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

Insect Management In Pulse Crops

(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 *Autographa californica* (Speyer) (Lepidoptera: Noctuidae)

Chemical control:

Insecticide **Active ingredient** Product name	**Crop**	**Rate / acre**	**Rate / Hectare**	**Preharvest Interval (days)**	**Ref**
Naled Dibrom	Dry beans	0.42 – 0.85 L	1.05 – 2.1L	4	-
Carbaryl Sevin	Field peas	1.90 L	4.7L	3	-

Restrictions:

Naled: Do not apply when temperature is over 32°C. Do not graze within 4 days of application. Do not apply more than twice per season.

Aphids (Hemiptera: Aphididae)

Soybean aphid (*Aphis glycines* Matsumura)	Soybeans
Pea aphid (*Acyrthosiphon pisum* (Harr.))	Peas, lentils, chickpeas, fababean

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). 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.

Aphids per sweep	Aphids per tip	% yield loss
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.

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).
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 180º 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 Beleaf	Dry beans, faba bean	49 – 65 g	120 – 160 g	7	
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/ Labamba	Soybeans, lentil, peas (field), faba beans, chickpeas	34 - 94 ml	83 – 233 ml	soybeans - 21 lentils, field peas, faba beans, chickpeas – 14 (Matador/ labamba), 21 (Silencer)	9
Lambda-cyhalothrin and Chlorantraniliprole Voliam Xpress	Dry beans, Peas (field), Soybeans, Chickpeas, Faba bean, Lentil	91- 223 ml	225 – 550 ml	14 (dry beans, field peas, chickpeas, faba beans, lentils) 21 (soybeans)	
Imidacloprid and Deltamethrin Concept	Soybeans	132 – 263 ml	325 – 650 ml	20	
Malathion					1

Malathion 500 Malathion 85E	Dry beans Dry beans Peas (field)	0.56 – 1.21 L 297 – 544 ml 445 ml	1.40 – 3.0L 735–1345 ml 1100 ml	1 3 3	
Naled Dibrom	Dry beans	0.42 – 0.85 L	1.05 - 2.1 L	4	-
Dimethoate Cygon 480 – AG Lagon / Cygon 480 EC	 Dry beans Peas (Field) Soybeans	 0.28 – 0.40 L 0.11 – 0.15 L 0.28 – 0.40 L	 .70 - 1.0 L .275 - .380 L .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.

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

Cutworms — Lepidoptera (Noctuidae)

Redbacked cutworm (*Euxoa ochrogaster*)
Pale western cutworm (*Agrotis orthogonia*)
Variegated cutworm (*Peridroma saucia*)
Darksided cutworm (*Euxoa messoria*)
Army cutworm (*Euxoa auxiliaris*)
White cutworm (*Euxoa scandens*)

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 had hatched and before the crop was seeded (4).

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 three feet 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 cutworms 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	Beans (dry), chickpeas, faba beans, lentils, peas (field)		32-64 ml / 100 kg seed		
Spinosad Scorpio Ant and Insect Bait (black cutworm)	Beans (dry), chickpeas, faba beans, lentils, peas (field), soybeans	10 – 20 kg	25 – 50 kg	28	
Sprays					
Chlorantraniliprole Coragen	Beans (dry), chickpeas, faba beans, lentils, peas (field), soybeans	101 ml	250 ml	1	
Lambda – Cyhalothrin Matador / Silencer / Labamba	Beans (dry), Chickpeas, peas (field), soybeans, Lentils	34 ml	83 ml	soybeans - 21 lentils, field peas, dry beans, fababeans, chickpeas – 14 (Matador/ labamba), 21 (Silencer)	
Deltamethrin Decis Poleci	Lentils	Decis: 80 ml Poleci: 162 ml	Decis: 197 ml Poleci: 400 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 five leaf stage	
Chlorpyrifos Lorsban, Pyrinex, Nufos, Citadel, Warhawk, Sharphos	Lentils	0.354 – 0.486 L	.875 – 1.20 L	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.
4 Salt and Seamans, 1945. Can. Entomol. 77: 150-155.

European Corn Borer *Ostrinia nubilalis* (Hübner) (Lepidoptera: Crambidae)

Chemical control:

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 / Labamba	Dry Beans	34 ml	83 ml	14 (Matador/ Labamba) 21 (Silencer)	-
Lambda-cyhalothrin and Chlorantraniliprole Voliam Xpress	Dry beans	202 ml	500 ml	14	

Grasshoppers (Orthoptera: Acrididae)

Economic Threshold -

Lentils: The average yield loss is estimated to be approximately 2% for every one grasshopper/m^2 (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 / m^2 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**
Carbaryl Eco Bran	Dry beans	0.8 – 1.6 kg	1.97 – 3.95 kg	5	-
Chlorantraniliprole Coragen	Dry beans, chickpeas, faba beans, lentils, peas (field), soybeans	51 - 101 ml	125 – 250 ml	1	
Lambda – Cyhalothrin Matador / Silencer / Labamba	Chickpeas, Lentils. Peas (field), Soybeans	34 ml	83 ml	soybeans - 21 lentils, field peas, chickpeas – 14 (Matador/ Labamba), 21 (Silencer)	-
Deltamethrin Decis Poleci	Lentils	Decis: 40 – 60 ml (ground) 60 ml (air); Poleci: 81-121 ml (ground), 121 ml (air)	Decis : 100 – 150 ml Poleci : 200 – 300 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, Sharphos	Lentils	0.235 – 0.486 L	.58 – 1.2 L	21 - 60	-

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.

