

FORAGE CROPS

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ALFALFA BLOTCH LEAFMINER

Alfalfa blotch leafminer

Economic Thresholds

Alfalfa hay crops
- 40% of leaflets show pinhole feeding (OMAFRA)

Alfalfa seed crops
- unknown

Biological Control -

A species of parasitic wasp, *Dacnusa dryas*, has kept the leafminer in check in eastern Canada in most localities and years. Chemical control of the pest may decimate populations of its biocontrol agent.

Chemical Control -

Active Ingredient	Rate (g AI/ha)	Preharvest Interval (days)	References
dimethoate	264	2	-
malathion	1375	7	
phosmet	1125	7	-

Note: For insecticides to be effective, they should be applied no later than the pinhole stage of feeding.

Restrictions -

crop in bloom Do not apply during bloom. See Section 17 regarding hazard to bees.

dimethoate Use a minimum water volume of 200 L/ha with ground equipment. Do not apply more than once per cutting. Ground and aerial application is permitted.

malathion Use a minimum water volume of 275 L/ha. Repeat application may be necessary. Do not apply by air.

phosmet Use water volumes of 200-500 L/ha at first sign of infestation.

ALFALFA WEEVIL

Alfalfa weevil

Economic Thresholds

- Alfalfa hay crops (6-9)
- 25-50% of leaves on the upper one-third of the stem show damage (6)
- 50-70% of terminals show injury (9)

- Alfalfa seed crops (10)
- 20-25 larvae/sweep (90°=straight sweep)
- 35-50% of foliage tips show damage

Cultural Control -

Cut the first hay crop early. If damage reappears in new growth, treat with insecticides immediately.

Chemical Control -

Active Ingredient	Rate (g AI/ha)	Preharvest Interval (days)	References
cyhalothrin-λ	10	14	
deltamethrin (seed crop only)	10 - 12.5	20	11, 12
dimethoate	204	2	--
malathion	1000 - 1500	7	1, 2
phosmet	1125	7	-

Forage Crop If application is made to heavy growth, 110-220 L water/ha may be required for adequate coverage.

Seed Crop To minimize hazard to bees, use cyhalothrin-λ or deltamethrin. Hold leafcutting bees off the crop until the cyhalothrin-λ dries completely or at least 24 hours following deltamethrin application.

Restrictions -

crop in bloom Do not apply insecticide when bees are pollinating. See page 164 regarding hazard to bees.

cyhalothrin-λ Do not graze or feed treated forage or pasture to lactating dairy cows. Do not apply within 14 days of cutting for forage or grazing of non-lactating dairy animals or other livestock. Do not use more than 3 applications per year. Alfalfa seed from treated crops must not be used for production of alfalfa sprouts. Ground or aerial application is permitted.

deltamethrin For use on seed crops only. Do not feed harvested forage within 90 days of harvest. One application per year. Apply by ground only.

dimethoate	For reduction of alfalfa weevil larvae. Do not apply when alfalfa is in bloom. Ground or aerial application is permitted.
malathion	For alfalfa weevil larvae. Apply when daytime temperatures are expected to exceed 18°C and when 75% of leaves show feeding damage. Do not apply when alfalfa is in bloom. Ground or aerial application.
phosmet	Apply in 200-500L water per ha. Do not apply more than once per cutting. Apply by ground only.

References -

1. Bass and Knapp, J. Econ. Entomol. 59:648, 1966.
2. Swailes and McDonald, Pest. Res. Rep. 1964:177.
3. Ellis, Pest. Res. Rep. 1976:167.
4. Richards and Charnetski, Pest. Res. Rep. 1976:168.
5. Harper, Can. Entomol. 110:891, 1978.
6. Bereza, Ontario Agdex 121/622. 4 pp., 1977.
7. Hastings and Pepper, J. Econ. Entomol. 46:785, 1953.
8. Hintz et al., J. Econ. Entomol. 69:749, 1976.
9. Carpenter, J. Econ. Entomol. 63: 1602, 1970
10. Johansen, Pacific North West Ext. Publ. No. 128, 1980.
11. Charnetski and Schaber, Pest. Res. Rep. 1980:160.
12. Charnetski, Pest. Res. Rep. 1983:154.

