador) 21 (Silencer)	A or G	64-110
Defoliators					
Grasshoppers	Coragen (D)	51-101 ml	1	A or G	>5,000
	Matador/Silencer (P)	34 ml	14 (Matador) 21 (Silencer)	A or G	64-110

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

² LD₅₀ values represent the relative toxicity of a pesticide. They represent the dose (in mg/kg body weight) that will kill 50% of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD₅₀.

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/3 seedlings (1/5 seedlings under dry conditions). 2nd year stands: 9-12 weevil adults/plant.

Clovers (sweet, red, alsike) 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
Defoliators					
Grasshoppers	Spreadable Bran Baits				
	Eco bran (C)	0.8-1.6kg	2	G	N/A
	Sprays				
	Malathion 85E (OP)	0.445-0.544 L	7	A or G	5,500
	Lagon (OP)	172-405 ml	2-28 (see label)	A or G	425
Sweetclover Weevil	Locate new seedlings as far as possible from 2nd-year clover. Cultivating second-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 500 (OP) (sweet clover only)	0.56-1.01 L	7-Cattle may be returned immediately after spraying.	A or G	4302
Malathion 85E (OP) (sweet clover only)	0.445-0.544 L				5,500

Insect	Insecticide (and insecticide group ¹)	Rate/Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD ₅₀ (Mammalian Toxicity) ²
Sweetclover Weevil <i>continued</i>	Lagon /Cygon 480 EC / Cygon 480-AG (OP)	0.34-0.45 L	28	A or G	60-450
Alfalfa weevil	Coragen (D) (suppression only)	152-202 ml	0	G	>5,000
Lesser clover leaf weevil	Decis 5 EC /Poleci (P) (suppression only/ red clover seed production only)	101 ml (Decis) 202 ml (Poleci)		G	395
Sap or Fluid Feeders					
Lygus Bugs	Beleaf 50SG (F)	80-121 g	7	G	>2,000
	Dibrom (OP)	0.42-0.85 L	4	A or G	345
Leafhoppers	Malathion 85E (OP)	0.445-0.544 L	7	A or G	5,500
	Dibrom (OP)	0.42-0.85 L	4	A or G	345
Aphids	Beleaf 50SG (F)	49-65 g	7	G	>2,000
	Malathion 85E (OP)	0.445-0.544 L	7	A or G	5,500
	Dibrom (OP)	0.42-0.85 L	4	A or G	345

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² LD₅₀ values represent the relative toxicity of a pesticide. They represent the dose (in mg/kg body weight) that will kill 50% of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD₅₀.

Field Scouting in Corn (Field Corn)

- **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 cutworms, 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. Cutworms 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 3-6% of plants are cut and small larvae less than 1 inch 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% 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.
- **Armyworms**
 - **Economic Threshold:** For corn past the 6-leaf stage, if 50% of the plants are showing damage and have larvae smaller than 2.5 cm (1 in.), 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/Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD ₅₀ (Mammalian Toxicity) ²
Belowground and Surface Feeders					
Cutworms	Seed Treatments				
	Fortenza (D)	83-167 ml / 100 kg seed			
	Foliar Sprays				
	Coragen	101 ml	14 (field corn) 1 (seed corn or sweet corn)	A or G	>5,000
	Matador/Silencer (P)	34 ml	14	A or G	64-110
	Mako (P) UP-Cyde (P)	71 ml 115 ml	21	G	242-542 355
	Pounce/Perm-UP (P) Ambush (P)	73-158 ml 57-121 ml	Treat prior to 5 leaf stage	A or G (see labels) G	1030
	Chlorpyrifos (darksided, black, redbacked) (OP)	0.971 L (Pre-plant treatment), 0.486-0.971 L (seedling treatment)	70	G	205-418
	Pyrifos 15G (OP)	75 g per / 100 m of row	70	G	2250
Wireworms	Fortenza (D)	Seed Treatment			
	Cruiser Maxx Corn (N)	83 ml Cruiser 5FS / 100 kg seed	A seed treatment containing Cruiser 5 FS and Maxim Quattro.		>5,000
	Poncho 600 FS (N)	33.3-66.6 ml of Poncho 600 per 80,000 unit of seed	Seed Treatment	Seed Treatment	2,000
	Nipsit Inside (N)	33.3-66.6 ml per 80,000 unit of seed	Seed Treatment	Seed Treatment	3,044
	Sombrero (N)	0.16 mg per kernel	Seed Treatment	Seed Treatment	N/A
Seedcorn maggot	Cruiser Maxx Corn (N)	83-166 ml Cruiser 5FS/100 kg seed	A seed treatment containing Cruiser 5 FS and Maxim Quattro.		>5,000
	Poncho 600 FS (N)	33.3-66.6 ml of Poncho 600 per 80,000 unit of seed	Seed Treatment	Seed Treatment	2,000
	Nipsit Inside (N)	33.3-66.6 ml per 80,000 unit of seed	Seed Treatment	Seed Treatment	3,044
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 May 2018) is available at: http://www.cornpest.ca/bt-corn/ .				
	Cruiser Maxx Corn (N)	830 ml Cruiser 5FS/ 100 kg seed	A seed treatment containing Cruiser 5 FS and Maxim Quattro.		>5,000
	Poncho 600 FS (N)	166.7 ml of Poncho 600 per 80,000 unit of seed	Seed Treatment	Seed Treatment	2,000
	Nipsit Inside (N)	166.7 ml per 80,000 unit of seed	Seed Treatment	Seed Treatment	3,044
	Pyrifos 15G (OP)	75 g/100 m of row	70	G	2250

Insect	Insecticide (and insecticide group ¹)	Rate/Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD ₅₀ (Mammalian Toxicity) ²
Sap Feeders					
Aphids	Sivanto Prime (B)	202-304 ml	7 (silage, forage, sweet corn) 21 (grain)	A or G	>2,000
	Closer (S)	30 – 61 ml	7 (forage) 14 (grain)	A or G	>5,000
Spider mites	Oberon (TT)	162-243 ml	Green forage – 5 Grain or stover – 30	A or G	>2,000
Defoliators and Borers					
Grasshoppers	Spreadable Bran Baits				
	Eco bran (C)	0.8-1.6 kg	1	G	N/A
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%.				
	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 May 2018) is available at: http://www.cornpest.ca/bt-corn/ .				
	Dipel 2X DF (M)	0.23-0.45 kg	0	G	>4,000
	Coragen (D)	101 – 152 ml	14 (field corn) 1 (seed corn or sweet corn)	A or G	>5,000
	Delegate (Sp)	49 – 85 g	28	A or G	>5,000
	Matador/ Silencer (P)	34-76 ml	14 (silage) 21 (field corn)	A or G	64-110
	Decis 5EC /Poleci (P)	0 101-121 ml (Decis); 202-243 ml (Poleci)	N/A	G	395
	Mako (P)	71 ml	5	A or G	242-542
	UP-Cyde/Ship (P)	113 ml	5	A or G	355
	Voliam Xpress (D+P)	202 ml	14 (silage) 21 (field corn)	A or G	98
	Malathion 85E (OP)	0.445-0.544 L	5	A or G	5,500
	Orthene (seed and sweet corn only) (OP)	228-334 g	21	G	1,494
Corn Earworm	Some cultivars of Bt corn are resistant to feeding by corn earworm.				
	Coragen (D)	101-152 ml	14 (field corn) 1 (seed corn or sweet corn)	A or G	>5,000
	Matador/Silencer (P)	34-76 ml	14 (silage) 21 (field corn)	A or G	64-110
	Mako (P) UP-Cyde (P)	71 ml 113 ml	5	A or G, see product label	242-542 355
	Voliam Xpress (D+P)	202 ml	14 (silage) 21 (field corn)	A or G	98
	Malathion 85E (OP)	0.445-0.544 L	5	A or G	5,500
Armyworm	Coragen (D)	101-152 ml	14 (field corn) 1 (seed corn or sweet corn)	A or G	>5,000

Insect	Insecticide (and insecticide group ¹)	Rate/Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD ₅₀ (Mammalian Toxicity) ²
Armyworm continued	Matador/Silencer (P)	34 ml	14 (silage) 21 (field corn)	A or G	64-110
	Voliam Xpress (D+P)	202 ml	14 (silage) 21 (field corn)	A or G	98
Fall armyworm	Some cultivars of Bt corn are resistant to feeding by fall armyworm.				
	Coragen (D)	101-152 ml	14 (field corn) 1 (seed corn or sweet corn)	A or G	>5,000
	Matador/Silencer (P)	34 ml	14	A or G	64-110

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

² LD₅₀ values represent the relative toxicity of a pesticide. They represent the dose (in mg/kg body weight) that will kill 50% of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD₅₀.

Faba Bean 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 Feeders					
Cutworms	Coragen (D)	101 ml	1	A or G	>5,000
Wireworms	Cruiser Maxx Vibrance Pulses	A seed treatment containing Cruiser 5FS and Vibrance Maxx RFC.			
	Cruiser 5FS (N)	17-50 ml/ 100 kg seed	May be applied on-farm or by commercial seed treaters.		
	Stress Shield 600 (N)	104 ml / 100 kg seed	Seed Treatment		
Pea Leaf Weevil	Stress Shield 600 (N)	104 ml / 100 kg seed	Seed Treatment		
	Cruiser Maxx Vibrance Pulses	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.		
Sap and Fluid Feeders					
Lygus Bugs	Beleaf 50 SG (F)	81 g	7	G	>2,000
	Matador/Silencer (P)	34 ml	14 (Matador) 21 (Silencer)	A or G	64-110
Potato Leafhopper	Matador/Silencer (P)	34 ml	14 (Matador) 21 (Silencer)	A or G	64-110
Pea Aphid	Beleaf 50 SG (F)	49 - 65 g	7	G	>2,000
	Matador/Silencer (P)	34 - 94 ml	14 (Matador) 21 (Silencer)	A or G	64-110
	Voliam Xpress (D+P)	91 - 223 ml	14	A or G	98
Defoliators					
Grasshoppers	Coragen (D)	51-101 ml	1	A or G	>5,000

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

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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 cutworms, and evidence of cutworm feeding, when monitoring in late May to mid-July. Often cutworms will be close to the cut or shriveled plants that they have just damaged. Cutworms 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 m² (50cm x 50cm) 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 m². Repeat in several locations to get an accurate assessment of what cutworm levels are.
- **Economic Threshold:** 4-5 larvae/m². 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/acre per aphid per plant for crops sampled at full bloom and 0.1275 bushels/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/m²

Flax 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	No insecticides registered for the control of wireworms in flax.				
Cutworms	Coragen (D)	101 ml	1	A or G	>5,000
	Decis 5EC /Poleci (P)	80 ml (Decis) 162 ml (Poleci)	40	A or G	395
	Matador (P)	34 ml	7	A or G	64-110
	Pounce/Perm-UP (P) Ambush (P)	73-158 ml 57-121 ml	Treat prior to 5 leaf stage	A or G (see labels) G	1030
	Chlorpyrifos (OP)	0.354-0.486 L	21	A or G	205-418
Sap Feeders					
Potato Aphid	Lagon/Cygon 480 EC/ Cygon 480-AG (OP)	0.18 L	21	A or G	60-450
Lygus bugs	Voliam Xpress (D+P)	91 ml	7	A or G	98
Defoliators					
Grasshoppers	Coragen (D)	51 - 101 ml	1	A or G	>5,000
	Decis 5EC/Poleci (P)	Decis: 40-60 ml (Ground), 60 ml (Aerial) Poleci: 81-121 ml (ground), 121 ml (air)	40	A or G	395

Insect	Insecticide (and insecticide group ¹)	Rate/Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD ₅₀ (Mammalian Toxicity) ²
Grasshoppers <i>continued</i>	Matador/Silencer (young grasshoppers only) (P)	25-34 ml (Ground) 34 ml (Aerial)	7	A or G	64-110
	Voliam Xpress (D+P)	91 ml	7	A or G	98
	Malathion 500 (OP)	0.44-0.68 L	7	A or G	4302
	Malathion 85E (OP)	0.217-0.346 L	7	A or G	5,500
Bertha Armyworm	Coragen (D)	51-152 ml	1	A or G	>5,000
	Voliam Xpress (D+P)	91 ml	7	A or G	98
	Lannate (C)	89-109 g	8	A or G	30-34
	Chlorpyrifos (OP)	0.304-0.405 L	21	A or G	205-418
Armyworm	Chlorpyrifos (OP)	0.354-0.486 L	21	A or G	205-418
Clover Cutworm	Decis 5EC/Poleci (P)	40-60 ml (Decis) 81-121 ml (Poleci)	40	A or G	395
Variegated cutworm	Chlorpyrifos (OP)	0.354-0.486 L	21	A or G	205-418
Beet Webworm	Decis 5EC/Poleci (P)	40-60 ml (Decis) 81-121 ml (Poleci)	40	G	395

