

Western Committee on Crop Pests Guide to Integrated Control of Insect Pests of Crops

INSECT MANAGEMENT IN PULSE CROPS AND SPECIAL CROPS

(Pulse Crops, Buckwheat, Millet and Canaryseed)

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ALFALFA LOOPER

Autographa californica (Speyer) (Lepidoptera: Noctuidae)

Management:

Insecticide Active ingredient Product name	Crop	Rate / acre	Rate / Hectare	Preharvest Interval (days)	Ref
Naled Dibrom	Dry beans	0.445 – 0.890 L	1.10 – 2.2L	4	-
Carbaryl Sevin	Field peas	1.90 L	4.7L	3	-
Methomyl Lannate	Field Peas	0.206 kg	.510kg	1	-

Restrictions:

methomyl: Do not graze livestock within 10 days.
naled: Do not apply when temperature is over 32°C. Do not graze within 4 days of application

APHIDS

Sampling Methods, Economic Thresholds and Natural Enemies -

Canaryseed: A nominal threshold for aphids in canaryseed is 10 to 20 aphids on 50% of stems prior to soft dough stage.

Field peas: Sampling to determine aphid density should be done when 50 to 75% of the pea plants are in flower. Economic thresholds may vary depending on the value of the crop and cost of control, as well as variation in potential seed weight caused by variation in precipitation and heat stress. The economic threshold in peas at \$0.21/kg (\$5.71 per bushel) and average control cost of \$16.63-\$22.86/ha (\$6.73-\$9.25/acre) is 2 to 3 aphids per 8-inch (20 cm) plant tip, or 9 to 12 aphids per sweep, at flowering (4). If the economic threshold is exceeded, a single application of insecticide when 50% of plants have produced some young pods will protect the crop against yield loss and be cost-effective. Cultivars of peas may also vary in their tolerance to feeding by pea aphids, thus economic injury levels may differ between cultivars (5, 6). The economic thresholds presented above were developed using “Century” field peas.

The following table relates the yield loss in peas for average aphid counts per sweep or per 20-cm tip of a field pea stem when about 25 % of the crop has begun to flower.

<u>Aphids per sweep</u>	<u>Aphids per tip</u>	<u>% yield loss</u>
7	1	3.4
10	2	4.9
12	3	6.1
15	4	7.1
16	5	8.0
18	6	8.8
20	7	9.6
21	8	10.3

Natural Enemies: At least five species from a family of parasitic wasps known as Aphidiidae are known to attack pea aphids in Manitoba and Saskatchewan. The most common of these is a species known as *Aphidius ervi*. *Aphidius smithi*, a parasitoid of the pea aphid, was imported into Manitoba and over 104,000 adults were released at four sites (fields near Glenlea, Lowe Farm, Oakbank, and Homewood) from 1983 to 1987 (13).

Soybean Aphid on Soybeans: Economic threshold: At least 250 aphids per plant on average and the population is increasing, and plants are in the R1 (beginning bloom) to R5 (beginning seed) growth stages (7). 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.

Sampling: A binomial sequential sampling plan for soybean aphids, commonly called “speed scouting” has been developed to assist in making soybean aphid treatment decisions (8). With this method, the sampler determines whether a plant has 40 or more aphids or not; plants with less than 40 aphids are considered non-infested, and plants with 40 or more aphids are considered infested. A minimum of eleven plants to as many as 31 plants should be sampled using this technique. The parameters used with this method are equivalent to a mean density of 250 aphids per plant. Decisions on whether to treat, continue sampling, or not to treat for aphids are made using the following levels of infested plants:

Do not treat Resample in 7-10 days	Continue sampling 5 more plants	Treat decision, Confirm in 3-4 days
6 or less	7 to 10	11 or more
10 or less	11 to 14	15 or more
14 or less	15 to 18	19 or more
18 or less	19 to 22	23 or more
22 or less	23 to 26 Stop Sampling. Resample the same field in 3-4 days.	27 or more Confirm “treat” decision. Resample the same field in 3-4 days. Apply insecticide in 3-4 days if confirmed.

Natural Enemies: Coccinellids (lady beetles), particularly *Harmonia axyridis*, and *Orius insidiosus* (Anthororidae), are key predators of soybean aphids (10). Seven species of entomopathogenic fungi have been identified infecting soybean aphids in New York State (11).

