

Forages: Alfalfa and Other Legumes

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Alfalfa Weevil

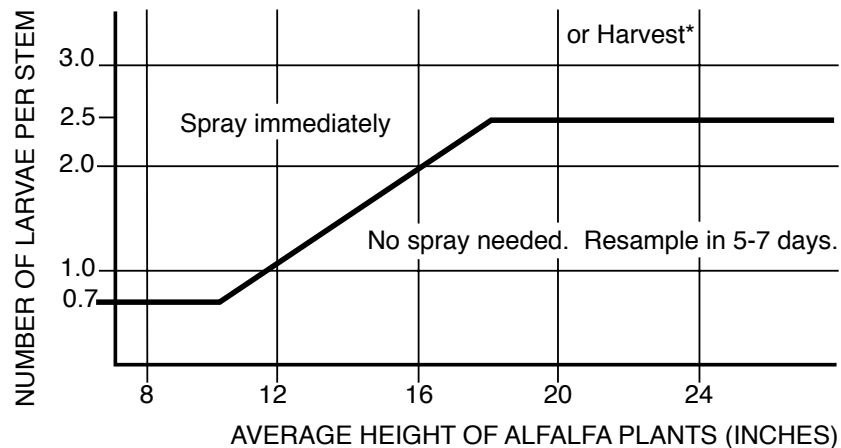
Sampling to Determine Whether Control Measures Are Needed

When the alfalfa starts growing in the spring, walk through the field at least once a week and closely inspect alfalfa tips for feeding injury. When damage and weevil larvae are observed, systematic sampling should be conducted (using the procedure described below) at least once weekly (or more frequently if weevil populations are approaching the action threshold) until the fields are sprayed, harvested, or the weevil season is over. If you are required to spray early and you use a short-residual insecticide, wait 2 to 3 weeks after spraying and resume the sampling program.

Equipment needed to sample a field includes a 3- to 5-gallon bucket, a shallow dishpan, a clipboard with pencil and paper, and tape measure or folding rule. Mentally divide the field into 6 equal sections and walk to the approximate center of the first section. Randomly pull 10 entire stems and place them, tip end first, into the bucket. Be careful to hold the bucket under each stem tip as it is pulled to catch any weevil larvae that may fall off. When the ten stems are collected, grasp them firmly by the base and shake them vigorously against the sides of the bucket for 5 to 10 seconds. As you are shaking the stems, hold the clipboard over the top of the bucket to prevent larvae from being thrown out. Pour the contents of the bucket into the shallow dishpan and count the total number of all weevil larvae.

Randomly select two of the stems from your sample and measure their lengths. Record the number of larvae and the two stem lengths on your clipboard. Walk to the approximate center of the other 5 sections of field and repeat the sampling procedure. Note: in a fairly large field (greater than 20 acres) you may wish to take a few extra samples to improve your sampling accuracy. When you have finished the field, total the larvae and stem lengths for all six sample sites. Determine the average number of larvae/stem by dividing the total by 60 (10 stems at 6 sites) and the average stem length by dividing by 12. Then refer to the decision-making chart, Fig. 4.1. Plot your average number of larvae/stem against stem height. If the point falls near or above the economic threshold line, either harvest or treat the field with a short-residual insecticide. If the point falls below the threshold line, no control measures are recommended; sample again in 5 to 7 days. More frequent sampling may be desired if population levels are approaching the threshold and daily temperatures are above 70° F. **Note: these thresholds are intended for alfalfa growing under adequate fertility and soil moisture conditions. Under drought stress conditions, when alfalfa is growing slowly, the threshold should be lowered by about 0.5 weevil per stem.**

FIG 1. Alfalfa Weevil Decision Making Chart



* If Harvested without spraying, Inspect stubble closely after hay is removed for presence of weevils and feeding damage. A stubble spray may be required.

Fig. 4.1. Decision-making chart for determining the need to apply insecticides for alfalfa weevil control. Average number of alfalfa weevil larvae (obtained from field sampling) are plotted on the vertical axis; average alfalfa stem length is plotted on the horizontal axis.