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

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Forage Grasses (Timothy, etc.) 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
Sap and Fluid Feeders					
Plant bugs	Lagon/Cygon 480-AG (OP)	0.17 L	2	A or G	60-450
Defoliators					
Grasshoppers	Spreadable Bran Baits				
	Eco bran (C)	0.8-1.6 kg	1-2	G	N/A
	Sprays				
	Coragen (D) (for feed)	51-101 ml	0	G	>5,000
	Matador/Silencer (P) (on timothy)	25-34 ml	14	G	64-110
	Malathion 500 (OP)	0.69 L	7	A or G	4302
	Sevin XLR (C)	0.49-1.42 L	1-2	G	699
	Lagon/Cygon 480-AG (OP)	0.17-0.22 L (nymphs) 0.34-0.40 L (adults)	2-28	A or G	60-450
European skipper (on timothy)	Dipel 2X DF (M)	57-111 g	N/A	A or G	>4,000
Armyworm	Coragen (D)	101-152 ml	0	G	>5,000

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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/m² 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:** 30-40 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/Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD ₅₀ (Mammalian Toxicity) ²
Belowground and Surface Feeders					
Wireworms	Cruiser Maxx Vibrance Pulses (N)	A seed treatment containing Cruiser 5FS and Vibrance Maxx RFC.			
	Cruiser 5FS (N)	17-50 ml / 100 kg seed	May be applied on-farm or by commercial seed treaters.		
	Stress Shield 600 (N)	Seed Treatment			
Cutworms	Coragen (D)	101 ml	1	A or G	>5,000
	Decis 5EC/Poleci (P)	80 ml (Decis) 162 ml (Poleci)	30	A or G	395
	Matador/Silencer (P)	34 ml	14 (Matador) 21 (Silencer)	A or G	64-110
	Pounce/Perm-UP (P) Ambush (P)	73-158 ml 57-121 ml	Treat prior to 5-leaf stage	A or G (see labels) G	1030
	Chlorpyrifos (for pale western cutworm only) (OP)	0.354-0.486 L	21-60	A or G	205-418
Sap and Fluid Feeders					
Lygus Bugs	Matador/Silencer (P)	34 ml	14 (Matador) 21 (Silencer)	A or G	64-110
Potato Leafhopper	Matador/Silencer (P)	34 ml	14 (Matador) 21 (Silencer)	A or G	64-110
Pea Aphid	Movento (TT)	75-111 ml	7	G	>2,000
	Matador/Silencer (P)	34-94 ml	14 (Matador) 21 (Silencer)	A or G	64-110
	Voliam Xpress (D+P)	91-223 ml	14	A or G	98
Defoliators					
Grasshoppers	Coragen (D)	51-101 ml	1	A or G	>5,000
	Decis 5E/Poleci (P)	Decis: 40-60 ml (ground), 60 ml (air) Poleci: 81-121 ml (ground), 121 ml (air)	30	A or G	395

Insect	Insecticide (and insecticide group ¹)	Rate/Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD ₅₀ (Mammalian Toxicity) ²
Grasshoppers continued	Matador/Silencer (P)	34 ml	14 (Matador) 21 (Silencer)	A or G	64-110
	Malathion 500 (OP)	0.68 L	30	A or G	4302
	Malathion 85E (OP)	0.336 L	14	A or G	5,500
	Chlorpyrifos (OP)	0.235-0.486 L	21-60	A or G	205-418

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Mustard 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					
Root Maggots	No insecticides registered.				
Cutworms	Seed Treatments				
	Fortenza (D)	Applied combined with Helix Vibrance.			
	Foliar Sprays				
	Coragen (D)	101 ml	1	A or G	>5,000
	Matador (P)	34 ml	7	A or G	64-110
Sap Feeders					
Lygus Bugs	Decis 5EC /Poleci (P)	60 ml (Decis) 121 ml (Poleci)	7	A or G	395
	Voliam Xpress (D+P)	91 ml	7	A or G	98
Swede midge	Coragen (D)	101 ml	1	A or G	>5,000
Defoliators					
Flea beetles	Seed Treatments				
	Fortenza (D)	Applied combined with Helix Vibrance.			
	Helix Vibrance (N)	A seed treatment containing Helix Xtra and Vibrance 500FS.			
	Prosper (N)		Seed Treatment	Seed Treatment	N/A
	Visivio (N+S)	Seed treatment containing Helix Vibrance and sulfoxaflor. Visivio can also be combined with Fortenza if cutworm control is needed.			
	Gaucho Canola System (N)	0.833 L/ 100 kg of seed	N/A	Seed Treatment	N/A
	Gaucho Platinum (N)	1.667 L/ 100 kg of seed	N/A	Seed Treatment	N/A
	Sombrero (N)	0.67 – 1.33 L /100 kg seed	Seed Treatment	Seed Treatment	N/A
	Sprays				
	Decis 5EC/Poleci (P)	40-60 ml (Decis) 81-121 ml (Poleci)	7	A or G	395
	UP-Cyde/Ship (P)	56.7 ml	30	A or G	355
Matador/Silencer (P)	34 ml	7	A or G	64-110	

Insect	Insecticide (and insecticide group ¹)	Rate/Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD ₅₀ (Mammalian Toxicity) ²
Flea beetles <i>continued</i>	Voliam Xpress (D+P)	91 ml	7	A or G	98
	Malathion 85E (OP)	0.217-0.346 L	7	A or G	5,500
Cabbage seedpod weevil	Note: Yellow mustard (<i>Sinapis alba</i>) is resistant to cabbage seedpod weevil; oriental and brown mustards (<i>Brassica juncea</i>) are susceptible to feeding by cabbage seedpod weevil.				
	Matador/Silencer (adults) (P)	34 ml	7	A or G	64-110
	Decis 5 EC/Poleci (for control of adults only) (P)	80 ml (Decis) 162 ml (Poleci)	7	A or G	395
	Voliam Xpress (D+P)	91 ml	7	A or G	98
Diamondback Moth	Coragen (D)	51 ml	1	A or G	>5,000
	Decis 5 EC/Poleci (P)	40-60 ml (Decis) 81-121 ml (Poleci)	7	A or G	395
	Matador/Silencer (P)	34 ml	7	A or G	64-110
	Voliam Xpress (D+P)	91 ml	7	A or G	98
	Malathion 85E (OP)	0.109-0.168 L	7	A or G	5,500
Bertha Armyworm	Coragen (D)	51-152 ml	1	A or G	>5,000
	Decis 5EC/Poleci (P)	40-60 ml (Decis) 81-121 ml (Poleci)	7	A or G	395
	Matador/Silencer (P)	34 ml	7	A or G	64-110
	Voliam Xpress (D+P)	91 ml	7	A or G	98
Clover Cutworm	Decis 5EC /Poleci (P)	40-60 ml (Decis) 81-121 ml (Poleci)	7	A or G	395
Imported cabbageworm	Coragen (D)	101 ml	1	A or G	>5,000
	Matador/Silencer (P)	34 ml	7	A or G	64-110
	Voliam Xpress (D+P)	91 ml	7	A or G	98
Beet webworm	Decis 5EC /Poleci (P)	40-60 ml (Decis) 81-121 (Poleci)	7	G	395
Cabbage looper	Coragen (D)	101 ml	1	A or G	>5,000
Grasshopper	Coragen (D)	51-101 ml	1	A or G	>5,000
	Decis 5EC /Poleci (P)	Decis: 40-60 ml (Ground),60 ml (Aerial) Poleci: 81-121 ml (ground), 121 ml (air)	7	A or G	395
	Matador/Silencer (young grasshoppers only) (P)	25-34 ml(Ground) 34 ml (Aerial)	7	A or G	64-110
	Voliam Xpress (D+P)	91 ml	7	A or G	98
	Malathion 85E (OP)	0.217-0.346 L	7	A or G	5,500

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Oats – See small grain cereals

Grasshopper Management on Pastures, Rangelands, Hay, Headlands, and Roadsides

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/Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD ₅₀ (Mammalian Toxicity) ²
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. For more information on managing grasshoppers by this method see: http://www.grasshoppercontrol.com/_pdf/articles/raat.pdf .				
Spreadable Bran Baits				
Nolo Bait (Pastures, Rangelands)	Minimum of 0.45 kg		A or G	
Eco bran (pastures, rangelands, field borders, headlands, right-of-way, roadsides, wastelands) (C)	0.8-1.6 kg	0-2 (see label)	G	N/A
Sprays				
Coragen (D) (Pastures and Rangeland)	51-101 ml	0	G	>5,000
Decis 5EC /Poleci (P) (Rangeland, pastures, roadside)	40-60 ml (Decis) 81-121 ml (Poleci)	N/A	A or G (Rangeland, pastures) G (Roadsides)	395
Mako (P) (Roadsides, headlands, and summerfallow) (young grasshoppers only) UP-Cyde (P) (Roadsides, headlands, and summerfallow) (young grasshoppers only)	20-28 ml 33-46 ml	Treated areas must not be grazed or cut for hay.	G	242-542 355
Matador (P) (Unimproved pasture, summerfallow) (young grasshoppers only)	25-34 ml (Ground) 34 ml (Aerial)	3	A or G	64-110
Silencer (P) (Unimproved pasture) (young grasshoppers only)	25-34 ml (Ground) 34 ml (Aerial)	3	A or G	64-110
Sevin XLR (C) (Pastures, rangelands, ditchbanks, headlands)	0.49-1.42 L	0-2 (see label)	G	699
Malathion 500 (OP) (hay only)	0.69 L	7	A or G	4302
Malathion 85E (OP) (pastures, rangelands)	0.336 L	Do not apply to fields occupied by dairy animals, but may be grazed or harvested on the day of application.	G	5,500
Dibrom (OP) (Rangeland, pastures, dairy and horse paddocks)	0.21-0.33 L (young grasshoppers) 0.27-0.39 L (adult grasshoppers)	4	A or G	345
Lagon /Cygon 480 EC /Cygon 480-AG (OP) (pasture, wasteland)	0.22 L (nymphs) 0.34-0.41 L (adults)	2 days – 0.22L rate 7-28 days – 0.34-0.41L rates (see labels)	A or G	60-450
Lagon (OP) (Hay)	0.17-0.22 L	2	A or G	60-450
Chlorpyrifos (OP)	Ungrazed and unoccupied areas such as roadsides, right of way, and fence lines adjacent to barley, wheat, oats, or canola, and lentils.		A or G	205- 418

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Field Scouting in Peas (Field Peas)

- Cutworms
 - **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 2-3 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/Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD ₅₀ (Mammalian Toxicity) ²
Belowground and Surface Feeders					
Wireworms	Cruiser Maxx Vibrance Pulses (N)	A seed treatment containing Cruiser 5FS and Vibrance Maxx RFC.			
	Cruiser 5FS (N)	17-50 ml/ 100 kg seed	May be applied on-farm or by commercial seed treaters.		
	Stress Shield 600 (N)	104ml/100kg of seed	Seed Treatment		
Cutworms	Coragen (D)	101 ml	1	A or G	>5,000
	Matador/Silencer (P)	34 ml	14 (Matador) 21 (Silencer)	A or G	64-110
	Pounce/Perm-UP (P) Ambush (P)	73-158 ml 57-121 ml	Treat prior to 5 leaf stage	A or G (see labels) G	1030
Sap and Fluid Feeders					
Leafhoppers	Malathion 85E (OP)	0.445 L	3	A or G	5,500
Pea Aphid	Movento (TT)	75-111 ml	7	G	>2,000
	Matador/Silencer (P)	34-94 ml	14 (Matador) 21 (Silencer)	A or G	64-110
	Voliam Xpress (D+P)	91-223 ml	14	A or G	98
	Lannate (C)	0.206 kg	1	G	30-34
	Malathion 85E (OP)	0.445 L	3	A or G	5,500
	Lagon/Cygon 480 EC (OP)	0.11-0.15 L	3-21 (see labels)	A or G	60-450
Defoliator					
Grasshoppers	Coragen (D)	51-101 ml	1	A or G	>5,000
	Matador/Silencer (P)	34 ml	14 (Matador) 21 (Silencer)	A or G	64-110
Alfalfa Looper	Lannate (C)	0.206 kg	1	G	30-34
	Sevin XLR (C)	1.90 L	3	G	699
Pea leaf weevil	Cruiser Maxx Vibrance Pulses (N)	A seed treatment combining Cruiser 5FS and Vibrance Maxx RFC.			
	Cruiser 5FS (N)	50 or 83 ml/ 100 kg seed	On-farm application at the lower rate only.		
	Stress Shield 600 (N)	104-208 ml/ 100kg of seed	Seed Treatment		
	Matador/Silencer (P)	34 ml	14 (Matador) 21 (Silencer)	A or G	64-110

Insect	Insecticide (and insecticide group ¹)	Rate/Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD ₅₀ (Mammalian Toxicity) ²
Armyworm	Coragen (D)	101-152 ml	1	A or G	>5,000

ALWAYS CONSULT THE INSECTICIDE LABEL BEFORE APPLYING ANY INSECTICIDE.

¹ Insecticide Group: D=diamides, N=neonicotinoids, P=pyrethroids, C=carbamates, OP=organophosphates, TT = tetrionic and tetramic acid derivatives.

² LD₅₀ values represent the relative toxicity of a pesticide. They represent the dose (in mg/kg body weight) that will kill 50% of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD₅₀.

