

Insect Management in Pulse Crops in Western Canada

(Dry beans, chickpeas, faba beans, lentils, field peas, and soybeans)

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This document is only a guide. Always refer to the product label for application details and precautions before using an insecticide.

Alfalfa Looper	<i>Autographa californica</i> (Speyer) (Lepidoptera: Noctuidae)
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Chemical control:

Insecticide Active ingredient Product name	Crop	Rate / acre	Rate / Hectare	Preharvest Interval (days)	Ref
Carbaryl Sevin XLR	Field peas	1.90 L	4.7 L	3	-

Aphids	(Hemiptera: Aphididae)
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Soybean aphid (*Aphis glycines* Matsumura)

Soybeans

Pea aphid (*Acyrtosiphon pisum* (Harr.))

Peas, lentils, chickpeas, faba bean

Sampling Methods, Economic Thresholds and Natural Enemies -

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 differences 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). 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</u> <u>sweep</u>	<u>Aphids per</u> <u>tip</u>	<u>% yield</u> <u>loss</u>
7	1	3.4
10	2	4.9
12	3	6.1
15	4	7.1

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16	5	8.0
18	6	8.8
20	7	9.6
21	8	10.3

Natural Enemies: At least five species of parasitic wasps in the Braconid subfamily Aphidiinae are known to attack pea aphids in Manitoba and Saskatchewan. The most common of these is the species *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 most insecticides 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.

Incorporating Predators and Parasitoids into Management Decisions: A dynamic action threshold, which incorporates both aphid counts and some natural enemies into management decisions, has been developed for soybean aphids (14). This can be used through the mobile phone app Aphid Advisor. Information on the app is available at <http://www.aphidapp.com/>

Natural Enemies: Coccinellids (lady beetles) and *Orius insidiosus* (Anthocoridae), are key predators of soybean aphids (10).

Insect Management in Pulse Crops

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 aphids 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.

Chemical control:

Insecticide Active ingredient Product name	Crop	Rate / acre	Rate / Hectare	Pre harvest Interval (days)	Ref
Afidopyropen Sefina	Soybeans	81 ml	200 ml	7	
Flonicamid Carbine	Dry beans, field peas, chickpeas, faba beans, lentils.	49 – 65 g	120 – 160 g	7	
Spirotetramat Movento	Soybeans, field peas, lentils, chickpeas, dry beans	75 – 111 ml	185 – 275 ml	21 (soybeans) 7 (field peas, lentils, chickpeas, dry beans)	
Flupyradifurone Sivanto Prime	Dry beans, chickpeas, faba beans, lentils, field peas, soybeans	202 – 304 ml	500 – 750 ml	21 (soybeans) 7 (dry beans, chickpeas, faba beans, lentils, field peas)	
Lambda – Cyhalothrin Matador/ Silencer/ Labamba/ Zivata	Soybeans, lentils, field peas, faba beans, chickpeas, dry beans	34 - 94 ml	83 – 233 ml	soybeans - 21 lentils, field peas, faba beans, chickpeas, dry beans – 14 (Matador/ Labamba), 21 (Silencer/ Zivata)	9
Lambda-cyhalothrin and Chlorantraniliprole Voliam Xpress	Dry beans, field peas, soybeans, chickpeas,	91- 223 ml	225 – 550 ml	14 (dry beans, field peas, chickpeas, faba beans, lentils)	

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	faba beans, lentils			21 (soybeans)	
Imidacloprid and Deltamethrin Concept	Soybeans	132 – 263 ml	325 – 650 ml	20	
Malathion Malathion 85E	Dry beans, Field peas	297 – 544 ml 445 ml	735–1345 ml 1100 ml	3 3	1
Dimethoate Cygon 480 – AG Lagon / Diamante 4	Dry beans (Cygon 480-AG only) Field peas (Lagon/ Diamante 4 only) Soybeans (Lagon and Cygon 480- AG only)	0.28 – 0.40 L 0.11 – 0.15 L 0.28 – 0.40 L	0.70 - 1.0 L 0.275 - 0.380 L 0.70 - 1.0 L	7 3–21 (see label) 30	9

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.