BLISTER BEETLE

Blister beetle

Damage, although usually localized, can occur quickly and mainly in dry situations when grasshoppers are present. Blister beetle larvae eat grasshopper eggs.

Chemical control

Active Ingredient	Crop	Rate (g AI/ha)	Preharvest Interval (days)	References
carbaryl	alfalfa, clover	1165 - 1925	1 - 2	--

Restrictions -

carbaryl Remove cattle from area while spraying. Beef cattle may be reintroduced to treated areas one day after spraying, dairy cattle in two days.

BROMEGRASS SEED MIDGE

Bromegrass seed midge

Cultural Control -

Thorough burning of stubble and trash in early spring or before regrowth in late summer provides some control. (1-2)

References -

1. Knowles, Forage Notes 18(2), 1973; 19(2), 1974.
2. Neuman and Manglitz, Agric. Expt. Sta., Univ. Neb., Res. Bull. 252, 1972.

GRASSHOPPERS

Grasshoppers (on alfalfa, clover, pastures and grasses)

Economic Thresholds - See Cereal Crops, page . Unless the forage crops are in their establishment year, economic thresholds should be closer to ETs for roadsides than those for field crops.

Chemical Control -

Active Ingredient	Crop	Rate (g AI/ha)	Preharvest Interval (days)	References
carbaryl	alfalfa, clover	560 - 1630	1 - 2	--
	forage grasses, pastures, rangelands	560 - 1630	1 - 2	--
carbaryl bran bait	alfalfa, clover, forage grasses, rangeland	40 - 100	1 - 2	--
cyhalothrin-λ	alfalfa, pasture	7.6 - 10 ground 10 aerial	14	--
deltamethrin	rangeland, pastures	5 - 7.5 ground 7.5 aerial	1	9
dibrom	rangeland, pastures	475 - 735 young GH 605-865 older GH	0	--
dimethoate	alfalfa, forage crops, pastures	204 - 265 younger GH 410 - 480 older and winged	2 - 28	1-4
malathion	alfalfa, clovers grasses, pasture, rangeland	1000 - 1500 500 - 850	7	--

Note: Use lower rates on younger grasshoppers. Best control is achieved when product is applied to young grasshoppers.

Restrictions -

crop in bloom See page 164 regarding hazard to bees.

carbaryl	Remove cattle from area while spraying. Dilutions of higher than 1:11 are not recommended when residual insect control from the wash-off is desired.
carbaryl bran bait	Apply by ground only. Rain shortly after application will decrease efficacy of product.
cyhalothrin-λ	Do not graze or feed treated forage or pasture to lactating dairy cows. Do not apply within 14 days of cutting for forage or grazing of non-lactating dairy animals or other livestock. Do not use more than 3 applications per year. Do not make more than 1 application by air per year. Do not use alfalfa seed from treated crops for production of alfalfa sprouts.
deltamethrin	Do not make more than three applications per year, with a maximum of two aerial applications. Only beef cattle may graze or pasture on treated crops. Under severe insect pressure, application of a 15m boundary strip along roadsides and fencelines may be necessary to achieve optimum control.
dibrom	Use sufficient water to provide thorough coverage and contact spray. Animals may be present during treatment. Ground or aerial application is permitted. Do not apply when temperatures exceed 32°C.
dimethoate	Use lower rates for low infestations or grasshopper nymphs, higher rates for grasshopper adults in seed alfalfa or forage crops. Crops treated with lower rates of dimethoate should not be grazed or harvested for forage within 2 days after treatment. Crops treated with higher rates should not be grazed or harvested within 28 days after treatment. Do not apply during bloom.
malathion	Do not apply when air temperatures drop below 18°C. Pasture and rangelands treated with malathion may be grazed or harvested on day of treatment; do not apply to fields occupied by dairy animals. No application within 7 days of harvest or pasturing of alfalfa, clovers. Do not apply during bloom.