Table 4.3 - Recommended Insecticides for Control of Alfalfa Weevil

Insecticide (Formulation)	Amount active ingredient per acre	Amount product per acre	Time limits: days before harvest	Remarks
beta-cyfluthrin (Baythroid XL)	0.0125-0.022 lb	1.6-2.8 oz	hay harvest: 7 grazing: 7	RESTRICTED USE. Maximum product allowed per cutting is 3.2 oz/A. Maximum product allowed per crop season is 12.8 oz/A. Minimum application volume (water): 10 gal/A by ground, 2 gal/A by air.
carbofuran (Furadan 4F)	0.25-1 lb	0.5-2 pt	0.5 pt: 7 1 pt: 14 2 pt: 28	RESTRICTED USE. Follow label directions carefully. Apply when 50% or more of tips show weevil feeding before full-bud stage, or use IPM guidelines described above.
chlorpyrifos (Lorsban 4E)	0.5-1 lb	1-2 pt	1 pt: 14 >1 pt: 21	Some temporary yellowing may occur after application, but this will disappear within a week and not cause yield loss. Do not apply more than 4 times/year or more than once/cutting.
indoxcarb (Steward SC 1.25)	0.065-0.11 lb	6.7-11.3 oz	7	Apply no more than once per cutting. A total of 45 oz/A may be applied/season.
lambda-cyhalothrin (Karate [2.08EC]) (Warrior II [2.08EC])	0.02-0.03 lb	1.28-1.92 oz	forage harvest: 1 hay harvest: 7	RESTRICTED USE. Apply as required by scouting. Ground application: use 10 to 20 gal water/A. Aerial application: use 2 to 10 gal water/A. Apply in sufficient water for full coverage. Do not apply >0.12 pt/A/cutting. Do not apply >0.48 pt/A/season.
methomyl (Lannate LV 2.4)	0.9 lb	3 pt	7	RESTRICTED USE. Also labeled for beet armyworm.
phosmet (Imidan 50WP)	1 lb	2 lb	7	RESTRICTED USE. Follow safety precautions on label. Do not apply more than once/cutting.
permethrin (Pounce 3.2EC) (Ambush 2E)	0.1-0.2 lb 0.1-0.2 lb	4-8 oz 6.4-12.8 oz	≤0.1 lb AI/A: 0 >0.1 lb AI/A: 14	RESTRICTED USE. Do not apply more than 0.2 lb AI/A per cutting. When honey bees are foraging, apply during early morning or evening.
zeta-cypermethrin (Mustang Max [0.8EC])	0.014-0.025 lb	2.24-4.0 oz	cutting/grazing: 3 seed harvest: 7	RESTRICTED USE. Minimum 7 days between applications. Maximum 0.025 lb AI/cutting. Maximum 0.075 lb AI/season.

Note: to avoid injury to honey bees, do not apply insecticides during bloom.

Potato Leafhopper

Sampling Methods and Action Thresholds

Although several natural enemies prey upon potato leafhoppers in alfalfa, damaging levels of leafhopper are often reached, requiring insecticide application or harvest management. Leafhopper infestations are highly variable from field to field and from year to year; therefore, monitoring of individual fields is required for effective pest management decision-making. Leafhoppers are most easily sampled using a standard 15-inch diameter sweep net. At each of 6 randomly selected sites in a field, take 10 pendular sweeps with the net (swinging it back and forth in front of you) as you walk. One sweep equals one stroke of the net. After the last sweep, quickly grab the net to prevent insects from escaping. Carefully unfold the net, working your way toward the bottom. Count the number of leafhopper adults and nymphs as they emerge and leafhoppers in the bottom of the net (note: this takes a little practice to get an accurate count.). In fields with high leafhopper infestations, many leafhopper nymphs can be seen on the top and edge of the sweep net before the net is opened to examine the contents. Include these in your count. At each sample site, also measure and record the lengths of two randomly selected stems.

Record the total number of leafhoppers for all 6 sites and divide by 60 to determine the number of leafhoppers per sweep. Divide the total stem length by 12 to estimate average stem length. Then go to the Decision Making Chart shown in Fig. 4.3.

Using the Decision Making Chart

(Fig. 4.3) From the average number of leafhoppers per sweep and the average height of the plants, draw horizontal and vertical lines until they intersect. If the intersection point is above the treatment line, spray or harvest (see below) as soon as possible; if the intersection falls below the line, resample in 5 to 7 days. As can be seen from this chart, the economic threshold is variable, depending on plant height.

For example, if you collected 30 leafhoppers in 60 sweeps for an average of 0.5 leafhoppers per sweep, and your average plant height was 4 inches, spraying would be indicated by the chart. If your average plant height was 12 inches for the same leafhopper count, no spray would be indicated. Keep in mind that this decision-making chart is intended for general use, and individual fields may vary considerable in plant response to the leafhopper feeding depending on soil moisture, fertility, and cultivar.

Spray or Harvest?

Alfalfa should be harvested whenever the crop is in 10 percent or more flower regardless of leafhopper levels. Insecticidal control is most effective if applied early in the crop's growth (assuming leafhopper densities are above the economic threshold), since the spray will protect the alfalfa during the most susceptible stage of growth. As the alfalfa grows in height, the economic return on investment for insecticidal control is reduced but can still be justified if damaging population levels are present. Beyond a crop height of 14 inches, the value of insecticidal control becomes marginal, since considerable clogging of the plant's vascular tissue will have already occurred.