Lambda-cyhalothrin: Do not feed treated crop to livestock.

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.
14. Hallett et al. Pest Manag Sci. 2014: 879-888.

Cutworms	Lepidoptera (Noctuidae)
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Redbacked cutworm (<i>Euxoa ochrogaster</i>) Pale western cutworm (<i>Agrotis orthogonia</i>) Variegated cutworm (<i>Peridroma saucia</i>)	Dark-sided cutworm (<i>Euxoa messoria</i>) Army cutworm (<i>Euxoa auxiliaris</i>) White cutworm (<i>Euxoa scandens</i>)
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Cultural Control – Studies and observations from Alberta show that pale western cutworm populations can be reduced by cultivating the soil and keeping it free of all plant growth for a 10-day period after the cutworms hatch and before the crop is seeded (1).

Economic Thresholds – There are no research-based economic thresholds available for cutworms in pulse crops. Nominal threshold that may be used for cutworms in soybeans and dry beans are 1 or more larvae per metre of row and larvae are small (less than 2 cm), or 20% of plants cut. A nominal threshold for cutworms in peas is 2 to 3 per square metre.

Chemical control:

Insecticide Active ingredient Product name	Crop	Rate / acre	Rate / Hectare	Preharvest Interval (days)	Ref
Seed Treatments and Granular Insecticides					
Chlorantraniliprole Lumivia CPL	Dry beans, chickpeas, faba beans, lentils, field peas	32-64 ml / 100 kg seed	79-158 ml / 100 kg seed		
Cyantraniliprole Lumiderm Fortenza	Soybeans		37.5-75 g ai / seed 41.5-83 ml / 100 kg seed		
Spinosad Scorpio Ant and Insect Bait (black cutworm)	Dry beans, chickpeas, faba beans, lentils, field peas, soybeans	10 – 20 kg	25 – 50 kg	28	
Sprays					
Chlorantraniliprole Coragen Max Coragen	Dry beans, chickpeas, faba beans, lentils, field peas, soybeans	33.5 ml 101 ml	83 ml 250 ml	1	
Tetraniliprole Vayego	Soybeans	61 ml	151 ml	14	
Lambda – Cyhalothrin Matador/ Silencer/	Dry beans, chickpeas, field peas,	34 ml	83 ml	soybeans - 21	

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Labamba/ Zivata	soybeans, lentils			Lentils, field peas, dry beans, chickpeas – 14 (Matador/ labamba), 21 (Silencer/ Zivata)	
Deltamethrin Decis 100 EC Advantage Deltamethrin (lentils only) Poleci (lentils only)	Dry beans ,lentils, chickpeas, faba beans, field peas	40 ml 81 ml 162 ml	100 ml 200 ml 400 ml	7 (Decis 100 EC) 30 (Poleci, Advantage Deltamethrin)	
Permethrin Pounce, Perm up, IPCO Syncro Ambush	Lentils, field peas	73 – 158 ml 57 – 121 ml	180 – 390 ml 140 – 300 ml	7	

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 (2).

Note -

Cyantraniliprole: Do Not make a subsequent foliar application of any group 28 insecticide (such as Coragen) for a minimum of 60 days after planting seed treated with Lumiderm.

Do Not make any subsequent applications of a group 28 insecticide (such as Coragen) following Fortenza seed treatment.

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.

Lambda-cyhalothrin: Do not feed treated crops to livestock.