References -

1. Holmes et al., J. Econ. Entomol. 58:77, 1965.
2. Banham, Pest. Res. Rep. 1964:134.
3. McDonald and McKinlay, Pest. Res. Rep. 1964:132.
4. Dolinski et al., Pest. Res. Rep. 1973:185.
5. Mukerji et al., Can. Entomol. 1981:707.
6. Johnson et al., Pest. Res. Rep. 1985: 174.

LESSER CLOVER LEAF WEEVIL

Lesser clover leaf weevil

Economic thresholds

Red clover

- third and fourth instar larval densities greater than 3 per five shoots could damage up to 50% of buds and flower heads (1)

Chemical control -

There are no insecticides currently registered for control of lesser clover leaf weevil.

Reference -

1. Weiss and Gillott, Can. Entomol. 125:831-837, 1993.

PEA APHID

Pea aphid (alfalfa)

Economic Thresholds -

1430 aphids/sweep did not reduce the forage yield of irrigated alfalfa. (2)

Caged alfalfa initially infested with 100-200 aphids/plant produced less forage and had lower carotene contents than uninfested plants. (4)

100 - 200 aphids/ 180° sweep when seed crop is drought-stressed, plants are wilting, and seed is still developing (before mid-August)

Cultural Control -

On irrigated alfalfa, control may be unnecessary if adequate water is provided to the plants. (2)

Biological Control -

High winds, heavy rain and hail can cause pea aphid numbers to decline drastically. Predators such as ladybird beetles and others, parasitic wasps, and entomophagous diseases often cause aphid population crashes to occur, especially late in the season.

Chemical Control -

Active Ingredient	Rate (g AI/ha)	Preharvest Interval (days)	References
cyhalothrin-λ	10	14	--
dibrom	950 - 1900	4	--
dimethoate	200	2	1, 3
malathion	1000 - 1500	7	--

Note: Ensure thorough coverage. Treat if population is large enough to stunt plants or if heavily infested hay is to be dehydrated.

Restrictions -

Do not apply when pollinators are present. See page 164 regarding hazard to bees.

- cyhalothrin-λ Do not graze or feed lactating dairy cows treated forage or pasture. Do not apply within 14 days of cutting for forage or grazing of non-lactating dairy animals or other livestock. Do not use more than 3 applications per year. Do not use alfalfa seed from treated crops for production of alfalfa sprouts. Application by ground or air is permitted.
- dibrom Do not apply when temperature is over 32°C. Application by ground or air is permitted.
- dimethoate Do not graze or harvest for forage within 2 days after application. Maximum number of applications per season - two.
- malathion Do not apply when air temperatures drop below 18°C. Do not apply to alfalfa in bloom.

References -

1. Harper, Can. Entomol. 110:891, 1978.
2. Hobbs et al., Can. Entomol. 93:801, 1961.
3. McDonald and Harper, Can. Entomol. 110:213, 1978.
4. Harper and Lilly, J. Econ. Entomol. 59:1426, 1966.

PLANT BUGS IN ALFALFA SEED FIELDS

Plant bugs in alfalfa seed fields : Alfalfa plant bug, Superb plant bug, Lygus bugs and Plagiognathus bug

Economic Thresholds -

8 lygus bugs/sweep or 4 alfalfa plant bugs/sweep or 5 nymphs/sweep of any or all species of plant bugs, when the alfalfa is in bud or in bloom. (7-9)

Chemical application should be timed so that the majority of nymphs are third instars or older.