Dipteran (fly) predators (particularly from the families Cecidomyiidae and Syrphidae) and Hymenopteran (wasp) parasitoids (particularly from the families Braconidae and Aphelinidae) have also been recorded as natural enemies of soybean in North America (12).

Lentils: For pea aphids in lentils, a nominal threshold is 30 to 40 aphids per 180° sweep of a 38 cm (15 inch) diameter insect net, **and** few natural enemies are present, **and** when aphid numbers do not decline over a 2-day period.

Management:

Insecticide Active ingredient Product name	Crop	Rate / acre	Rate / Hectare	Pre harvest Interval (days)	Ref
Spirotetramat Movento	Soybeans, peas (field), lentils, chickpeas, beans (dry)	75 – 111 ml	185 – 275 ml	21 (soybeans) 7 (peas, lentils, chickpeas, beans)	
Lambda – Cyhalothrin Matador/Silencer	Soybeans, lentil, peas (field),	34 ml	83ml	14	9
Matador Silencer	fababeans, chickpeas	34 – 94 ml 34 ml	83 – 232 ml 83 ml	21 21	
Imidacloprid and Deltamethrin Concept	Soybeans	132 – 263 ml	325 – 650 ml	20	
Methomyl Lannate	Peas (field)	0.206 kg	.510kg	1	-
Malathion Malathion 500 Malathion 85E	Dry beans Dry beans Peas (field) Canaryseed	0.56 – 1.21 L 297 – 544 ml 445 ml 277 ml	1.40 – 3.0L 735–1345 ml 1100 ml 277 ml	1 3 3 14	1
Diazinon Diazinon 50W Diazinon 500E Diazinon 50 EC	Dry beans	0.40 kg 0.445 kg 0.45 kg	.988 kg 1.10 kg 1.11 kg	7 3 7	-
Naled Dibrom	Dry beans	0.445 – 0.890 L	1.10 - .420 L	4	-
Dimethoate Cygon 480 – AG Lagon / Cygon 480 EC	Dry beans Peas (Field) Soybeans Canaryseed	0.28 – 0.40 L 0.11 – 0.17 L 0.28 – 0.40 L 0.20 L	.70 - 1.0 L .275 - .425 L .70 - 1.0 L .50 L	7 3–21 (see label) 30 21	9

Endosulfan					
Thionex EC	Dry beans	0.6 – 1.0 L	1.5 – 2.5 L	2	-
Thiodan	Dry beans	0.6 – 1.0 L	1.5 – 2.5L	2	

Restrictions -

dimethoate:	Do not feed or allow livestock to graze treated pea vines within 21 days after application. Do not apply foliar sprays during the heat of the day when temperatures are exceedingly high. Do not graze or feed treated bean forage to livestock.
endosulfan:	dry beans, peas - do not ensile or feed crop refuse (vines, tops, stalks or threshings) to livestock. peas - treat only if crop is to be mechanically harvested by combine. Apply not more than twice per year.
methomyl:	Do not graze livestock for 10 days after treatment.
naled:	Do not apply when temperature is over 32°C.

References -

1. Wise, Pest. Res. Rep. 1988: 82
2. Moons, Pest. Res. Rep. 1987: 91
3. Baillargeon, Pest. Res. Rep. 1978: 193
4. Maiteki and Lamb, J. Econ. Entomol. 1985: 1449-1454.
5. Soroka and Mackay, Can. Ent. 1990: 1201-1210.
6. Soroka and Mackay, Can. Ent. 1990: 1193-1199.
7. Ragsdale et al., J. Econ. Entomol. 2007: 1258-1267.
8. Hodgson et al. J. Econ. Entomol. 2004: 2127-2136.
9. Smith et al. Pest Man. Res. Rep. 2009. 29-30.
10. Fox et al. Environ. Entomol. 33 : 608-618.
11. Nielson and Hajek. Environ. Entomol. 2005. 1036-1047.
12. Kaiser et al. Ann. Entomol. Soc. Am. 2007: 196-205.
13. Wylie et al. Can. Entomol. 2005: 91-97.