Notes -

Chlorpyrifos: A pulse MRL advisory from Keep it Clean states: "In cases of late-season application during pod development or seed fill to maturity (e.g. for late-season grasshopper control), consult with your exporter/processor."

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.
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)

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**
Lambda – Cyhalothrin	Dry Beans, Chickpeas,	34 ml	83 ml	14 (Matador/ Labamba)	-

Matador / Silencer / Labamba	Faba bean, Lentils			21 (Silencer)	
Carbaryl Sevin	Dry Beans	1.01 L	2.49 L	5	-
Malathion Malathion 85E	Peas (field)	445 ml	1100 ml	3	-
Dimethoate Cygon 480 AG / Lagon / Cygon 480 EC	Dry Beans (Cygon 480 AG only), Soybeans	0.28 – 0.40L 0.28 – 0.40L	0.7 – 1.0 L 0.7 - 1.0 L	7 30	

Restrictions -

Dimethoate: Do not graze or feed treated forage 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 Enromology. 65: 78-82.
4. Schaafsma and Ablett. 1990. Annu Rep Bean Improv Coop. 33: 76-77.

Lygus Bugs (Hemiptera: Miridae)

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).

Chemical control:

Insecticide **Active ingredient** Product name	**Crop**	**Rate / acre**	**Rate / Hectare**	**Preharvest Interval (days)**	**Ref**
Flonicamid[1] Beleaf	Dry beans, faba bean	81 g	200 g	7	
Lambda –Cyhalothrin Matador / Silencer / Labamba	Dry Beans, Faba beans, Lentils, Soybeans	34 ml	83 ml	soybeans - 21 Dry beans, faba beans, lentils – 14 (Matador/ Labamba), 21 (Silencer)	-

Carbaryl Sevin	Dry Beans	2.12– 2.59 L	5.25 – 6.4 L	5	-
Dimethoate Cygon 480-AG / Lagon / Cygon 480 EC	Dry Beans (Cygon 480 AG only), Soybeans	0.28 – 0.40L 0.28 – 0.40L	0.7 - 1 L 0.7 - 1 L	7 30	

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

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

Sitona lineatus (L.) (Coleoptera: Curculionidae)

Sampling Methods: Feeding damage is a very characteristic crescent notching on leaf edges. 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.

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).
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).
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 (2). Foliar sprays for adults may not be an efficient means to protect yields; use of an insecticidal seed treatment may be more effective (4 and references therein). 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 (3).

Chemical control:

Insecticide **Active ingredient** Product name	**Crop**	**Rate / acre**	**Rate / Hectare**	**Preharvest Interval (days)**	**Ref**
Seed Treatments					

Chlorantraniliprole Lumivia	Faba beans, Field peas	64 – 96 ml / 100 kg seed			
Thiamethoxam Cruiser Maxx Pulses	Field Peas	50 – 83 ml of Cruiser 5FS / 100 kg seed			-
Imidacloprid Stress shield 600	Field Peas	104 – 208 ml / 100 kg seed			
Sprays					
Lambda – Cyhalothrin Matador / Silencer / Labamba	Field Peas	34 ml	83 ml	14 (Matador/ Labamba) 21 (Silencer)	-

References -

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

Seedcorn Maggot *Delia platura* (Meigen) (Diptera: Anthomyiidae)

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	Soybeans	41.5-83 ml/100 kg seed		
Thiamethoxam Cruiser Maxx Vibrance Beans Cruiser 5FS	Dry Beans, Soybeans,	Seed Treatments		1
Imidacloprid Stress Shield 600 Alias Sombrero	Soybeans	Seed Treatments		

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 EC	Soybeans	0.40 L	1.0 L	30	
Cygon 480-AG	Soybeans, dry beans	0.40 0.28-0.40 L	1.0 L 0.7-1.0 L	30 7	

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.

Stink Bugs (Hemiptera: Pentatomidae)

Chemical control:

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

Variegated Cutworm *Peridroma saucia* (Hübner) (Lepidoptera: Noctuidae)

Chemical control:

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

Wireworms (Coleoptera: Elateridae)

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) will feed on wireworms (4).

Chemical control:

Insecticide **Active ingredient** Product name	**Crop**	**Rate**	**Preharvest Interval (days)**	**Ref**
Cyantraniliprole Fortenza	Soybeans	83 ml/100 kg seed		
Thiamethoxam Cruiser Maxx Vibrance Beans Cruiser Maxx Vibrance Pulses	Dry Beans, Soybeans Field peas, chickpeas, fababeans, lentils	Seed Treatments		1, 2

Imidacloprid Stress Shield Alias, Sombrero	 Dry beans, chickpeas, faba beans, lentils, field peas, soybeans Soybeans	Seed Treatments		
Spinosad Scorpio Ant and Insect Bait	Beans (dry), chickpeas, faba beans, lentils, peas (field), soybeans	25 – 50 kg / ha	28	

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.