Scouting and Thresholds for Insects in Potatoes

• 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 = 3-10 green peach aphids/100 leaves. For processing potatoes = 30-100 green peach aphids/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 3-5 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 % 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/ 20 plants for Russet Burbank vs 6 larvae/20 plants for Norland. Treat when defoliation exceeds 10%.

• 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% defoliation. Later in the season (August) treat if greater than 25% 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/Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD ₅₀ (Mammalian Toxicity) ²
Belowground and Surface Feeders					
Wireworms	Titan (N)	20.8 ml per 100 kg potato seed pieces			2,000
	Nipsit Inside (N)	20.8 ml per 100 kg potato seed pieces	Seed Treatment	Seed Treatment	3,044
	Capture (P)	8.3-14.1 ml per 100 metres of row	21	G	262

Insect	Insecticide (and insecticide group ¹)	Rate/Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD ₅₀ (Mammalian Toxicity) ²
Wireworms <i>continued</i>	Pyrifos 15G (OP)	0.1 kg per 100 metres of row	70	G	2,250
	Pyrinex 480 EC (OP)	0.97 L (based on 90 cm row spacing)	70	G	409
	Thimet 20-G (OP)	105g/100m in sandy or light soil 161g/100m in silt or heavy soils	Do not harvest potatoes before 90 days after planting time.	G	5.1-13.5
Cutworms	Pounce/Perm-UP (P) Ambush (P)	73-158 ml 57-121 ml	Treat prior to 5-leaf stage	A or G (see labels) G	1276
	Mako (P) UP-Cyde (P)	71 ml 115 ml	21	G	242-542 355
	Chlorpyrifos (Redbacked, black, and darksided cutworms only) (OP)	0.971 L (pre-plant) 0.486-0.971 L (seedling)	7	G	205-418
Sap or Fluid Feeders					
Aphids	Seed Piece Treatments				
	Actara 240SC (N)	See chart on label	N/A	Seed Treatment	>5,000
	Alias 240 SC (N)	11.79-17.69 ml per 100 pounds (45.36 kg) of potato seed tubers	N/A	Seed Treatment	>4,870
	Cruiser Maxx Potato Extreme (N)	20 ml /100 kg seed	NA	Seed Treatment	
	Titan (N)	10.4-20.8 ml per 100 kg potato seed pieces	N/A	Seed Treatment	2,000
	Nipsit Inside (N)	10.4-20.8 ml per 100 kg potato seed pieces	Seed Treatment	Seed Treatment	3,044
	In-Furrow Application				
	Minecto Duo (N, D)	178-283 g		G	>5,000
	Actara 240SC (N)	0.15-0.20 L (based on 90 cm row spacing)		G	>5,000
	Admire 240 F/ Alias 240 SC (N)	0.344-0.526 L (based on 90 cm row spacing)		G	4143-4870
	Foliar Sprays				
	Fulfill (PAD)	78.1 g	14	A or G	>5,000
	Beleaf 50 SG (F)	49-65 g	7	G	>2,000
	Sefina	81 ml	7	A or G	>2,000
	Superior 70 Oil	4 L	14	G	>5,000
	Movento	89-148 ml	7	A or G	>2,000
	Exirel (D)	202-607 ml	7	A or G	>5,000
	Sivanto Prime (B)	202-304 ml	7	A or G	>2,000
	Closer (S)	20-61 ml	7	A or G	>5,000
	Actara 240SC (N)	44.1 ml	7	A or G	
Actara 25WG (N)	42.5 g	7	A or G	>5,000	

Insect	Insecticide (and insecticide group ¹)	Rate/Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD ₅₀ (Mammalian Toxicity) ²
Aphids <i>continued</i>	Admire 240 F/ Alias 240 SC (N)	81 ml	7	G	4143-4870
	Assail (N)	22.7-34.8 g	7	G	1,064
	Clutch (N)	28-43 g	14	A or G	4,300
	Concept (N + P)	263 ml	7	G	
	Lannate (C)	0.2185 kg	3	G	30-34
	Malathion 500 (OP)	0.56-0.80 L	3	A or G	4302
	Malathion 85E (OP)	0.297-0.445 L	3	G	5,500
	Lagon/Cygon 480 EC/ Cygon 480-AG (OP)	0.22-0.41 L	7	G	60-450
	Imidan (OP)	0.65 kg	7	G	285
	Orthene (OP)	228-334 g	21	G	1,494
Potato psyllid	Agri-mek	91 ml	14	G	300
	Minecto Pro (A + D)	150-271 ml	14	G	451
	Movento (TT)	89-148 ml	7	A or G	>2,000
	Voliam Xpress (D+P)	202 ml	7	A or G	98
Leafhoppers	Seed Piece Treatments				
	Actara 240SC (N)	See chart on label	N/A	Seed Treatment	>5,000
	Alias 240 SC (N)	11.79-17.69 ml per 100 pounds (45.36 kg) of potato seed tubers	N/A	Seed Treatment	>4,870
	Cruiser Maxx Potato Extreme (N)	20 ml/100 kg seed	NA	Seed Treatment	
	Titan (N)	10.4-20.8 ml per 100 kg potato seed pieces	N/A	Seed Treatment	2,000
	Nipsit Inside (N)	10.4-20.8 ml per 100 kg potato seed pieces	Seed Treatment	Seed Treatment	3,044
	In-Furrow Application				
	Minecto Duo (N, D)	178 – 283 g		G	>5,000
	Actara 240SC (N)	0.15-0.20 L (based on 90 cm row spacing)		G	>5,000
	Admire 240F/ Alias 240 SC (N)	0.344-0.526 L (based on 90 cm row spacing)	N/A	G	4143-4870
	Foliar Sprays				
	Sivanto Prime (B)	202-304 ml	7	A or G	>2,000
	Closer (S)	121 ml	7	A or G	>5,000
	Actara 240SC (N)	44.1 ml	7	A or G	
	Actara 25WG (N)	42.5 g	7	A or G	
	Clutch (N)	28-43 g	14	A or G	4,300
	Pounce/Perm-UP (P)	73-105 ml	1	A or G	1276
	Decis 5EC/Poleci (P)	40-60 ml (Decis) 81-121 ml (Poleci)	1	A or G	395
	Matador/Silencer (P)	34 ml	7	A or G	64-110

Insect	Insecticide (and insecticide group ¹)	Rate/Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD ₅₀ (Mammalian Toxicity) ²
Leafhoppers <i>continued</i>	Mako (P)	25-50 ml	7	A or G	242-542
	UP-Cyde/Ship (P)	57 ml	7	A or G	355
	Concept (N + P)	263 ml	7	G	2,500
	Lannate (C)	0.2185 kg	3	G	30-34
	Sevin XLR (C)	1.01 L	7	G	699
	Malathion 500 (OP)	0.56-0.80 L	3	A or G	1375-2800
	Malathion 85E (OP)	0.297-0.445 L	3	G	5,500
	Lagon/Cygon 480 EC/ Cygon 480-AG (OP)	0.22-0.41 L	7	G	60-450
	Dibrom (OP)	0.42 L	4	A or G	345
	Imidan (OP)	0.65 kg	7	G	285
	Orthene (OP)	228-334 g	21	G	1,494
Lygus bugs	Pounce/Perm-UP (P) Ambush (P)	73-105 ml 57-81 ml	1	A or G	1276
	Decis 5EC/Poleci (P)	40-60 ml (Decis) 81-121 ml (Poleci)	1	A or G	395
	Matador/Silencer (P)	34 ml	7	A or G	64-110
	Mako (P)	50 ml	7	A or G	242-542
	UP-Cyde/Ship (P)	81 ml	7	A or G	355
	Sevin XLR (C)	2.12-2.59 L	7	G	699
	Concept (N + P)	263 ml	7	G	2,500
	Lagon/Cygon 480 EC (OP)	0.22-0.41 L	7	G	60-450
	Chlorpyrifos (nymphs only) (OP)	0.405 L	7	G	205-418
	Orthene (OP)	228-334 g	21	G	1,494
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)	10-22.5 ml/ 100 kg seed	N/A	Seed Treatment	>5,000
	Verimark (D)	45 ml/100 kg of seed pieces	N/A	Seed Treatment	>5,000
	Actara 240SC (N)	See chart on label	N/A	Seed Treatment	>5,000
	Alias 240 SC (N)	11.79-17.69 ml per 100 pounds (45.36 kg) of potato seed tubers	N/A	Seed Treatment	>4,870
	Cruiser Maxx Potato Extreme (N)	20 ml /100 kg seed	NA	Seed Treatment	
	Titan (N)	10.4-20.8 ml per 100 kg potato seed pieces	N/A	Seed Treatment	2,000
	Nipsit Inside (N)	10.4-20.8 ml/100 kg potato seed pieces	Seed Treatment	Seed Treatment	3,044

Insect	Insecticide (and insecticide group ¹)	Rate/Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD ₅₀ (Mammalian Toxicity) ²
Colorado potato beetle <i>continued</i>	In-Furrow Application				
	Verimark (D)	304-405 ml (based on 90 cm row spacing)	N/A	G	>5,000
	Minecto Duo (N, D)	178-283 g		G	>5,000
	Actara 240SC (N)	0.15-0.20 L (based on 90 cm row spacing)		G	>5,000
	Admire/Alias 240 SC (N)	0.345 -0.525 L	7	G	4143-4870
	Clutch (N)	108-181 g (based on 90 cm row spacing)	14	G	4,300
	Foliar Sprays				
	Rimon (SB)	0.17-0.33 L	14	G	>5,000
	Entrust (Sp)	20-40 g	7	G	>5,000
	Success (Sp)	34-67 ml	7	G	>5,000
	Delegate (Sp)	65-97 g	7	A or G	>5,000
	Coragen (D)	101-202 ml	14	A or G	>5,000
	Exirel (D)	304 – 405 ml	7	A or G	>5,000
	Sivanto Prime (B)	304-405 ml	7	A or G	>2,000
	Minecto Pro (A + D)	225-271 ml	14	G	451
	Actara 240SC (N)	44.1 ml	7	A or G	
	Actara 25WG (N)	42.5 g	7	A or G	>5,000
	Admire/Alias 240 SC (N)	81 ml	7	G	4143-4870
	Assail (N)	16.2-32.4 g	7	G	1,064
	Clutch (N)	28-43 g	14	A or G	
	Pounce/Perm-UP (P) Ambush (P)	73-105 ml 57-81 ml	1	A or G	1276
	Decis 5EC/Poleci (P)	40 -60 ml (Decis) 81-121 ml (Poleci)	1	A or G	395
	Matador/Silencer (P)	34-50 ml	7	A or G	64-110
	Mako (P)	25-50 ml	7	A or G	242-542
	Up-Cyde/Ship (P)	57 ml	7	A or G	355
	Concept (N + P)	263 ml	7	G	
	Sevin XLR (C)	0.51 L	7	G	699
	Malathion 500 (OP)	0.56-0.80 L	3	A or G	4302
	Malathion 85E (OP)	0.297-0.445 L	3	G	5,500
	Dibrom (OP)	0.42 L	4	A or G	345
Imidan (OP)	0.65 kg	7	G	285	
Chlorpyrifos (larvae only) (OP)	0.405 L	7	G	205-418	
Potato Flea Beetle	Verimark (D)	In-furrow application: 304-405 ml (based on 90 cm row spacing) Seed-piece treatment: 45 ml/ 100 kg of seed pieces	N/A	In-furrow application or seed-piece treatment	>5,000

Insect	Insecticide (and insecticide group ¹)	Rate/Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD ₅₀ (Mammalian Toxicity) ²
Potato Flea Beetle <i>continued</i>	Admire SPT/Alias 240 SC (N)	11.79-17.69 ml per 100 pounds (45.36 kg) of potato seed tubers	N/A	Seed Treatment	>4,870
	Titan (N)	10.4-20.8 ml/100 kg potato seed pieces			2,000
	Nipsit Inside (N)	10.4-20.8 ml per 100 kg potato seed pieces	Seed Treatment	Seed Treatment	3,044
	Exirel (D)	202 – 405 ml	7	A or G	>5,000
	Minecto Pro (A + D)	150-271 ml	14	G	451
	Minecto Duo (N + D)	178-283 g		G	>5,000
	Admire 240 F/ Alias 240 SC(N)	Soil Application: 0.344-0.526 L (based on 90 cm row spacing)	N/A	G	4143-4870
	Pounce/Perm-UP (P) Ambush (P)	73-105 ml 57-81 ml	1	A or G	1276
	Decis 5EC/Poleci (P)	40-60 ml (Decis) 81-121 ml (Poleci)	3	A or G	395
	Matador/Silencer (P)	34 ml	7	A or G	64-110
	Mako (P)	25-50 ml	7	A or G	242-542
	UP-Cyde/Ship (P)	57 ml	7	A or G	355
	Concept (N + P)	263 ml	7	G	
	Lannate (C)	0.2185 kg	3	G	30-34
	Sevin XLR (C)	1.01 L	7	G	699
	Dibrom (OP)	0.42 L	4	A or G	345
	Imidan (OP)	0.65 kg	7	G	285
	Chlorpyrifos (OP)	0.405 L	7	G	205-418
	Orthene (OP)	228-334 g	21	G	1,494
Variegated cutworm	Coragen (D)	101-152 ml	1	A or G	>5,000
	Exirel (D)	202-304 ml	7	A or G	>5,000
	Minecto Pro (A + D)	150-225 ml	14	G	451
	Pounce/Perm-UP (P) Ambush (P)	73 ml 57 ml	1	G	1276
	Mako (P) UP-Cyde (P)	71 ml 115 ml	7	G	242-542 355
	Voliam Xpress (D+P)	202 ml	7	A or G	98
	Lannate (C)	0.11-0.22 kg	3	G	30-34
	Sevin XLR (C)	45 mL / 100 m of row	7	G	699
Armyworm	Coragen (D)	101-152 ml	1	A or G	>5,000
	Exirel (D)	202 ml	7	A or G	>5,000
	Minecto Pro (A + D)	150 ml	14	G	451
	Matador/Silencer (P)	34 ml	7	A or G	64-110