References -

1. Salt and Seamans, 1945. Can. Entomol. 77: 150-155.
2. Byers *et al.*, J. Econ. Entomol. 1992. 85 : 1146 – 1149.

European Corn Borer	<i>Ostrinia nubilalis</i> (Hübner) (Lepidoptera: Crambidae)
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Chemical control:

Insecticide Active ingredient Product name	Crop	Rate / acre	Rate / Hectare	Preharvest Interval (days)	Ref
Chlorantraniliprole Coragen MaX Coragen	Dry beans	33.5 – 50.5 ml 101 - 152 ml	83 – 125 ml 250 - 375 ml	1	
Methoxyfenozide Intrepid	Dry beans	121 – 243 ml	300 – 600 ml	7	
Lambda – Cyhalothrin Matador/ Silencer/ Labamba/ Zivata	Dry Beans	34 ml	83 ml	14 (Matador/ Labamba) 21 (Silencer/ Zivata)	-
Lambda- cyhalothrin and Chlorantraniliprole Voliam Xpress	Dry beans	202 ml	500 ml	14	

Grasshoppers	(Orthoptera: Acrididae)
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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).

Soybeans: A nominal threshold for grasshoppers in soybeans is if the defoliation exceeds 30% during pre-bloom (i.e. vegetative) stages; 15% from bloom to pod-fill; or 25% from pod fill to maturity (unless pod feeding is observed).

Chemical control:

Insecticide Active ingredient Product name	Crop	Rate / acre	Rate / Hectare	Preharvest Interval (days)	Ref
Spreadable Bran Baits					
Carbaryl Eco Bran	Dry beans	0.8 – 1.6 kg	1.97 – 3.95 kg	5	-
Sprays					
Chlorantraniliprole Coragen MaX Coragen	Dry beans, chickpeas, faba beans,	17 – 33.5 ml 51 - 101 ml	42 – 83 ml	1	

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	lentils, field peas, soybeans		125 – 250 ml		
Lambda – Cyhalothrin Matador/ Silencer/ Labamba/ Zivata	Chickpeas, lentils, field peas, soybeans	34 ml	83 ml	soybeans - 21 lentils, field peas, chickpeas – 14 (Matador/ Labamba), 21 (Silencer/ Zivata)	-
Lambda-cyhalothrin and Chlorantraniliprole Voliam Xpress	Dry beans, field peas, lentils, chickpeas, faba beans, soybeans	91 ml	225 ml	Soybeans – 21 Dry beans, field peas, lentils, chickpeas, faba beans – 14	
Deltamethrin Decis 100 EC Advantage Deltamethrin (lentils only) Poleci (lentils only)	Dry beans, lentils, chickpeas, faba beans, field peas	20-30 ml 40 – 60 ml 81-121 ml (ground), 121 ml (air)	49-74 ml 100 – 150 ml 200 – 300 ml (ground), 300 ml (air)	7 (Decis) 30 (Poleci, Advantage Deltamethrin)	-
Malathion Malathion 85E	Lentils	336 ml	830 ml	14	-

Restrictions -

Deltamethrin: Do not apply more than 3 times per year by ground. Do not apply more than 2 times per year by air. Ground application: Do not apply if temperature exceeds 25°C. Aerial application: Do not apply when wind exceeds 8 km/h (5 mph). Use high rate only.

Lambda-cyhalothrin: Do not feed treated crop to livestock.

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	<i>Hypena scabra</i> (Fabricius) (Lepidoptera: Noctuidae)
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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 metre of soybean row. Use an economic injury level of 22.5 green cloverworms per metre of soybean row under normal to above-normal precipitation conditions.

If multiple defoliating insects are present in soybeans, rather than using thresholds for individual defoliating insects consider total leaf area lost as a threshold if defoliators are actively feeding: vegetative stages 50% defoliation, bloom 40%, bloom-pod fill 20%, and pod fill-harvest 35%.

Chemical control: No insecticides are registered for green cloverworm in Canada.

References -

1. Ostlie and Pedigo, J. Econ. Ent. 1985:437-444.

Leafhoppers	(Hemiptera: Cicadellidae)
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Potato leafhopper, *Empoasca fabae* (Harr.).