CUTWORMS

(Lepidoptera: Noctuidae)

Cutworms: Redbacked (*Euxoa ochrogaster*), Darksided (*Euxoa messoria*), Pale western (*Agrotis orthogonia*), Army (*Euxoa auxiliaris*), Variegated (*Peridroma saucia*) and White (*Euxoa scandens*) cutworms.

Management:

Insecticide Active ingredient Product name	Crop	Rate / acre	Rate / Hectare	Preharvest Interval (days)	Ref
Chlorantraniliprole Coragen	Beans (dry), peas (field), chickpeas, lentils	101 ml	250 ml	1	
Lambda – Cyhalothrin Matador / Silencer	Beans (dry), Chickpeas, peas (field), soybeans,	34 ml	83 ml	14 - 21	

	Lentils				
Deltamethrin Decis	Lentils	80 ml	197 ml	30	
Permethrin Pounce, Perm up Ambush	Lentils, peas (field)	73 – 158 ml 57 – 121 ml	180 – 390 ml 140 – 300 ml	Treat Prior to six leaf stage	
Chlorpyrifos Lorsban, Pyrinex, Nufos, Citadel, Warhawk	Lentils	0.354 – 0.486 ml	.875 – 1.20 ml	21 - 60	1, 2

It may take several days for optimum control using insecticides. Not all cutworms will surface to feed on any given night and come in contact with the insecticide on the soil and plants. One of the reasons is that during moulting periods (between larval stages) the cutworms are inactive (3).

Restrictions -

chlorpyrifos: Apply once per season in 50 - 200 L water/ha.

Note -

permethrin: Use the high rate when the soil surface is extremely dry, when cutworms are nearing maturity or the infestation is heavy. Apply in the evening or at night when cutworms are most active. Do not disturb soil surface for 5 days after treatment.

References -

1. Allen and Askew, Pest. Res. Rep. 1971:154.
2. Askew *et al.*, Pest. Res. Rep. 1973:151.
3. Byers *et al.*, J. Econ. Entomol. 1992. 85 : 1146 – 1149.

EUROPEAN CORN BORER *Ostrinia nubilalis* (Hübner) (Lepidoptera: Crambidae)

Management :

Insecticide Active ingredient Product name	Crop	Rate / acre	Rate / Hectare	Preharvest Interval (days)	Ref
Chlorantraniliprole Coragen	Dry beans	101 - 152 ml	250 - 375 ml	1	
Lambda – Cyhalothrin Matador / Silencer	Dry Beans	34 ml	83 ml	14	-

GRASSHOPPERS

(Orthoptera: Acrididae)

Economic Threshold -

Lentils: The average yield loss is estimated to be approximately 2% for every one grasshopper/m²(1). For lentils at \$0.30/kg, an insecticide application would be warranted in areas

within lentil fields where the grasshopper density exceeds 2 grasshoppers / m² during flowering and podding stages. Grasshopper damage tended to be most severe within the field margin (5 - 10 m), therefore, producers should scout throughout the field and treat only regions of the field where control measures are warranted. In most case, only the field perimeters and the source areas (grass ditches and fence lines) would require treatment (1).

Management -

Insecticide Active ingredient Product name	Crop	Rate / acre	Rate / Hectare	Preharvest Interval (days)	Ref
Carbaryl Eco Bran	Beans	0.8 – 1.6 kg	1.97 – 3.95 kg	5	-
Lambda – Cyhalothrin Matador / Silencer	Chickpeas, Lentils. Peas (field), Soybeans	34 ml	83 ml	14 21 (soybeans)	-
Deltamethrin Decis	Lentils	40 – 60 ml (ground) 60 ml (air)	100 – 150 ml	30	-
Malathion Malathion 500 Malathion 85E	Lentils	0.68 L 336 ml	1.68 L 830 ml	30 14	-
Chlorpyrifos Lorsban, Pyrinex, Nufos, Citadel, Warhawk	Lentils	0.235 – 0.486 L	.58 – 1.2 L	21 - 60	-

Restrictions -

- deltamethrin: Do not feed treated straw or crop residue to livestock within 1 day of application. Do not graze treated fields. Do not apply more than 3 times per year by ground. Do not apply more than 2 times per year by air.
- ground application: Use 100 - 200 L water/ha. Do not apply if temperature exceeds 25°C.
- aerial application: Use 11-22 L of water per ha. Do not apply more than 2 times per year. Do not apply when wind exceeds 8 km/h (5 mph). Use high rate only.