Insect	Insecticide (and insecticide group ¹)	Rate/Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD ₅₀ (Mammalian Toxicity) ²
Stem Borers					
European Corn Borer	Rimon (SB)	0.17-0.33 L	14	G	>5,000
	Entrust (Sp)	35.4 g/acre	7	G	>5,000
	Success (Sp)	59 ml	7	G	>5,000
	Delegate (Sp)	65 g	7	A or G	>5,000
	Coragen (D)	101-152 ml	1	A or G	>5,000
	Exirel (D)	202-304 ml	7	A or G	>5,000
	Minecto Pro (A + D)	150-225 ml	14	G	451
	Matador/Silencer (P)	34 ml	7	A or G	64-110
	Pounce/Perm-UP (P) Ambush (P)	73 ml 57 ml	1	A or G	1276
	Concept (N + P)	263 ml	7	G	2,500
Sevin XLR (C)	1.01-2.12 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=fonicamid, SB=substituted benzoylurea, Sp=spinosyns, D=diamides, S=sulfoxamines, B=butenolides, N=neonicotinoids, P=pyrethroids, C=carbamates, OP=organophosphates, PAD= Pyridine azomethine derivatives

² LD₅₀ values represent the relative toxicity of a pesticide. They represent the dose (in mg/kg body weight) that will kill 50% of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD₅₀.

Quinoa 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
Stem borers					
European Corn Borer	Dipel (M)	227-453 g	N/A	A or G	>4,000

ALWAYS CONSULT THE INSECTICIDE LABEL BEFORE APPLYING ANY INSECTICIDE.

¹ Insecticide Group: M=microbial

² LD₅₀ values represent the relative toxicity of a pesticide. They represent the dose (in mg/kg body weight) that will kill 50% of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD₅₀.

Field Scouting in Rye

Information on typical damage, when and how to monitor, and economic thresholds for cutworms, aphids and armyworms 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/Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD ₅₀ (Mammalian Toxicity) ²
Belowground and Surface Feeders					
Wireworms	Cruiser Vibrance Quattro (N)	325 ml/100 kg seed		Seed Treatment	>5,000
	Cruiser 5FS (N)	17-50 ml/100 kg seed	May be applied on-farm or by commercial seed treaters.		
Cutworms	Coragen (D)	101 ml	1	A or G	>5,000
	Pounce/Perm-UP (P) Ambush (P)	73-158 ml 57-121 ml	Treat prior to 5 leaf stage	A or G (see labels) G	1030

Sap Feeders					
Aphids	Malathion 500 (OP)	0.60-0.80 L	7	A or G	4302
	Malathion 85E (OP)	0.445-0.544 L	7	A or G	5,500
Defoliators					
Grasshoppers	Spreadable Bran Baits				
	Nolo Bait	Minimum of 0.45 kg		A or G	
	Eco bran (C)	0.8-1.6 kg	14	G	N/A
	Sprays				
	Coragen (D)	51-101 ml	1	A or G	>5,000
	Malathion 500 (OP)	0.69 L	7	A or G	4302
	Malathion 85E (OP)	0.445-0.544 L	7	A or G	5,500
	Lagon 480 E (OP)	0.22 L (nymphs) 0.34-0.41 L (adults)	35	A or G	60
Armyworm	Coragen (D)	101-152 ml	1	A or G	>5,000
	Delegate (Sp)	40-81 g	21	G	>5,000
	Malathion 500 (OP)	0.60-0.80 L	7	A or G	4302
	Malathion 85E (OP)	0.445-0.544 L	7	A or G	5,500

ALWAYS CONSULT THE INSECTICIDE LABEL BEFORE APPLYING ANY INSECTICIDE.

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

² LD₅₀ values represent the relative toxicity of a pesticide. They represent the dose (in mg/kg body weight) that will kill 50% of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD₅₀.

Safflower 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					
Cutworms	Coragen (D)	101 ml	1	A or G	>5,000
Defoliators					
Grasshoppers	Coragen (D)	51-101 ml	1	A or G	>5,000
	Voliam Xpress (D+P)	91 ml	7	A or G	98
	Lagon 480 E/Cygon 480 EC/ Cygon 480-AG (OP)	0.22-0.40 L	21	A or G	60-450

ALWAYS CONSULT THE INSECTICIDE LABEL BEFORE APPLYING ANY INSECTICIDE.

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

² LD₅₀ values represent the relative toxicity of a pesticide. They represent the dose (in mg/kg body weight) that will kill 50% of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD₅₀.

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

Belowground and Surface Feeders

- **Cutworms**

- **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 cutworms, 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. Cutworms 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 m² (50cm x 50cm) 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 m². Repeat in several locations to get an accurate assessment of what the cutworm levels are.

- **Economic Threshold:** Pale western cutworm – 3-4/m²; Redbacked and army cutworm – 5-6/m². 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:** 12-15 aphids/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 seven 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/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/yard² (m²).
- **Economic Threshold:** 8-13 grasshoppers/m². Early in the season, when grasshoppers are small, 18 grasshoppers/m² 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/m² or higher.

• Armyworms

- **Typical Damage:** Leaves stripped from plants, awns chewed from heads, heads clipped.
- **When and How to Monitor:** Check the soil surface for armyworms, 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% 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/Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD ₅₀ (Mammalian Toxicity) ²
Belowground and Surface Feeders					
Wireworms	Cruiser Vibrance Quattro (N)	325 ml/100 kg seed		Seed Treatment	>5,000
	Cruiser 5FS (N) (Wheat and barley only)	17-50 ml/100 kg seed	May be applied on-farm or by commercial seed treaters.		
	Nipsit Suite Cereals (N) (Wheat only)	326 ml per 100 kg seed	Seed Treatment	Seed Treatment	>5,000
	Nipsit Inside (N)	17-100 ml per 100 kg seed	Seed Treatment	Seed Treatment	3,044
	Alias 240 SC (N)	42-125 ml/ 100 kg seed		Seed Treatment	
	Sombrero 600 FS (N)	17-50 ml/100 kg seed	Seed Treatment	Seed Treatment	
	Raxil ProShield (N)	A co-pack of Raxil Pro and StressShield 600			
Cutworms	Coragen (D)	101 ml	1	A or G	>5,000
	Decis 5EC /Poleci (P)	80 ml (Decis) 162 ml (Poleci)	31 (oats) 40 (barley, wheat)	A or G	395
	Mako (P) (barley and wheat only)	71 ml	21	G	242-542
	UP-Cyde (P) (barley and wheat only)	115 ml			355
	Pounce/Perm-UP (P) Ambush (P)	73-158 ml 57-121 ml	Treat prior to 5-leaf stage	A or G (see labels) G	1030
	Chlorpyrifos (OP)	0.354-0.486 L	60	A or G	205-418
Sap and Fluid Feeders					
Aphids	Malathion 500 (OP)	0.60-0.8 L	7	A or G	4302
	Malathion 85E (OP)	0.445-0.544 L	7	A or G	5,500
	Cygon 480 EC/ Cygon 480-AG (OP)	0.17 L	35	A or G	60-450
Thrips	Lannate (C)	0.1214kg	20	A or G	30-34
	Lagon 480 E/Cygon 480 EC/ Cygon 480-AG (OP)	0.40 L	35	A or G	60-450
Brown Wheat Mite	Chlorpyrifos (OP)	0.253 L	60	A or G	205-418
Defoliators					
Grasshoppers	Spreadable Bran Baits				
	Nolo Bait	Minimum of 0.45 kg		A or G	
	Eco bran (C)	0.8-1.6kg	14 (oats, wheat) 28 (barley)	G	
	Sprays				
	Coragen (D)	51-101 ml	1	A or G	>5,000
	Decis 5EC/Poleci (P)	Decis: 40-60 ml (ground), 60 ml (air) Poleci: 81-121 ml (ground), 121 ml (air)	31 (oats) 40 (wheat, barley)	A or G	395

Insect	Insecticide (and insecticide group ¹)	Rate/Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD ₅₀ (Mammalian Toxicity) ²
Grasshoppers continued	Mako (P) (young grasshoppers only) (wheat and barley only)	20-28 ml	30 (wheat) 45 (barley)	G	242-542
	UP-Cyde (P) (young grasshoppers only) (wheat and barley only)	33-46 ml	30 (wheat) 45 (barley)	G	355
	Matador/Silencer (P) (young grasshoppers only)	25-34 ml (ground) 34 ml (aerial)	Do not apply within 28 days of harvest or 14 days of livestock foraging	A or G	64-110
	Malathion 500 (OP)	0.68 L	7	A or G	4302
	Malathion 85E (OP)	0.445-0.544 L	7	A or G	5,500
	Chlorpyrifos (OP)	0.235-0.354 L	60	A or G	205-418
	Lagon 480 E/Cygon 480EC (OP)	nymphs-0.22 L adults-0.34-0.40 L	35	A or G	60-450
Cereal Leaf Beetle	A parasitoid of cereal leaf beetle, <i>Tetrastichus julis</i> , has been released and established in many areas.				
	Malathion 500 (OP)	0.22-0.45 L	7	A or G	4302
	Malathion 85E (OP)	0.435 L	7	A or G	5,500
Armyworm	Coragen (D)	101-152 ml	1	A or G	>5,000
	Delegate (Sp)	40-81 g	21	G	>5,000
	Matador /Silencer (P)	34 ml	Do not apply within 28 days of harvest or 14 days of livestock foraging	A or G	64-110
	Lannate (C)	0.1093-0.2185kg	20	A or G	30-34
	Malathion 500 (OP)	0.60-0.80 L	7	A or G	4302
	Malathion 85E (OP)	0.445-0.544 L	7	A or G	5,500
	Chlorpyrifos (OP)	0.354-0.486 L	60	A or G	205-418
Slugs	Sluggo Professional	10-20 kg		G	>5,000
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: http://www.midgetolerantwheat.ca/farmers/				
	Biological Control - A parasitoid, <i>Macroglenes penetrans</i> , was found to control an average of 32% of the wheat midge in Saskatchewan.				
	Chlorpyrifos (OP)	0.336-0.405 L	60	A or G	205-418
	Lagon 480 E/Cygon 480 EC /Cygon 480-AG (OP)	0.40 L	35	A or G	60-450
Stem-Borers					
Hessian Fly	<ul style="list-style-type: none"> • 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 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. 				
Wheat Stem Maggot	Crop rotation and stubble cultivation may reduce populations.				

Insect	Insecticide (and insecticide group ¹)	Rate/Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD ₅₀ (Mammalian Toxicity) ²
Wheat stem sawfly	<ul style="list-style-type: none"> • Solid-stem wheat varieties (such as the hard red spring wheat varieties AC Lillian, AC Abbey and AC Eatonia, and the durum varieties AAC Raymore and CDC Fortitude) 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 <i>Bracon cephi</i> 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, N= neonicotinoids, P=pyrethroids, C=carbamates, OP=organophosphates.

² LD₅₀ values represent the relative toxicity of a pesticide. They represent the dose (in mg/kg body weight) that will kill 50% of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD₅₀.

Scouting for insects in Soybeans

• Cutworms

- A nominal threshold that may be used for cutworms in soybeans is 1 or more larvae per three feet of row and larvae are small (less than 2 cm), or 20% 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 250-300 aphids per plant and not cause economical yield loss. If the aphid levels are not rising above 250-300 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.