Cultural Control -

Burning of alfalfa stubble and debris in early spring controls all species except lygus bugs. (3,5,15)

Chemical Control -

Active Ingredient	Rate (g AI/ha)	Preharvest Interval (days)	References
cyhalothrin-λ	10	14	--
deltamethrin	10 - 12.5	20	10-14
dibrom	950 - 1900	4	--
dimethoate	200 - 530	2 (low rate) - 28	1, 6
malathion	1000 - 1500	7	--

Note: For control of lygus bugs In burned fields, apply dimethoate or deltamethrin just before alfalfa begins to bloom.

When putting out or replacing leafcutting bees on the crop, wait 7 days after applying dimethoate and wait 1 day after applying deltamethrin.

In unburned fields for control of all plant bugs, apply dimethoate when flower buds are beginning to form.

If the alfalfa is in bloom and bees are in the crop, apply cyhalothrin-λ in late evening when bees are not foraging.

Restrictions -

cyhalothrin-λ	Do not graze or feed treated forage or pasture to lactating dairy cows. Allow 14 days between application and cutting for forage or grazing of non-lactating dairy animals or other livestock. Do not use more than 3 applications per year. Do not use alfalfa seed from treated crops for production of alfalfa sprouts. Ground or air application is permitted.
deltamethrin	Do not feed treated forage within 90 days of harvest. Do not apply more than once annually. Use higher rates when alfalfa weevils are present.
dibrom	Do not apply when temperature exceeds 32°C. Application by ground or air is permitted.
dimethoate	Do not graze or harvest for forage within 28 days following treatment. Do not apply to crops in bloom. Do not apply more than once annually. Application by ground or air is permitted.
malathion	Do not apply when air temperatures drop below 18°C. Do not apply to alfalfa in bloom.

References -

1. Craig, Pest. Res. Rep. 1971:167.
2. Kolach and Senkow, Pest. Res. Rep. 1972:151.
3. Lilly and Hobbs, Can. J. Plant Sci. 42:53, 1962.
4. Craig, Pest. Res. Rep. 1973:168.
5. Craig, Agric. Can. Publ. 1935, 1973.
6. Harper, Can. Entomol. 110:891, 1978.
7. Craig and Lasiuk, Pest. Res. Rep. 1971:167.
8. McMahon, Rep. B.C. Agron. Assoc. 1950:58.
9. Sorenson, Utah Agric. Expt. Sta. Bull. 284,1939.
10. Charnetski and Schaber, Pest. Res. Rep. 1980:161.
11. Charnetski, Pest. Res. Rep. 1983:154.
12. Butts, Pest. Res. Rep. 1981:149; 1983:156.
13. Butts and Lippert, Pest. Res. Rep. 1982:166.
14. Cattellier and Wise, Pest. Res. Rep. 1982:167.
15. Schaber and Entz, J. Econ. Entomol. 81:668-672, 1987.

PLANT BUGS IN GRASS SEED FIELDS

Plant bugs *Capsus cinctus* Kolenaty, *Trigonotylus coelestialis* (Kirk), others. (See Silvertop of Grasses below)

Chemical Control -

Active Ingredient	Rate (g AI/ha)	Preharvest Interval (days)	References
dimethoate	200	2	1

Restrictions -

dimethoate Do not graze, forage, or harvest 2 days after treatment.

References -

1. Okuda, Pest. Res. Rep. 1988 p134. (See Appendix 1, Forage Crops)

RED CLOVER THRIPS

Red clover thrips (red clover seed fields)

Economic Thresholds -

Damage is insignificant until 50-80 thrips/raceme are present. (l) Threshold levels occur only during years of early spring drought on dryland.

Reference -

1. Craig, unpublished data 1987, Agriculture and Agri-Food Canada, Saskatoon.

SILVERTOP OF GRASSES

Silvertop of grasses

Diverse causal agents. Insects associated with silvertop include grass plant bugs (e.g., *Capsus* species, *Trigonotylus* spp., *Irbisia* spp., *Labops* spp., others), thrips such as *Anaphothrips* species, and grain mites such as *Siteroptes graminum*. Diseases such as *Fusarium* have also been implicated.