Notes -

- deltamethrin: Best control is achieved when grasshoppers are in the 2nd – 4th nymphal stages. Observe buffer zones around sensitive areas: 100 m. when applying by air, 15 m. when applying by ground.

References -

1. Olfert and Slinkard, Crop Protection. 1999:527-530.

GREEN CLOVERWORM *Hypena scabra* (Fabricius) (Lepidoptera: Noctuidae)

Economic Injury Levels and Action Thresholds:

Soybeans: In soybeans, economic injury levels have been developed to reflect the amount of precipitation and canopy development (1). During drought, when canopy development is seriously impaired, use an economic injury level of 10 green cloverworms per m of soybean row.

Use an economic injury level of 22.5 green cloverworms per m of soybean row under normal to above-normal precipitation conditions.

Management:

Insecticide Active ingredient Product name	Crop	Rate / acre	Rate / Hectare	Preharvest Interval (days)	Ref
Endosulfan Thiodan	Dry Beans	0.6 – 1.0 L	1.5 – 2.5	2	

References -

- Ostliei & Pedigo, J. Econ. Ent. 1985:437-444.

LEAFHOPPERS

(Homoptera: Cicadellidae)

Soybeans:

Economic injury levels for potato leafhopper (*Empoasca fabae*) on soybeans are:

- V1 stage – 1.4 to 3.6 leafhoppers per plant (1)
- V2 stage – 3.0 to 7.8 leafhoppers per plant (1)
- V3 stage – 4.7 to 12.2 leafhoppers per plant (1)
- V4 stage – 6.5 to 16.7 leafhoppers per plant (1)
- R4 stage – 9 leafhoppers per plant (2)
- R7 stage – 18 leafhoppers per plant (2)

Glabrous varieties of soybeans (without hairs) are more susceptible to feeding by leafhoppers than varieties with hairs (3).

Dry beans:

Monitoring: Count nymphs on 5 samples of 5 leaflets per sample (4).

Economic Thresholds: Fourth trifoliolate stage – 1 potato leafhopper per trifoliolate (4)

First bloom – 2 potato leafhoppers per trifoliolate (4)

Management:

Insecticide Active ingredient Product name	Crop	Rate / acre	Rate / Hectare	Preharvest Interval (days)	Ref
Thiamethoxam Cruiser Maxx Beans	Dry Beans	Seed treatment			-
Lambda – Cyhalothrin Matador / Silencer	Dry Beans, Chickpeas, Fababean, Lentils,	34 ml	83 ml	14	-
Carbaryl Sevin	Dry Beans	1.01 L	2.49 L	5	-
Malathion Malathion 500 Malathion 85E	Dry Beans Peas (field)	0.56 – 1.21L 445 ml	1.38 – 2.9L 1100	1 3	-

Diazinon Diazinon 50W Diazinon 50 EC	Dry Beans	0.40 kg 0.445 L	.988 kg 1.10 L	7 7	-
Dimethoate Cygon 480 AG Lagon, Cygon 480 EC, Cygon 480 Ag	Dry Beans, Soybeans	0.28 – 0.40L 0.28 – 0.40L	0.7 – 1.0 L 0.7 - 1.0 L	7 30	
Endosulfan Thionex / Thiodan	Dry Beans	0.6 – 1.0 L	1.5 – 2.5 L	2	-

Restrictions -

dimethoate: Do not graze or feed treated forage to livestock.
endosulfan: Do not ensile or feed crop refuse to livestock.
malathion: peas: Do not apply unless foliage is dry.

References -

1. Hunt et al. 2000. Journal of Entomological Science. 35: 97-104.
2. Ogunlana and Pedigo. 1974. Journal of Economic Entomology. 67: 29-32
3. Broersma et al. 1972. Journal of Economic Entomology. 65: 78-82.
4. Schaafsma and Ablett. 1990. Annu Rep Bean Improv Coop. 33: 76-77.