Soybean 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	Fortenza (D)	83 ml/100 kg seed			
	Cruiser Maxx Vibrance Beans (N)	A seed treatment combining Cruiser Maxx Beans and Vibrance 500FS.			
	Cruiser 5FS (N)	83 ml/100 kg seed	May only be applied by commercial seed treaters.		
	Alias 240 SC (N)	Apply 260-520 ml per 100 kg seed			
	Sombrero 600 FS (N)	Apply 104-208 ml/100 kg seed			
	Stress Shield 600 (N)	Apply 104-208 ml/ 100 kg seed			
Seedcorn Maggot	Fortenza (D)	41.5-83 ml/100 kg seed			
	Cruiser Maxx Vibrance Beans (N)	A seed treatment combining Cruiser Maxx Beans and Vibrance 500FS.			
	Cruiser 5FS (N)	50-83 ml/ 100 kg seed	May only be applied by commercial seed treaters.		
	Alias 240 SC (N)	Apply 260-520 ml per 100 kg seed			

Insect	Insecticide (and insecticide group ¹)	Rate/Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD ₅₀ (Mammalian Toxicity) ²
Seedcorn Maggot <i>continued</i>	Sombrero 600 FS (N)	Apply 104-208 ml/100 kg seed			
	Stress Shield 600 (N)	Apply 104-208 ml / 100 kg seed			
Cutworms	Coragen (D)	101 ml	1	A or G	>5,000
	Matador/Silencer (P)	34 ml	21	A or G	64-110
Sap or Fluid Feeders					
Soybean Aphid	Sefina	81 ml	7	A or G	>2,000
	Movento (TT)	75-111 ml	21	A or G	>2,000
	Matador/Silencer (P)	34-94 ml	21	A or G	64-110
	Voliam Xpress (D+P)	91-223 ml	21	A or G	98
	Concept (N + P)	132-263 ml	20	G	
	Lagon 480 E/Cygon 480 EC/ Cygon 480-AG (OP)	0.28-0.40 L	30	A or G (Lagon 480 E, Cygon 480 EC) G only (Cygon 480-AG)	60-450
Leafhoppers	Lagon 480 E/Cygon 480 EC/ Cygon 480-AG (OP)	0.28-0.40 L	30	A or G (Lagon 480 E, Cygon 480 EC) G only (Cygon 480-AG)	60-450
Lygus bugs	Matador /Silencer (P)	34 ml	21	A or G	64-110
	Lagon 480 E/Cygon 480 EC / Cygon 480-AG (OP)	0.28-0.40 L	30	A or G (Lagon 480 E, Cygon 480 EC) G only (Cygon 480-AG)	60-450
Spider mites	Lagon 480 E/Cygon 480 EC / Cygon 480-AG (OP)	0.40 L	30	A or G (Lagon 480 E, Cygon 480 EC) G only (Cygon 480-AG)	60-450
Defoliators					
Armyworms	Coragen (D)	101-152 ml	1	A or G	>5,000
	Delegate (Sp)	40-81 g	28	G	>5,000
Corn Earworm	Coragen (D)	101-152 ml	1	A or G	>5,000
	Voliam Xpress (D+P)	202 ml	21	A or G	98
Grasshoppers	Coragen (D)	51-101 ml	1	A or G	>5,000
	Matador /Silencer (P)	34 ml	21	A or G	64-110

ALWAYS CONSULT THE INSECTICIDE LABEL BEFORE APPLYING ANY INSECTICIDE.

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

² LD₅₀ values represent the relative toxicity of a pesticide. They represent the dose (in mg/kg body weight) that will kill 50% of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD₅₀.

Stored Grain Insect Control-

See Insect Control in Stored Grain; after Insect Management Charts (pages 636-638).

Summerfallow-

See grasshopper management on Pastures, etc.

Scouting for insects in Sunflowers

Belowground and Surface Feeders

- **Cutworms**

- **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 cutworms, 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. Cutworms 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 m² (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 m². 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% 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: 1-2/seedling; Larvae: 10 to 15/plant or 25-30% 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: 1-2 weevils/plant. Control is based on a need to keep seed damage below 3 or 4% because of industry standards.
 - Oilseed sunflowers: 12-14 weevils/head.
 - The ideal plant stage to treat is when most plants in the field are at 40% 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/Acre	Pre-harvest interval (days)	Application (A=aerial; G=ground)	LD ₅₀ (Mammalian Toxicity) ²
Belowground and Surface Feeders					
Wireworms	Wireworms 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 wireworms.				
	Cruiser Maxx Sunflowers (N)	A seed treatment combining Cruiser 5FS with Maxim 480FS and Apron XL. Sunflower Seeds can not be treated with Cruiser Maxx Sunflowers in Canada.			
Cutworms	Coragen (D)	101 ml	1	A or G	>5,000
	Pounce/Perm-UP (P)	73-158 ml	Treat prior to 5-leaf stage	A or G (see labels) G	1030
	Ambush (P)	57-121 ml			
	Chlorpyrifos (OP)	0.486 L	42	G	205-418
Defoliators					
Sunflower Beetle	Cruiser Maxx Sunflowers (N)	A seed treatment combining Cruiser 5FS with Maxim 480FS and Apron XL. Sunflower Seeds cannot be treated with Cruiser Maxx Sunflowers in Canada.			
	Decis 5EC/Poleci (P)	40 ml (Decis) 81 ml (Poleci)	70	A or G	395
	Matador/Silencer (P)	17-25 ml (Ground) 34 ml (Aerial)	7	A or G	64-110
	Mako (P)	28 ml	70	A or G	242-542
	UP-Cyde/Ship (P)	40 ml	70	A or G	355
	Voliam Xpress (D+P)	91 ml	7	A or G	98
	Grasshoppers	Coragen (D)	51-101 ml	1	A or G
Voliam Xpress (D+P)		91 ml	7	A or G	98
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 (see page 597-598) and insecticides should only be used when economic thresholds are exceeded.				
	Matador	34 ml	7	A or G	64-110
	Voliam Xpress (D+P)	91 ml	7	A or G	98
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 (see page 597-598) and insecticides should only be used when economic thresholds are exceeded.				
	Mako (P)	28 ml	70	A or G	242-542
	UP-Cyde/Ship (P)	40 ml	70	A or G	355
	Chlorpyrifos (OP)	0.486 L	42	A or G	272/205
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 (see page 597-598) and insecticides should only be used when economic thresholds are exceeded.				
	Coragen (D)	101-152 ml	1	A or G	>5,000
Sunflower Moth	Dipel 2X DF (young larvae) (M)	127-253 g	N/A	A or G	> 4,000
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 LD₅₀ values represent the relative toxicity of a pesticide. They represent the dose (in mg/kg body weight) that will kill 50% of the test animals. Thus the lower the number the greater the toxicity. Values given are for oral LD₅₀.

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, diatomaceous earth or cyfluthrin – 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 or cyfluthrin (*Tempo*).

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 7-10 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.

The **rusty grain beetle** is the most common stored product insect. 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% 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 (eg. 14.5% 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 at: <http://www.grainscanada.gc.ca/storage-entrepose/keys-cles/sgp-irg/sgp-irg-eng.htm>.

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:

Phostoxin

Company: DeGESCH America Inc. (Phostoxin); PCP#15736 (Round tablets).

Formulation: 55% aluminum phosphide.

Formulation	Primary Use	Container Size
Phostoxin tablets (3g each)	On the farm or country elevator	500 tablets
Phostoxin pellets (0.6g each)	In terminals	2500 pellets
Phostoxin tablets prepac	Containers	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, Indian meal moth, yellow mealworm, lesser grain borer, nematodes, mice and rodents.

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

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

Phostoxin 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 250-500 tablets (or 880-2560 pellets) per 100 m³ 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.

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.

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

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

Phostoxin can not 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.

Protect-It, Insecto

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

Formulation: *Protect-It:* 74% Silicon dioxide, 10% 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.

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/m²).

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/tonne for control of rusty grain beetle in wheat to 1000 g/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 (500-1000 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 500 (IPCO)

Insect	Rate	Note
Rusty grain beetle, sawtoothed grain beetle, confused flour beetle, grain mite, granary weevil, Indian meal moth, lesser grain borer (empty grain bins)	250-300 ml/5 L of water on 100 m ²	May be used within 1 day of grain storage

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.

Tempo 20 WP

Company: Bayer PCP#25673

Formulation: 20% cyfluthrin. Tempo is a group 3 (pyrethroid) insecticide.

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 as it is being loaded into a bin or being turned by adding gradually at the grain auger. 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 500, Malathion 85E

Refer to labels for these products 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.

Application: Tempo can be used to control insects in grain storage facilities, truck beds and other areas where grain is stored *before filling these areas with grain*. Cleaning of all areas prior to use of Tempo 20 WP insecticide will increase levels of control. See the insecticide label for specific mixing instructions.

Insecticide Product Pages

For rates and pre-harvest intervals for insecticides, see the insect management charts on pp. 599-634.

Actara

Insecticide Group
4A

Refer to page 600

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/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 / ac 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 g/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

For an explanation of the symbols used here see pages 7 and 8.

Agri-Mek SC

Insecticide Group

6

Refer to page 600

Company:

Syngenta Canada (PCP#31607)

Formulation:

84 g/L abamectin formulated as a suspension concentrate.

- Container sizes - 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 / 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 U.S. and you require information on acceptable residue levels in the U.S., 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

For an explanation of the symbol used here see pages 7 and 8.

Assail

Insecticide Group

4A

Refer to page 600

Company:

Nippon Soda Company Ltd. (PCP#27128)
Distributed by Engage Agro Corp.

Formulation:

Acetamiprid formulated as a wettable powder-70% by weight

Insects Controlled and Registered Crops:

Crop	Insect
Alfalfa (seed production only)	Alfalfa plant bug, Lygus bugs (suppression only)
Potato	Colorado potato beetle, aphids

Application:

Assail

- Ground application only. DO NOT apply by air.
- Apply with a minimum finished spray volume of 80 litres per acre. For best results uniform spray coverage of the host plants is important.
- Begin application when insect levels reach economic thresholds. Use higher rates for heavy infestations, dense foliage or for adult stages of the Colorado potato beetle. Residual control will depend on environmental factors, plant growth, application rate and level of insect infestation.

How it Works:

Assail 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. This product rapidly degrades in the soil with no carryover effects.

Restrictions:

- DO NOT make more than 2 applications per year per crop. DO NOT apply more than once every 7 days.
- DO NOT exceed a total of 48 g active ingredient (68.8 g product) per acre per season. DO NOT apply less than 7 days prior to harvest (Pre-harvest interval).
- **Buffer Zones:** 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. For groundboom sprayers – 20 metres. DO NOT apply acetamiprid directly to water or to areas where surface water is present. Buffer zone required for sensitive terrestrial areas (grasslands, forested areas, shelterbelts, woodlots, hedgerow, rangelands) – 2 metres.
- **Re-entry Interval:** DO NOT re-enter treated areas for a period of 12 hours after application.

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 degrees 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.

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

Hazard Rating:



Warning – Poison

For an explanation of the symbol used here see pages 7 and 8.

Beleaf 50 SG

Insecticide Group

29

Refer to page 600

Company:

FMC Corporation (PCP#29796)

Formulation:

50% flonicamid formulated as a water soluble granule.

- Container size - 1 to 100 kg

Insects Controlled and Registered Crops:

Crop	Insect
Dry beans, chickpeas, faba beans	Aphids, Lygus bugs
Alfalfa, clover, vetch	Aphids, Lygus bugs
Potato	Aphids

Application:

Beleaf

- DO NOT apply by air.
- Ensure the spray system is clean and free of residues from previous applications. Fill the tank half full with clean water. Ensure agitation system is operating and sufficient to provide uniform spray mixing during application and until the spray tank has been emptied. Complete filling to the desired solution volume.
- 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.
- 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.

Restrictions:

- Allow a minimum of 7 days between applications. DO NOT make more than 3 applications per year.
- **Pre-harvest Interval:** Forage, fodder, straw and hay; peas and beans – DO NOT apply within 7 days of harvest.
- DO NOT apply more than apply more than 64 grams per acre of *Beleaf* per application. DO NOT apply more than 192 grams per acre of *Beleaf* per season.
- DO NOT use *Beleaf* in home gardens.
- **Re-cropping:** There are no plant-back restrictions for potatoes. 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 for *Beleaf* insecticide.

Beleaf insecticide should not be used with spray adjuvants. Avoid application 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.

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:

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:

Caution – Eye irritant

For an explanation of the symbol used here see pages 7 and 8.

Capture 240 EC

Insecticide Group

3A

Refer to page 600

Company:

FMC Corporation (PCP#31396)

Formulation:

240 g/L bifenthrin formulated as an emulsifiable concentrate.

- Container size - 3.78 L jug

Insects Controlled and Registered Crops:

Crop	Insect
Potato	Wireworms (at plant)

Application:*Capture 240 EC*

- Ground application only. *Capture 240EC* may be applied once per year in potato as an in-furrow planting time treatment for the control of wireworms. Apply *Capture 240EC* as an in-furrow spray or T-band spray at seeding time. Avoid application when heavy rain is forecast.

How it Works:

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

Restrictions:

- DO NOT apply by air.
- **Re-entry interval (REI):** DO NOT enter or allow worker entry into treated areas for 12 hours.
- **Pre-harvest Interval:** Potato – Do not apply within 21 days of harvest.
- **Storage:** Store in original container in cool, dry, locked, well-ventilated location.

Precautions:

Avoid spraying during conditions of low humidity and/or high temperature. DO NOT make applications during temperature inversions.

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.**Aquatic organisms:** Toxic to aquatic organisms.**Others:** Toxic to small wild mammals. Toxic to certain beneficial insects.**Hazard Rating:**

Danger – Poison, Potential skin sensitizer

For an explanation of the symbol used here see pages 7 and 8.