Soybeans:

Economic injury levels for potato leafhopper 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 trifoliate stage – 1 potato leafhopper per trifoliate (4)

First bloom – 2 potato leafhoppers per trifoliate (4)

Chemical control:

Insecticide Active ingredient Product name	Crop	Rate / acre	Rate / Hectare	Preharvest Interval (days)	Ref
Flupyradifurone Sivanto Prime	Dry beans, chickpeas, faba beans, lentils, field	202 – 304 ml	500 – 750 ml	21 (soybeans) 7 (dry beans, chickpeas, faba beans, lentils, field peas)	

WCCP Guide to Integrated Control of Insect Pests of Crops

	peas, soybeans				
Lambda – Cyhalothrin Matador/ Silencer/ Labamba/ Zivata	Dry beans, chickpeas, faba bean, lentils	34 ml	83 ml	14 (Matador/ Labamba) 21 (Silencer/ Zivata)	-
Lambda-cyhalothrin and Chlorantraniliprole Voliam Xpress	Dry beans, soybeans, chickpeas, faba beans, lentils	91 ml	225 ml	14 (dry beans, chickpeas, faba beans, lentils) 21 (soybeans)	
Carbaryl Sevin XLR	Dry beans	1.01 L	2.49 L	5	-
Malathion Malathion 85E	Field peas	445 ml	1100 ml	3	-
Dimethoate Cygon 480 AG / Lagon	Dry beans (Cygon 480 AG only), Soybeans	0.28 – 0.40L	0.7 – 1.0 L	7 (beans) 30 (soybeans)	

Restrictions -

Dimethoate: Do not graze or feed treated forage to livestock.

Lambda-cyhalothrin: Do not feed treated crop to livestock.

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	(Hemiptera: Miridae)
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Lentils

Sampling: Lygus adults usually move into lentil fields around bloom time, and nymphs usually do not appear in large numbers until the crop has reached the green flat to full pod stage of development (1). On average, five 25-sweep samples are required to estimate adult populations, and about 10 single-sweep samples are recommended to estimate populations of nymphs (1). Afternoon sampling provides more accurate population estimates than morning sampling (2).

Threshold: As a nominal threshold in lentils, insecticide treatment is recommended when 7 to 10 Lygus bugs are collected per 25 sweeps (3).

Insect Management in Pulse Crops

Chemical control:

Insecticide Active ingredient Product name	Crop	Rate / acre	Rate / Hectare	Preharvest Interval (days)	Ref
Flonicamid ¹ Carbine	Dry beans, faba beans, lentils	81 g	200 g	7	
Lambda –Cyhalothrin Matador / Silencer / Labamba/ Zivata	Dry beans, faba beans, lentils, soybeans	34 ml	83 ml	soybeans - 21 Dry beans, faba beans, lentils – 14 (Matador/ Labamba), 21 (Silencer/ Zivata)	-
Lambda-cyhalothrin and Chlorantraniliprole Voliam Xpress	Dry beans, soybeans, faba beans, lentils	91 ml	225 ml	14 (dry beans, faba beans, lentils) 21 (soybeans)	
Deltamethrin Decis 100 EC	Dry beans, faba beans, lentils	40 ml	100 ml	7	
Carbaryl Sevin XLR	Dry Beans	2.12– 2.59 L	5.25 – 6.4 L	5	-
Dimethoate Cygon 480-AG / Lagon	Dry beans (Cygon 480 AG only), soybeans	0.28 – 0.40 L	0.7 - 1 L	7 (dry beans) 30 (soybeans)	

¹Flonicamid will stop lygus bug feeding rapidly but it may take several days to see a reduction in Lygus bug numbers.

Restrictions -

Lambda-cyhalothrin: Do not feed treated crop to livestock.

References -

1. Schotzko and O’Keeffe. 1989. Environ. Entomol. 18: 308-314.
2. Schotzko and O’Keeffe. 1986. Journal of Economic Entomology. 79: 224-228.
3. Petroff. 2002. Crop profile for lentil in Montana. Montana State University.

Pea Leaf Weevil	<i>Sitona lineatus</i> (L.) (Coleoptera: Curculionidae)
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Sampling Methods – Adult feeding: Feeding by adults on seedlings results in a very characteristic crescent notching on leaf edges. When scouting, damage estimates should be done

WCCP Guide to Integrated Control of Insect Pests of Crops

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.