Economic Thresholds -

Thresholds will vary according to seed prices, which fluctuate wildly. In general, grass fields exhibiting 10% or more silvertop should have remedial action taken the following year. Silvertop, once evident, cannot be treated or reversed.

Cultural Control -

Post-harvest burning or burning in the spring prior to new growth will destroy plant bug eggs and adults. Do not burn creeping red fescue fields in the Peace River region because of potential damage to the subsequent seed crop. In this region, burn only following the last seed harvest prior to entering a rejuvenation cycle. Low-mowing (below 3 cm) and removal of straw following harvest also decreases the incidence of silvertop.

Chemical Control -

At present, dimethoate at 200 g AI/ha is registered for control of lygus bugs and plant bugs in forage crops. (See also Appendix 1 - Forage Crops.)

References -

1. Peterson and Vea, J. Econ. Entomol. 64:247-251, 1971
2. Kamm and Fuxa, J. Range Management 30:385-387, 1977
3. Okuda, Pest. Res. Rep. 1988:134.

SPIDER MITES

Spider mites in legumes

Spider mite populations can increase rapidly and cause damage in very warm, dry years.

Economic Thresholds -

Unknown for Canadian prairies. In clover seed crops in Idaho, mites should be controlled in June or July when 25% of the leaves show feeding injury. (1)

Biological Control -

Mite populations are usually kept in check by fungal diseases and predators.

Chemical Control -

Active Ingredient	Rate (g AI/ha)	Preharvest Interval (days)	References
malathion	750 - 1250	7	--

Restrictions -

malathion Do not apply when air temperatures drop below 18°C. Do not apply to alfalfa in bloom.

References -

1. Baird, Homan and Bolz. <http://info.ag.uidaho.edu/resources/PDFS/CIS0772.pdf>. Accessed June 2006. Bulletin revised May 2002.

SWEET CLOVER WEEVIL

Sweet clover weevil

Economic Thresholds (7) -

In seedling sweet clover crops:

1 weevil adult/5 seedlings in cotyledon stage under slow growth conditions.

1 weevil adult/3 seedlings in cotyledon stage under normal growth conditions.

In newly-emerging 2nd year sweet clover:

9-12 weevil adults/plant.

Cultural Control -

Seedling stands:

Locate new seedlings as far as possible from 2nd-year clover.

First-year stands in late summer:

Defoliation of 1st-year clover by close-cutting, grazing, or weevil feeding during the critical period of mid-August to mid-September will severely reduce 2nd-year yield. Swath companion grain crops high.

Second-year stands:

Second year clover will usually outgrow weevil damage; insecticide application is rarely necessary. Sweet clover silage and hay fields should be cultivated as soon as possible after the crop is taken; this kills the new-generation weevil larvae in the soil. (6,7)

Chemical Control -

In sweet clover seedling crops apply insecticide when very young seedlings are noticeably damaged by weevil feeding. In first-year clover in late summer and fall, apply insecticide to crop margins where weevils are concentrated.

Active Ingredient	Rate (g AI/ha)	Preharvest Interval (days)	References
dimethoate	410 - 530	28	1-5
malathion	750 - 1250	7	--
methoxychlor	1100 - 1500	7	--

Restrictions -

dimethoate Do not apply within 28 days of grazing or harvesting for forage.

malathion Spray field margins of first-year clover in late summer or early fall when adult migration is underway. Remove cattle when treating; cattle may be returned immediately after treatment.

methoxychlor May be applied during bloom at early morning or late evening when bees are not foraging.

References -

1. Craig, Pest. Res. Rep. 1971:179.
2. Craig, Pest. Res. Rep. 1964:136.
3. Craig, Pest. Res. Rep. 1965:135.
4. Swailes and McDonald, J. Econ. Entomol. 58:988, 1965.
5. Craig, Pest. Res. Rep. 1968: 150.
6. Bird, 80th Annual Rep., Entomol. Soc. Ont., 1949.
7. Craig, Can. Entomol. 110:883, 1978.