Chlorpyrifos

Insecticide Group

1B

Refer to page 600

Company:

Corteva Agriscience (*Lorsban 4E* – PCP#14879; *Lorsban NT* – PCP#29650)

ADAMA Canada (*Pyrinex 480EC* – PCP#23705)

FMC Corporation (*Nufos 4E* – PCP#25831)

IPCO (*Citadel 480EC* – PCP#27479)

Loveland Products Canada (*Pyrifos 15G* – PCP#24648; *Warhawk 480EC* – PCP#29984)

Sharda CropChem Canada (*Sharda Chlorpyrifos 480 EC* – PCP#32768)

Farmers of North America (*MPOWER Krypton* – PCP#30985)

Different trade names refer to different companies. Note that products may have different label recommendations.

Check your label for more information.

Formulations:

Citadel, *Nufos 4E*, *Lorsban 4E*, *MPOWER Krypton*, *Pyrinex*, *Warhawk*, and *Sharda chlorpyrifos 480 EC* – 480 g/L chlorpyrifos and *Lorsban NT* – 452 g/L formulated as an emulsifiable concentrate.

- Container sizes (Note that container sizes may vary between products) – 10 L jug, 115 L returnable container, 208 L drum.

Pyrifos – 15% chlorpyrifos formulated as a granule

Insects Controlled and Registered Crops:

Crop	Insect
Barley, Oats, Wheat	Army, darksided, pale western and red-backed cutworms, armyworms, grasshoppers, brown wheat mite
Wheat only	Wheat midge
Canola	Darksided, redbacked, variegated, pale western, and army cutworms; berth armyworm, alfalfa looper, armyworm, diamondback moth larvae, grasshoppers, lygus bug
Flax	Darksided, redbacked, variegated, pale western, and army cutworms, armyworm, berth armyworm
Lentils	Pale western cutworm, grasshoppers
Sunflowers	Redbacked, pale western and army cutworms, sunflower seed weevil (except for <i>Pyrinex</i> and <i>Citadel</i>)
Corn	Darksided, black and redbacked cutworms
Potato	Wireworms (in-furrow at planting – <i>Pyrinex</i> and <i>Pyrifos</i> only), Colorado potato beetle (larvae), potato flea beetle, tarnished plant bug, redbacked cutworm, black cutworm, darksided cutworm

Application:

Chlorpyrifos

- May be applied by air or ground equipment **except** for the following. Ground application only for redbacked cutworm control in corn and sunflower. Ground application only for potatoes.
- *Pyrifos 15G* may be applied by ground only and is to be applied in furrow at planting. Refer to label for specific rates with respect to row spacing.
- Uniform coverage of the crop is essential in aerial applications. Apply when insects exceed economic threshold levels and use sufficient water for good coverage. Use higher rates for heavy infestations, mature insects, heavy crop canopy, or under dry soil conditions.

How it Works:

Chlorpyrifos is a broad spectrum, non-systemic insecticide and works by contact, ingestion and vapour action (inhalation).

Effects of Weather:

Avoid application under hot temperatures. Best results will be obtained for wheat midge and cutworms when application is made in evening (after 7 p.m.) or morning (before 8 a.m.). DO NOT apply to plants under extreme drought stress or crop injury may occur.

Tank mixes:

Various chlorpyrifos labels differ. Contact the specific company for supported tank mixes.

Restrictions:

- **Grazing:** Treated cereals grown for cover crop should not be used for human or animal consumption if treated within 60 days of harvest.
- **Storage:** Combustible. DO NOT store near heat or flame. DO NOT store with food, feed, drugs or clothing.
- **Wheat, barley, oats, canola, corn, flax, lentil, sunflower, potatoes** – DO NOT make more than 1 application per season.
- **Buffer zones around sensitive areas:** For all aerial applications, a buffer zone of 100 metres is required for the protection of aquatic habitats.
 - DO NOT apply directly to water or where runoff could occur to adjacent aquatic sites.

Precautions:

May be fatal if swallowed. Causes substantial but temporary eye injury. Harmful if absorbed through skin. May cause skin or eye irritation. Wear protective clothing, impervious gloves and goggles. Wash thoroughly with soap and water after handling and applying. Immediately remove contaminated clothing and wash before re-use. DO NOT apply or allow to drift on to workers or other persons.

In lentil, if applied according to label rates early in the crop year at 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.


Environmental Hazards:

Chlorpyrifos has a high acute mammalian toxicity. Very toxic to bees, fish, birds, aquatic organisms and other wildlife.

Bees: Toxic to bees exposed to direct treatment, drift, or residues on blooming plants. Do not use on flowering crops or weeds. Applicators should inform local bee keepers prior to application if hives are in adjacent fields.

Aquatic organisms: Very toxic to fish and aquatic organisms. Drift and runoff from treated areas may be hazardous to aquatic organisms in adjacent aquatic sites. Avoid application of this product when heavy rain is forecast.

Hazard Rating:

 Danger – Poison

For an explanation of the symbol used here see pages 7 and 8.

Closer

Insecticide Group
4C

Refer to page 600

Company:

Corteva Agriscience (PCP#30826)

Formulation:

240 g/L sulfoxaflor formulated as a suspension concentrate.

- Container sizes - case contains 12 X 1L containers

Insects Controlled and Registered Crops:

Crop	Insect
Corn	Aphids
Potato	Aphids

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/acre. For aerial application use a minimum spray volume of 12 L/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/acre per growing season. DO NOT make applications less than 7 days apart. DO NOT apply within 7 days of harvest.
- DO NOT apply through any 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.
- **Re-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 U.S. and you require information on acceptable residue levels in the U.S., 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

Refer to page 600

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

For an explanation of the symbol used here see pages 7 and 8.

Concept

Insecticide Group
3A, 4A

Refer to page 600

Company:

Bayer (PCP#29611)

Formulation:

75 g/L imidacloprid and 10 g/L deltamethrin formulated as a suspension concentrate.

- Container sizes - 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 (i.e. minimum of 40-80 litres 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

For an explanation of the symbols used here see pages 7 and 8.

Coragen

Insecticide Group

28

Refer to page 600

Company:

FMC Corporation (PCP#28982)

Formulation:

200 g/L chlorantraniliprole formulated as a suspension.

- Container sizes - 6.0 L

Insects Controlled and Registered Crops:

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

Application:

Coragen

- 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/acre by ground. Apply in a minimum finished spray volume of 20 L/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.

Tank Mixes:

FMC Corporation supports the following mixes that are not on the *Coragen* label. 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*
- **Fungicides:** *Acapela*

Restrictions:

- DO NOT make more than 4 applications per season on alfalfa (seed production), bean, chickpea, lentil, pea, soybean, potatoes, corn, and forage grasses.
- 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* 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.
- **Re-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.

Cypermethrin

**Insecticide Group
3A**

Refer to page 600

Company:

Engage Agro corporation (*Mako Insecticide* – PCP#30316)

United Phosphorous, Inc. (*UP-Cyde 2.5 EC* – PCP#28795)

Sharda CropChem Canada (*Ship 250 EC* – PCP#32563)

Formulation:

cypermethrin formulated as an emulsifiable concentrate. (*Mako Insecticide* – 407 g/L; *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 (<i>Up-Cyde</i> and <i>Mako</i> only)	Grasshoppers, cutworms
Canola, rapeseed, mustard	Grasshoppers, flea beetles, bertha armyworm
Roadsides, headlands, summerfallow (<i>Up-Cyde</i> and <i>Mako</i> only)	Grasshoppers
Sunflower	Sunflower beetle, Sunflower seed weevils
Corn	European corn borer, cutworms, corn earworm
Potato	Colorado potato beetle, flea beetle, leafhoppers, tarnished plant bug, cutworms

*Refer to labels: *Ship* is not registered in wheat, barley, roadsides, headlands, summerfallow, or for grasshoppers or cutworms 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 cutworms. After application for cutworms leave soil surface undisturbed for 5 days.
- May be applied by ground or air for 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:

Mako, *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.
- **Re-entry Interval (REI):** 12 hours.
- **Buffer zones:** DO NOT apply by ground equipment within 15 m of water or waterfowl habitats. For aerial application a buffer zone of 100 metres must be left around environmentally sensitive areas such as ponds, stream, rivers, dugouts and wetlands.
 - **Canola, Rapeseed, Mustard** - *Mako* may only be applied by ground for flea beetles. 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.
 - **Pre-harvest interval** - 30 days
 - **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.
 - **Pre-harvest interval** - 5 days
 - **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.
 - **Pre-harvest interval** - 7 days
 - **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 interval** - 70 days
 - **Pre-harvest intervals** - Wheat - 30 days; Barley - 45 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

For an explanation of the symbol used here see pages 7 and 8.

Delegate

Insecticide Group

5

Refer to page 600

Company:

Corteva Agriscience (PCP#28778)

Formulation:

25% spinetoram formulated as wettable granules.

- Container sizes - 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	Armyworms

* 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.

Application:

Aerial application in potatoes 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.

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:

DO NOT mix this product with any other pesticide or fertilizer.

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) or within 7 days for potato.
- **Grazing:** No restrictions indicated.
- **Aerial Application:**
 - **Potatoes and Corn (field, sweet, seed and popcorn):** Use a minimum spray volume of 12.1 L/ac. Recommended spray volume is 12.1-20.2 L/ac.
- **Storage:** Store in a cool, dry place. Keep from freezing.
- **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*	10	5	1

See page 36 for an explanation of the different habitats.

* Buffer zones can be reduced by 70% when using shrouds and by 30% 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.

Tank Cleaning:

Refer to page 12.

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**

Refer to page 600

Company:

Bayer (*Decis 5 EC* - PCP#17734)

Sharda Cropchem Limited (*Poleci 2.5 EC Western* - PCP#32447)

Formulations:

deltamethrin formulated as an emulsifiable concentrate.

(*Decis* - 50 g/L; *Poleci* - 25 g/L)

- Container sizes - *Decis 5EC* - 2.4 L and 9.6 L jugs; *Poleci 2.5 EC* - 4.8 L jugs

Insects Controlled and Registered Crops:

Crops	Insect
Alfalfa (seed crops only)	Alfalfa weevil, Lygus bugs, grasshoppers (<i>Decis</i> only)
Field corn	European corn borer
Potato	Colorado potato beetle, potato flea beetle, Lygus bugs, leafhoppers
Canola, rapeseed, mustard (condiment and oilseed quality <i>Brassica juncea</i> varieties)	Beet webworm, bertha armyworm, cabbage seedpod weevil (adults only), clover cutworm, diamondback moth, flea beetles, grasshoppers, Lygus bugs, swede midge
Sunflower	Sunflower beetle
Wheat, barley, oats, lentils	Cutworms, grasshoppers
Rangeland, pastures, roadside, fence row	Grasshoppers
Flax	Cutworms, beet webworm, grasshoppers
Red clover (seed production only)	Lesser clover leaf weevil (suppression only)

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/ha (202 ml/ac) or 25 g ai/ha. If 3 applications are used, only the first or second application can be at 200 mL/ha. Allow a 7 day interval between treatments by ground application. Maximum of ONE (1) APPLICATION/YEAR via aerial application.
- Corn – DO NOT apply more than 3 times per year
- 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.
- **Pre-harvest Intervals (Days):** alfalfa (20), barley (40), canola (7), flax (40), lentils (30), mustard (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.
- **Others:**
 - **Ground application** - Observe a 16 yard (15 m) buffer zone from environmentally sensitive areas (for example, wetlands, sloughs, rivers, houses, farm buildings).
 - **Aerial application** – Leave a 110 yard (100m) buffer zone. DO NOT apply *deltamethrin* by air when the wind speed exceeds 8 kph. In soils with high organic content (muck soils), *deltamethrin* should be applied only once during each crop year, prior to August 1, and at rates of no more than 80 mL/acre.

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

For an explanation of the symbol used here see pages 7 and 8.

Dibrom

Insecticide Group

1B

Refer to page 600

Company:

Loveland Products Canada (PCP#7442)

Formulation:

900 g/L naled formulated as an emulsifiable concentrate.

- Container sizes - 4 x 3.78 L jugs per case and 2 x 9.46 L jugs per case

Insects Controlled and Registered Crops:

Crop	Insect
Alfalfa, clover, vetch	Aphids, loopers, leafhoppers, Lygus bugs
Beans	Alfalfa looper, aphids
Potatoes	Flea beetles, Colorado potato beetles, leafhoppers
Rangeland, field areas and pastures	Grasshoppers

Application:

Dibrom

- Apply by ground or air. Use designated amounts in full volumes of water. For ground application use 40-120 L of water per acre. For aerial use 4-12 L of water per acre unless otherwise stated.

How it Works:

Dibrom is an organophosphate insecticide. It acts as a contact and stomach poison.

Effects of Weather:

DO NOT apply *Dibrom* when air temperature is greater than 32°C.

Restrictions:

- **Environment:** DO NOT contaminate any body of water, waterway or water source. *Dibrom* is moderately to highly toxic to birds, aquatic animals and other wildlife.
- **Re-entry interval:** DO NOT enter or allow worker re-entry into treated area for 48 hours following application.
- DO NOT apply more than 2 times per season.

Precautions:

Concentrate may cause skin damage. DO NOT get on skin, eyes or clothing. Use waterproof gloves and face shield or goggles when handling concentrate. Harmful if swallowed. Avoid breathing spray mist.

Avoid contamination of feed, foodstuffs and drinking water.