LYGUS BUGS

(Heteroptera: Miridae)

Management:

Insecticide Active ingredient Product name	Crop	Rate / acre	Rate / Hectare	Preharvest Interval (days)	Ref
Lambda –Cyhalothrin Matador / Silencer	Dry Beans, Fababeans, Lentils, Soybeans	34 ml	83 ml	14 21 (soybeans)	-
Carbaryl Sevin	Dry Beans	2.12– 2.59 L	5.25 – 6.4 L	5	-
Dimethoate Cygon 480-AG Lagon/ Cygon 480 EC / Cygon 480-AG	Dry Beans, Soybeans	0.28 – 0.40L 0.28 – 0.40L	0.7 - 1 L 0.7 - 1 L	7 30	

PEA LEAF WEEVIL

Sitona lineatus (L.) (Coleoptera: Curculionidae)

Sampling Methods and Economic Threshold: A nominal threshold is: feeding damage on the terminal leaves (also known as the emerging node or clam leaf) on 1 out of 3 plants. Feeding damage is a very characteristic crescent notching. When scouting, damage estimates should be done on at least 10 plants at each of 5 spots along the edge of the field. Then again at another 5 spots more than 100 m into the field. Following this assessment if 1 out of 3 plants (or more) are showing damage on the terminal leaf then control measures may be warranted. If control measures are to be taken, spraying should occur prior to the 5 to 6 node stage. The preference for

earlier application is to minimize the amount of egg laying. Application should only occur if there is new feeding damage on the terminal leaves (clam leaf).

Management:

Insecticide Active ingredient Product name	Crop	Rate / acre	Rate / Hectare	Preharvest Interval (days)	Ref
Thiamethoxam Cruiser Maxx Pulses	Field Peas	50 – 83 ml of Cruiser 5FS / 100 kg seed			-
Lambda – Cyhalothrin Matador / Silencer	Field Peas	34 ml	83 ml	14 (Matador) 21 (Silencer)	-

SEEDCORN MAGGOT

Delia platura (Meigen) (Diptera: Anthomyiidae)

Management:

Insecticide Active ingredient Product name	Crop	Rate	Preharvest Interval (days)	Ref
Thiamethoxam Cruiser Maxx Beans	Dry Beans, Soybeans,	50 – 83 ml of Cruiser 5FS per 100 kg seed		1
Diazinon Agrox CD, Agrox B-2, DCT (dry beans only)	Dry Beans, Field Peas, Soybeans	Seed Treatment		2
Diazinon Diazinon 50 W	Dry Beans, Field Peas, Soybeans	20 g/300 ml water/ 4 L seed	14	-

References -

1. Smith et al., Pest Man. Res. Rep. 2008: 80-82.
2. Schaafsma et al. Pest Man.Res. Rep. 2000. 128-131.

SPIDER MITES

Management

Insecticide Active ingredient Product name	Crop	Rate / acre	Rate / Hectare	Preharvest Interval (days)	Ref
Dimethoate Lagon / Cygon 480 EC, Cygon 480-AG	Soybeans	0.40 L	1.0 L	30	-

Restrictions -

dimethoate: Do not apply more than 3 times per season. Do not feed or allow livestock to graze treated forage.

STINK BUGS

(Heteroptera: Pentatomidae)

Management:

Insecticide Active ingredient Product name	Crop	Rate / acre	Rate / Hectare	Preharvest Interval (days)	Ref
Carbaryl Sevin	Dry Beans	2.12 – 2.59 L	5.25 – 6.4 L	5	-

VARIEGATED CUTWORM *Peridroma saucia* (Hübner) (Lepidoptera: Noctuidae)

Management:

Insecticide Active ingredient Product name	Crop	Rate / acre	Rate / Hectare	Preharvest Interval (days)	Ref
Carbaryl Sevin	Dry Beans	30 – 35 ml/100 m of row	74 -86 ml/100 m of row	5	-

WIREWORMS

(Coleoptera: Elateridae)

Management:

Insecticide Active ingredient Product name	Crop	Rate	Preharvest Interval (days)	Ref
Thiamethoxam Cruiser Maxx Beans Cruiser Maxx Pulses Cruiser Maxx Cereals Seed Treatment	Dry Beans, Soybeans Field peas Buckwheat, Millet	83 ml of Cruiser 5FS / 100 kg of seed 325 ml / 100 kg of seed		1, 2

References -

1. Smith et al., Pest Man. Res. Rep. 2008: 80-82.
2. Smith et al., Pest Man. Res. Rep. 2008: 83-85.