Economic Threshold: The economic threshold during the second to fifth node stages in field peas is 30% of seedlings with damage to the terminal (clam) leaf (1). For faba beans, 15% of seedlings with terminal leaf damage is considered the nominal threshold (2).

If control measures are to be taken for field peas, 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).

Pea crops in soils with high levels of soil nitrogen are unlikely to be affected by pea leaf weevil and should not require insecticide inputs (3). Foliar sprays for adults may not be an efficient means to protect yields in both field peas and faba beans; use of an insecticidal seed treatment may be more effective (2, 5 and references therein). Systemic seed treatments kill larvae and reduce egg laying near treated field pea plants (6). This effect may also be seen in faba beans (2). Growers should consult provincial surveys regional estimates of population densities and base seed treatment options on these.

Cultural Control –

Tillage practices: Research in Idaho found that densities of colonizing adults and immature pea leaf weevils were significantly higher in conventional tillage plots than no-tillage plots (4).

Chemical control:

Insecticide Active ingredient Product name	Crop	Rate / acre	Rate / Hectare	Preharvest Interval (days)	Ref
Seed Treatments					
Chlorantraniliprole Lumivia CPL	Faba beans, field peas	64 – 96 ml / 100 kg seed			
Thiamethoxam Cruiser 5FS	Field peas, faba beans	50 / 100 kg seed (faba beans) 50 or 83 ml / 100 kg seed (field peas). On farm application at the lower rate only.			-
Imidacloprid Trilex EverGol Shield	Field peas, faba beans	Seed Treatment			
Sprays					
Lambda – Cyhalothrin Matador/ Silencer/ Labamba/ Zivata	Field Peas	34 ml	83 ml	14 (Matador/ Labamba) 21 (Silencer/ Zivata)	-

Insect Management in Pulse Crops

Lambda-cyhalothrin and Chlorantraniliprole Voliam Xpress	Field peas, faba beans	91 ml	225 ml	14	
Deltamethrin (suppression only) Decis 100 EC	Field peas, faba beans	30 ml	75 ml	7	

Restrictions -

Lambda-cyhalothrin: Do not feed treated crop to livestock.

References -

1. Cárcamo and Vankosky. 2011. *Prairie Soils and Crops Journal*. 4: 77-85.
2. Wijerathna, et al. 2021. *Journal of Economic Entomology*. 114: 1597-1606.
3. Cárcamo et al., *Journal of Insect Science*. 2015: 1-5.
4. Hanavan et al. 2010. *Journal of Economic Entomology*. 103: 691-697.
5. Cárcamo et al., 2018. *Annals of the Entomological Society of America*, Vol. 111: 144-153.
6. Cárcamo et al., *Journal of Insect Science*. 2012: 1-12.

Seedcorn Maggot	<i>Delia platura</i> (Meigen) (Diptera: Anthomyiidae)
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Cultural Control –

Seedcorn maggot populations were higher in soybeans when a live, green cover crop was incorporated into the soil than dead crop residue (2). When spring tillage incorporates green, living organic matter into the soil, plant injury can be reduced if a grower waits for 2.5 – 3 weeks after tillage until planting, when the majority of insects are in the pupal stage (3).

Chemical control:

Insecticide Active ingredient Product name	Crop	Rate	Preharvest Interval (days)	Ref
Cyantraniliprole Fortenza Lumiderm	Soybeans	41.5-83 ml/100 kg seed 0.0375-0.125 mg ai/seed		
Thiamethoxam Cruiser 5FS	Dry Beans, Soybeans	Seed Treatment 50-83 mL/100 kg seed		1
Imidacloprid Sombrero	Soybeans	104-208 mL/100 kg seed		

References -

1. Smith et al., *Pest Man. Res. Rep.* 2008: 80-82.
2. Hammond. 1990. *Environmental Entomology*. 19: 510-514.
3. Hammond and Cooper. 1993. *Crop Protection*. 12: 539-543.