Environmental Hazards:

Bees: Toxic to bees; avoid application during periods of bee activity.

Aquatic organisms: Toxic to aquatic organisms.

Hazard Rating:

 Danger – Poison

For an explanation of the symbol used here see pages 7 and 8.

Dimethoate

Insecticide Group

1B

Refer to page 600

Company:

IPCO (*Cygon 480 EC* – PCP#9807)FMC Corporation (*Cygon 480-Ag* – PCP#25651)Loveland Products Canada (*Lagon 480E* – PCP#9382)

Different trade names refer to different companies. Note that products may have different label recommendations. Check your label for more information.

Formulation:

Cygon/Lagon - 480 g/L dimethoate formulated as an emulsifiable concentrate.

- Container size - 10 L

Insects Controlled and Registered Crops:

Crop	<i>Cygon 480-Ag</i> Insect	<i>Lagon 480E</i> Insect	<i>Cygon 480 EC</i> Insect
Peas	Aphids	Aphids	Aphids
Potatoes (ground application only)	Aphids, leafhoppers	Aphids, leafhoppers, Lygus bugs	Aphids leafhoppers, Lygus bugs
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	Aphids	Aphids	Aphids
Canola/rapeseed	Aphids, leafhoppers, grasshoppers	Aphids, leafhoppers, grasshoppers	Aphids, leafhoppers, grasshoppers
Dry beans	Aphids, leafhoppers, lygus bugs, spider mites		
Forage crops	Lygus bugs, plant bugs, grasshoppers	Grasshoppers, aphids (suppression only of Russian wheat aphid), Lygus bugs and plant bugs	Aphids, grasshoppers, leafhoppers, Lygus bugs, plant bugs, reduction of alfalfa weevil larvae
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, grasshoppers
Barley, oats	Aphids, thrips	Thrips, grasshoppers,	Aphids, thrips, grasshoppers
Flax	Aphids	Aphids	Aphids
Rye		Grasshoppers	Grasshoppers
Soybeans	Aphids, leafhoppers, lygus bugs, spider mites	Aphids, leafhoppers, Lygus bugs, spider mites	Aphids, leafhoppers, Lygus bugs, spider mites

Application:

Dimethoate

- May be applied by air or ground equipment (unless otherwise specified above). Apply when insects exceed economic threshold numbers and use sufficient water for good coverage. Use higher rates for adult insects, heavy infestations or dense canopy.

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. 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:

 Warning – Poison – *Lagon, Cygon 480 AG*

 Danger – Poison – *Cygon 480 EC*

For an explanation of the symbol used here see pages 7 and 8.

Dipel 2X DF

Insecticide Group

11

Refer to page 600

Company:

Valent BioSciences (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 loopers

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 1-3 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

For an explanation of the symbol used here see pages 7 and 8.

Eco Bran

Insecticide Group

1A

Refer to page 600

Company:

Peacock Industries (PCP#25815)

Formulation:

Wheat bran infused with carbaryl insecticide.

- Container sizes - 20 kg bag; 1 kg bottle

Insects Controlled and Registered Crops:

Crop	Insect
Alfalfa, beans, clover, corn, oats, rye, wheat, barley, 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
Corn	1
Alfalfa, clover	2
Beans	5
Oats, rye, wheat	14
Barley	28
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 50m of sloughs, ponds, streams, dugouts or open water. Apply when winds are between 3-8 kph 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.

Exirel

Insecticide Group

28

Refer to page 600

Company:

FMC Corporation (PCP#30895)

Formulation:

Cytraniliprole 100 g/L, formulated as a suspension.

- Container sizes - 0.5, 3.79, 100 L

Insects Controlled and Registered Crops:

Crop	Insect	Rate
Potatoes	Colorado potato beetle	750-1000 ml/ha
	Aphids	500-1500 ml/ha
	European corn borer, variegated cutworm	500-750 ml/ha
	Armyworm	500 ml/ ha
	Potato flea beetle	500-1000 ml/ha

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.

Effects of Weather:

Apply to foliage when rain is not expected in the next 24 hours. 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:** minimum finished spray volume of 100 L/ha. DO NOT apply during periods of dead calm. Avoid application of this product when winds are gusty.
 - **Air:** minimum finished spray volume of 50 L/ha. 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 4.5 litres *Exirel* insecticide per ha 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.

For an explanation of the symbol used here see pages 7 and 8.

Entrust 80 W

Insecticide Group

5

Refer to page 600

Company:

Corteva Agriscience (PCP#27825)

Formulation:

80% spinosad.

- Container sizes - 4 x 113.4 g packets

Insects Controlled and Registered Crops:

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

Application:

Entrust 80 W

- 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.

How it Works:

Entrust 80 W is in the spinosine class of insecticides. It is a contact and stomach insecticide. It is derived from the fermentation of *Saccharopolyspora 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 g/acre).

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:



Caution – Poison

For an explanation of the symbol used here see pages 7 and 8.

Fulfil

Insecticide Group

9B

Refer to page 600

Company:

Syngenta Canada (PCP#27274)

Formulation:

50% pymetrozine formulated as a wettable granule.

- Container sizes - 6 X 780 g

Insects Controlled and Registered Crops:

Crop	Insect
Potatoes	Aphids including: green peach, potato, foxglove, buckthorn

Application:

Fulfill

- May be applied by ground or air. Apply *Fulfill* to plant foliage. Thorough spray coverage is essential for best performance. Apply *Fulfill* with sufficient water (minimum of 40 L/acre) to ensure good coverage of all plant surfaces. Higher water volumes will generally result in better coverage, especially under adverse conditions (hot, dry), where a dense plant canopy exists and/or aphid infestations are high. One additional application may be needed to control persistent aphid populations. Allow a minimum of 7 days between applications.
- DO NOT apply *Fulfill* insecticide through chemigation.
- DO NOT use in nurseries or in plant propagation houses, or on any plants grown for use as transplants.
- The use of a non-ionic adjuvant is recommended to improve the performance of *Fulfill* insecticide under drought stress conditions.

How it Works:

Fulfill is a systemic insecticide and works primarily by ingestion but has some contact activity. Affected aphids stop feeding shortly after exposure, but may remain on the plant foliage until they die, which is usually within 2-4 days. *Fulfill* insecticide has residual activity in the plant and will control aphids that move onto the plant after spraying.

Fulfill has shown no phytotoxicity on the varieties of potato tested when applied at the label rates.

Effects of Weather:

Fulfill insecticide exhibits movement through the leaf surface into plant tissue and is rainfast as soon as the spray solution has dried.

Restrictions:

- **Storage:** Store in a cool, dry, place away from food, drinks, and animal feeding stuffs. Keep in the original container tightly closed.
- **Others:** DO NOT apply by air. DO NOT exceed 2 applications (152 g product/acre) per crop per season. DO NOT apply directly to aquatic systems, permanent water bodies or areas where surface water is present. DO NOT contaminate water when cleaning equipment or disposing of equipment wash water.
- A re-cropping restriction of 30 days is required for all crops.

Precautions:

May cause skin sensitization reactions. Applicators and other handlers must wear personal protective equipment including, long-sleeved shirt, long pants, waterproof gloves and shoes plus socks. DO NOT enter or allow entry into treated areas for 12 hours. DO NOT use, pour, spill, or store near heat or open flame.

Environmental Hazards:

Aquatic organisms: Toxic to aquatic organisms. Do not contaminate aquatic systems when cleaning and rinsing spray equipment or containers.

Hazard Rating:



Caution – Poison

For an explanation of the symbol used here see pages 7 and 8.

Imidacloprid

Insecticide Group

4A

Refer to page 600

Company:

Bayer (*Admire 240* – PCP#24094)

ADAMA Canada (*Alias 240 SC* – PCP#28475)

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

- **Soil application:** (*Admire 240 / Alias 240 SC*) Apply as a narrow band in-furrow. For best results, direct spray on the seed pieces in the furrow. Scout potato fields frequently, especially during warmer part of growing season. If pest populations exceed economic thresholds apply a recommended foliar insecticide with a different mode of action than imidacloprid.
- **Seed piece treatment:** (*Admire 240 / Alias 240 SC*) Refer to Imidacloprid in the seed treatments product pages.
- **Foliar application:** (*Admire 240 / Alias 240 SC*) 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 seven days apart may be required to achieve control. DO NOT make a foliar application following a soil or 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 more than once per season as a soil application. DO NOT follow a soil application with a foliar application.
- **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.

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. Do not apply this product or allow it to drift to blooming crops or weeds if bees are visiting the treatment area.

Aquatic organisms: Highly toxic to aquatic invertebrates.

Hazard Rating:



Caution – Poison

For an explanation of the symbol used here see pages 7 and 8.

Imidan

Insecticide Group

1B

Refer to page 600

Company:

Gowan Canada (PCP#29064)

Formulation:

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

Insects Controlled and Registered Crops:

Crop	Insect
Alfalfa	Alfalfa weevil, alfalfa blotch leafminer
Potato	Colorado potato beetle, potato flea beetle, potato leafhopper, potato aphid

Application:

Imidan

- Apply by ground only.
- *Imidan 70-WP* instapak 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 above 40°C.
- Buffer zones required for the protection of freshwater habitat Depth of less than 1 metre - 15 metres and for depths greater than 1 metre - 4 metres.
- DO NOT apply more than once per cutting or within 7 days of harvest. DO NOT make more than 3 applications per season.
- **Re-entry Interval (REI):** 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 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 when heavy rain is forecast.

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

Hazard Rating:

 Danger – Poison

For an explanation of the symbol used here see pages 7 and 8.

Lambda-cyhalothrin

Insecticide Group

3A

Refer to page 600

Company:

Syngenta Canada (*Matador* – PCP#24984)

ADAMA Canada (*Silencer 120 EC* – PCP#29052)

Formulation:

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

- Container sizes - 4 x 3.78 L

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, swede midge, cutworms (<i>Matador</i> only)
Sunflower	Lygus bugs (<i>Matador</i> only), sunflower beetle
Wheat, barley, oats	Grasshoppers, armyworm
Alfalfa, unimproved pasture	Grasshoppers
Summerfallow (<i>Matador</i> only)	Grasshoppers
Flax	Grasshoppers, cutworms (<i>Matador</i> only)
Alfalfa <i>Matador</i> – Ground or Air <i>Silencer</i> – Ground only	Alfalfa weevil, Lygus bugs, pea aphid, potato leafhopper
Corn	European corn borer, corn earworm, cutworms, fall armyworm, armyworm
Beans	Cutworms, corn borer, potato leafhopper, Lygus bugs
Chickpeas	Grasshoppers, potato leafhopper, cutworms
Faba beans (broad beans)	Lygus bugs, potato leafhopper, pea aphid
Lentils	Cutworms, grasshoppers, Lygus bugs, pea aphids, potato leafhopper
Peas	Cutworms, grasshoppers, pea aphids, pea leaf weevil
Soybeans	Cutworms, grasshoppers, Lygus bugs, aphids
Timothy	Grasshoppers

Application:

Lambda-cyhalothrin

- **Aerial:**
 - *Matador and Silencer: Canola, mustard, sunflower, flax, alfalfa, unimproved pasture* - DO NOT make more than 1 application at the 33.2 ml/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/ac rate per year.
 - *Matador: Summerfallow* - DO NOT make more than 1 application at the 33.2 ml/acre rate per year.
- **Ground:**
 - *Canola, mustard, sunflower, flax, alfalfa, unimproved pasture, summerfallow (Matador only), corn, wheat, barley, oats* - DO NOT make more than 3 applications per year at the 33.2 ml/acre rate.
 - *Potatoes* - DO NOT make more than 3 applications per year at the 33.2 ml/acre rate. DO NOT make more than 2 applications per year if using the 50 ml/acre rate. DO NOT exceed 100 ml/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.

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 m 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 *Matador* 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*^Δ

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^Δ
- *Allegro* in dry bean
- *Quadris* (*Matador* only)
- *Quilt* (*Matador* only)
- *Headline* (*Silencer* only) 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*

^Δ 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:** Timothy - DO NOT graze or feed lactating dairy animals. DO NOT apply within 3 days of non-lactating livestock foraging.
- 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 7-day interval between applications. DO NOT apply within 15 m of productive fisheries, water or waterfowl habitat.
- **Re-entry interval (REI)** – 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
Ground	All field crops	15	15
Fixed wing airplane	Potatoes, oilseed crops, cereal crops, alfalfa, unimproved pasture, summerfallow	100	20
	Corn	225	20
	Legume vegetables	600	25

See page 36 for an explanation of the different habitats.

- Buffer zones can be reduced by 70% when using shrouds and by 30% 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:

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

For an explanation of the symbol used here see pages 7 and 8.

Lannate

**Insecticide Group
1A**

Refer to page 600

Company:

Corteva Agriscience (PCP#10868)

Formulation:

90% methomyl formulated as a water soluble powder.

- Container sizes - 24 x 225 gram water soluble bags

Insects Controlled and Registered Crops:

Crop	Insect
Canola	Alfalfa looper, bertha armyworm, clover cutworm, beet webworm
Flax	Bertha armyworm
Peas	Alfalfa looper, pea aphid
Wheat, oats, barley	Armyworm, thrips
Potato	Aphids, leafhoppers, flea beetles, variegated cutworm

Application:

Lannate

- May be applied to canola, flax and cereals by air or ground equipment. Ground applications only to peas and potatoes. Apply when insects exceed threshold levels using sufficient water for good coverage.
- Suggested water volumes for ground application:
 - Potatoes - 100 to 340 L per acre
 - Canola and flax - 40 L per acre
 - Wheat, oats, barley, peas - 40 to 140 L per acre
- When applied by air, pilot should not assist in mixing and loading operations. Apply a minimum of 9 L of water per acre) for aerial application.
- Use higher rates for mature insects, dense canopy or when infestations are heavy. Apply at 5 to 7 day intervals as necessary.
- Early morning or late evening sprays are recommended.

How it Works:

Lannate is a carbamate insecticide that works by contact and ingestion and has some systemic action. Rapidly degraded in green, growing plants; short term residual.

Restrictions:

- **Storage:** DO NOT store below 0°C. Store in original container away from other pesticides, fertilizer, food or feed.
- **Others:** DO NOT handle water soluble bags with bare hands. Sprays or drift must not contact workers, other persons or animals. The area being treated must be vacated by unprotected persons.

Precautions:

Lannate is of high acute mammalian toxicity. May be fatal if swallowed, inhaled or absorbed through the eyes. DO NOT breathe dust or spray mist. DO NOT get in eyes, on skin or on clothing.

When mixing, loading or applying *Lannate*, wear protective clothing, goggles and an approved respirator. Wear clean clothes daily. Wash thoroughly after handling or applying.

Environmental Hazards:

Bees: This product is toxic to bees exposed to direct application. Do not apply this product when bees are actively visiting the treatment area.

Aquatic organisms: Toxic to fish and aquatic organisms. Keep out of any body of water. Do not apply where runoff is likely to occur. Avoid application when heavy rain is forecast.

Others: Toxic to birds and small wild mammals.

Hazard Rating:



Danger – Poison

For an explanation of the symbol used here see pages 7 and 8.

Malathion

Insecticide Group

1B

Refer to page 600

Company:

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

IPCO (*Malathion 500* – PCP#5821)

Different companies produce malathion. Note differences in label registrations, formulations and recommendations. Check your label for more information.

Formulations:

Malathion 500 - 500 g/L malathion formulated as an emulsifiable concentrate.

Malathion 85E – 85% malathion formulated as an emulsifiable 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 (85E only)	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.
- **Re-entry interval (REI)** – 12 hours

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

For an explanation of the symbol used here see pages 7 and 8.

Minecto Duo 40WG

Insecticide Group

4 and 28

Refer to page 600

Company:

Syngenta Canada Inc. (PCP#30900)

Formulation:

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

- Container sizes - 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 ½ 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*.
- **Re-entry interval (REI):** 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 U.S. and you require information on acceptable residue levels in the U.S., 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

For an explanation of the symbol used here see pages 7 and 8.

Minecto Pro

Insecticide Group

6 and 28

Refer to page 600

Company:

Syngenta Canada Inc. (PCP#33023)

Formulation:

Abamectin and cyantraniliprole formulated as a soluble concentrate.

- Container sizes - 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	Rate
Potatoes	European corn borer	370 – 556 mL/ha (150 – 225 mL/ac)
	Spider mites, potato psyllids, and flea beetle	370 – 670 mL/ha (150 – 271 mL/ac)
	Colorado potato beetle	556 mL/ha – 670 mL/ha (225 – 271 mL/ac)

Application:

- **Minimum water volume:** 200L/ha, 80L/ac. Apply with 0.1-0.5% 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 (i.e. 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
- **Re-entry interval (REI):** 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.

For an explanation of the symbol used here see pages 7 and 8.

Movento 240 SC

Insecticide Group

23

Refer to page 600

Company:

Bayer (PCP#28953)

Formulation:

Spirotetramat formulated as a suspension concentrate - 240 g/L

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/ac. If needed repeat application with a minimum of 7 to 10 day interval. DO NOT exceed a maximum of 292 mL / 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 than *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

For an explanation of the symbol used here see pages 7 and 8.

Nolo Bait

Insecticide Group
Biological Insecticide

Refer to page 600

Company:

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

Formulations:

Wheat bran coated with spores of the protozoan *Nosema locustae*.

Minimum of 2.2×10^6 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
- **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:

Caution – Potential sensitizer. Wheat allergen

For an explanation of the symbol used here see pages 7 and 8.

Oberon

Insecticide Group

23

Refer to page 600

Company:

Bayer (PCP#28905)

Formulation:

240 g/L spiromesifen formulated as a suspension concentrate.

- Container sizes - 2 L jug

Insects Controlled and Registered Crops:

Crop	Insect
Alfalfa (seed production only)	Two-spotted spider mite
Corn	Banks grass mite, two-spotted 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 - i.e. minimum of 40 to 80 litres of water per acre.
- Avoid application when heavy rain is forecast.

How it Works:

Spiromesifen is in the Tetrionic 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	
Ground	10	3	2
Fixed wing airplane	800	100	85

See page 36 for an explanation of the different habitats.

- Buffer zones can be reduced by 70% when using shrouds and by 30% 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

For an explanation of the symbol used here see pages 7 and 8.

Orthene

Insecticide Group
1B

Refer to page 600

Company:

Arysta LifeScience Canada (PCP#14225)

Formulation:

75% acephate as a water soluble powder.

- Container sizes - case of 12 x 1.5 kg

Insects Controlled and Registered Crops:

Crop	Insect
Corn	Corn borer
Potato	Green peach aphid, potato aphid, potato flea beetle, potato leafhopper, tarnished plant bug

Application:

Orthene

- Apply with conventional ground equipment only. DO NOT apply by air. Apply only when insects exceed economic thresholds.
- Use higher rate only for heavy infestations.

How it Works:

Acephate is an organophosphate systemic insecticide that works through contact and as a stomach poison.

Effects of Weather:

DO NOT apply if rainfall is expected within 48 hours after application. Treatment areas should not be irrigated for at least 48 hours after application.

Restrictions:

- **Storage:** Store in cool, dry place, in the original container away from food or feed. Protect from excessive heat.
- **DO NOT** feed foliage to livestock or allow animals to graze on treated areas. **DO NOT** make more than 4 applications per season.
- **Others:** *Orthene* is not registered in the United States. Therefore, *Orthene* should not be used on any produce destined for markets in the United States.

Precautions:

First Aid: If swallowed, call a poison control centre immediately. In case of contact with skin, wash with soap and water. If in eyes, flush with water. See a physician if eye irritation persists. Atropine is an antidote.

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. *Orthene* has the potential to leach through soils to ground water. The use of this product 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 wild mammals. Applications may adversely affect birds and wildlife visiting the treatment area.

Hazard Rating:



Caution – Poison

For an explanation of the symbol used here see pages 7 and 8.

Permethrin

Insecticide Group
3A

Refer to page 600

Company:

FMC Corporation (*Pounce 384 EC* – PCP#16688)

United Phosphorous (*Perm-UP* – PCP#28877)

Ambac Chemical Corporation (*Ambush* – PCP#14882)

Formulations:

Pounce 384 EC, *Perm-UP* - 384 g/L permethrin formulated as an emulsifiable concentrate.

- Container sizes - 1 L (12 x 1L), 2 X 10L

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

- Container sizes - 1 L, 5 L

Insects Controlled and Registered Crops:

Crop	Insect
Cereals, corn, flax, lentil, pea, potato, sunflowers	Cutworms
Canola, rapeseed	Cutworms, crucifer flea beetle
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 five 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.

Tanks Mixes:

None registered. 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).

Restrictions:

- **Grazing:** Cover crops or crops treated with *permethrin* should not be used as a green feed for animals.
- **Storage:** Store above 0°C.
- **Others:** Observe a 16 yard (15 m) setback distance for ground and 110 yard (100 m) setback distance by air near water bodies or other sensitive areas.

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.

Hazard Rating:



Caution – Poison

For an explanation of the symbol used here see pages 7 and 8.

Rimon 10 EC

Insecticide Group

15

Refer to page 600

Company:

Platform Specialty Products (PCP#28881)

Formulation:

10% novaluron formulated as an emulsifiable concentrate.

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 / acre should be used with ground sprayer equipment. Higher water volumes will provide better coverage and product performance.
- 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.

- 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 10 EC* 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 656 ml of *Rimon 10 EC* per acre per season. DO NOT apply within 14 days of harvest (Pre-harvest interval).

Precautions:

- **Re-entry period (REI):** 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.

For an explanation of the symbol used here see pages 7 and 8.

Sefina

Insecticide Group

9

Refer to page 600

Company:

BASF (PCP#33265)

Formulation:

50 g/L afidopyropen formulated as a disperable concentrate.

- Container sizes - 0.1 L to 1,000 L

Insects Controlled and Registered Crops:

Crop	Insect
Soybean	Soybean aphid
Potato	Aphids
Dry beans	Spider mites

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 40.5-81 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:

- **Re-entry Interval (REI):** DO NOT enter or allow worker entry into treated areas for a period of 12 hours after application.
- **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/ac (potato) or 0.16 L/ac (soybean). DO NOT apply within 7 days of harvest.
 - DO NOT feed or graze soybean hay or forage.

Precautions:

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	
Aerial	Soybean	Fixed wing	10	1
		Rotary wing	10	1
	Potato	Fixed wing	75	25
		Rotary wing	65	20

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

For an explanation of the symbol used here see pages 7 and 8.

Sevin XLR

Insecticide Group

1A

Refer to page 600

Company:

Tessenderlo Kerley, Inc. (PCP#27876)

Distributed by Univar Canada Ltd.

Formulation:

466 g carbaryl per litre formulated as a liquid suspension.

Insects Controlled and Registered Crops:

Crop	Insect
Beans	Leafhoppers, lygus bugs, climbing cutworms
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 cutworms

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 two days. *Sevin XLR* injures Boston ivy, Virginia creeper and Maidenhair fern.

Others: Toxic to birds and mammals.

Hazard Rating:

 Warning – Poison

For an explanation of the symbol used here see pages 7 and 8.

Sivanto Prime

Insecticide Group
4D

Refer to page 600

Company:

Bayer Inc. (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, whiteflies, Colorado potato beetle
Corn	Aphids
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/ac.
 - **Air** – Minimum 8 L/ac. 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/ac.
 - **Air** – Minimum 8 L/ac. 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
- **Alfalfa (forage, silage and hay production only):**
 - **Application interval** – 10 days
 - **Ground** – Minimum 40 L/ac
 - **Pre-harvest interval** – 7 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/ac 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*	Potatoes, corn, alfalfa	1	1	1	1	
Aerial	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.

For an explanation of the symbol used here see pages 7 and 8.

Sluggo Professional

Molluscicide –
no group
Refer to page 600

Company:

Engage Agro Corporation (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

For an explanation of the symbol used here see pages 7 and 8.

Success 480 SC

Insecticide Group

5

Refer to page 600

Company:

Corteva Agriscience (PCP#26835)

Formulation:

480 g/L spinosad formulated as a suspension concentrate.

- Container sizes - 1L 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.

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 *Saccharopolyspora 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:

- **Re-entry Interval (REI):** 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/acre. DO NOT apply within 7 days of 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.

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.

Hazard Rating:



Caution – Poison

For an explanation of the symbol used here see pages 7 and 8.

Superior 70 Oil

Insecticide Group

NA

Refer to page 600

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.	Max – 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% rate (e.g. 10L per 1000L 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
- **Re-entry Interval (REI):** Do not re-enter treated areas within 12 hours of application.
- **Pre-harvest interval (PHI):** 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

For an explanation of the symbol used here see pages 7 and 8.

Thimet 20G

Insecticide Group

1B

Refer to page 600

Company:

Ambac Chemical Corporation (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 sizes - 20 kg bag

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 erodible 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. Store open bags in labeled sealed drums or heavy plastic bags.
- **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 and legume is required. A plant-back interval of 12 months is required for legume vegetables. 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

For an explanation of the symbol used here see pages 7 and 8.

Voliam Xpress

Insecticide Group

3, 28

Refer to page 600

Company:

Syngenta Canada Inc. (PCP#30325)

Formulation:

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

- Container 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), sunflower	Bertha armyworm, cabbage looper, cabbage seedpod weevil, imported cabbageworm, diamondback moth, flea beetles, grasshoppers, Lygus bugs, sunflower beetle
Corn	Armyworm, corn earworm, European corn borer
Potato	Cutworms, corn earworm, beet armyworm, leafminers, psyllids
Safflower	Grasshoppers
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.

Method of Application	Crop	Freshwater habitat Less than 1 metre	Freshwater habitat Greater than 1 metre
Ground sprayer	Corn, potato, canola, mustard, sunflower	15	15
Aerial (fixed wing)	Corn, potato	225	25
Aerial (fixed wing)	Bean, chickpea, faba bean, lentil, pea, soybean	100	15
Aerial (fixed wing)	Canola, mustard, Sunflower	45	10

Precautions:

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 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. *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.

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

For an explanation of the symbol used here see pages 7 and 8.

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