Spider Mites

(Acari: Tetranychidae)

Twospotted spider mite, *Tetranychus urticae* Koch.

Twospotted spider mites can be of concern in soybeans and dry beans, particularly under dry conditions.

Soybeans:

Susceptible stages: The stages of soybeans that are most susceptible to spider mites are the R4 (full pod) through R5 (beginning seed – when seeds are filling) stages. Once the soybeans reach R6 (full seed or green bean stage) the feeding from spider mites will have less impact on yield.

Monitoring: Beginning at the edge of the field, examine the undersides of leaves to determine if twospotted spider mites and/or webbing are present. If present, move farther into the field and examine two plants at each of twenty locations spread throughout the field (1).

Nominal threshold in soybeans: A rating scale from 0 (no spider mites or injury observed) to 5 can be used to determine if an insecticide application is needed. A rating of three is considered the spray threshold: heavy stippling on lower leaves with some stippling progressing into middle canopy; mites present in middle canopy with scattered colonies in upper canopy; lower leaf yellowing common and some lower leaf loss (1).

Spot or edge treatments for spider mites are sometimes all that is required in soybeans.

Chemical control:

Insecticide Active ingredient Product name	Crop	Rate / acre	Rate / Hectare	Preharvest Interval (days)	Ref
Spiromesifen Oberon	Dry beans	202-243 ml	500-600 ml	10	
Dimethoate Lagon/ Cygon 480-AG/ Diamante 4	Soybean, dry beans (Cygon 480-AG only)	0.28-0.40 L (dry beans) 0.40 L (soybeans)	0.7-1.0 L (dry beans) 1.0 L (soybeans)	7 (dry beans) 30 (soybeans)	-

Restrictions -

Dimethoate: Do not apply more than 3 times per season.

References -

1. Koch and Burkness. 2016. Twospotted spider mites on soybeans. University of Minnesota Extension.

Wireworms	(Coleoptera: Elateridae)
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Cultural Control –

Shallow seeding into warm and moist soil and packing of soil may promote quick germination and reduce the risk of damage from wireworms.

Biological Control –

The fungus *Metarhizium anisopliae* Sorokin (Hypocreales: Clavicipitaceae) can infect and kill wireworms (3).

Larvae of stiletto flies (Diptera: Therevidae) are common in soils and will feed on wireworms (4).

Chemical control:

Insecticide Active ingredient Product name	Crop	Rate	Preharvest Interval (days)	Ref
Cyantraniliprole Fortenza Lumiderm	Soybeans	83 ml/100 kg seed 0.0375-0.125 mg ai/seed		
Thiamethoxam Cruiser 5FS	Dry beans, chickpeas, faba beans, lentils, field peas	83 ml/100 kg seed (dry beans) 17-50 ml/100 kg seed (Field peas, chickpeas, faba beans, lentils		1, 2
Imidacloprid Sombrero Trilex EverGol Shield	Soybeans (Sombrero only) Trilex EverGol Shield only on dry beans, chickpeas, faba beans, lentils, field peas	104-208 mL/100 kg seed Seed Treatment containing Stress Shield 600 and 3 fungicides		
Spinosad Scorpio Ant and Insect Bait (suppression)	Dry beans , chickpeas, faba beans, lentils, field peas, soybeans	10 – 20 kg / acre		

Restrictions -

Cyantraniliprole: Do Not make a subsequent foliar application of any group 28 insecticide (such as Coragen) for a minimum of 60 days after planting seed treated with Lumiderm.

Do Not make any subsequent applications of a group 28 insecticide (such as Coragen) following Fortenza seed treatment.

WCCP Guide to Integrated Control of Insect Pests of Crops

References -

1. Smith et al., Pest Man. Res. Rep. 2008: 80-82.
2. Smith et al., Pest Man. Res. Rep. 2008: 83-85.
3. Kabaluk and Ericsson. 2007. Environmental Entomology. 36: 1415-20.
4. van Herk et al. 2015. Journal of Applied Entomology. 139: 154-157.