If plants are greater than 14 inches tall and leafhopper numbers are above the treatment threshold (see Decision-Making Chart), two management options are recommended. If the leafhopper count is above the treatment line but less than 2.3 per sweep, and the crop is showing 80 percent or more bud and less than 10 percent flower, harvest as soon as weather conditions are favorable. If the crop is not yet flowering, wait 7 to 10 days then harvest. If the leafhopper count is greater than 2.3 per sweep, harvest as soon as the alfalfa shows 25 percent bud. Harvest as soon as possible if considerable damage has already occurred.

Harvesting will remove the damaged stems and allow new growth to begin. Newly-planted fields established in the spring are often so severely stunted by potato leafhoppers that harvesting would not produce a significant amount of hay. The crop should still be clipped to remove weeds and the damaged plants.

Determining the Need for Stubble Sprays

Harvesting alfalfa has been shown to kill most potato leafhopper nymphs and many adults. The adults are highly mobile and most adult leafhoppers surviving harvest will leave the field. Even though high numbers of leafhoppers may be present in the field prior to cutting, stubble sprays are not necessarily needed to protect the next cutting. Ideally, the alfalfa should be sampled with a sweep net (as described above) about a week after harvest, or as soon as the alfalfa starts to grow back. If leafhoppers are present at levels greater than 0.4/sweep, spraying is recommended. If sampling the regrowth is not feasible, and high numbers of leafhoppers were present before harvest, a stubble spray on the regrowth may be a good protective measure, especially if

green alfalfa was left in the field following harvest. For best results, wait about 5 to 7 days after harvest, or until 4 to 6 inches of new growth has appeared.

Table 4.4 - Recommended Insecticides for Control of Potato Leafhopper

Insecticide (Formulation)	Amount active ingredient per acre	Amount product per acre	Time limits: days before harvest	Remarks
beta-cyfluthrin (Baythroid XL)	0.0065-0.0125 lb	0.8-1.6 oz	hay harvest: 7 grazing: 7	RESTRICTED USE. Maximum product allowed per cutting is 3.2 oz/A. Maximum product allowed per crop season is 12.8 oz/A. Minimum application volume (water): 10 gal/A by ground, 2 gal/A by air.
dimethoate (Dimethoate 4EC) (Cygon 400)	0.25-0.5 lb	0.5-1 pt	10	Dimethoate also will control aphids and grasshoppers. Make only one application/cutting.
carbaryl (Sevin 80S) (Sevinmol-4 [4 lb/gal])	1 lb 1 lb	1.25 lb 2 pt	7 7	Highly toxic to bees; avoid spraying weeds in bloom or alfalfa beyond 10 percent bloom.
carbofuran (Furadan 4F)	0.5-1 lb	1-2 pt	1 pt: 14 2 pt: 28	RESTRICTED USE. Follow safety precautions on the label.
chlorpyrifos (Lorsban 4E)	0.25-0.5 lb	0.5-1pt	0.5 pt: 7 1 pt: 14	Some temporary yellowing may occur after application, but this will disappear within a week and not cause yield loss. Do not apply more than 4 times/ year or more than once/cutting.
lambda-cyhalothrin (Karate [2.08EC]) (Warrior II [2.08EC])	0.015-0.025 lb	0.96-1.60 oz	forage harvest: 1 hay harvest: 7	RESTRICTED USE. Apply as required by scouting. Ground application: use 10 to 20 gal water/A. Aerial application: use 2 to 10 gal water/A. Apply in sufficient water for full coverage. Do not apply > 0.12 pt/A/cutting. Do not apply > 0.48 pt/A/season.
phosmet (Imidan 50WP)	1 lb	2 lb	7	Follow safety precautions on label. Do not apply more than once/cutting.
permethrin (Pounce 3.2EC) (Ambush 2E)	0.1-0.2 lb 0.05-0.2 lb	4-8 oz 3.2-12.8 oz	≤0.1 lb AI/A: 0 >0.1 lb AI/A: 14	RESTRICTED USE. Do not apply more than 0.2 lb AI/A/ cutting. When honey bees are foraging, apply during early morning or evening.
zeta-cypermethrin (Mustang Max [0.8EC])	0.014-0.025 lb	2.24-4.0 oz	cutting/grazing: 3 seed harvest: 7	RESTRICTED USE. Minimum 7 days between applications. Maximum 0.025 lb AI/cutting. Maximum 0.075 lb AI/season.

Note: do not wait until yellowing occurs. Materials should be used as a preventative treatment after leafhoppers first appear.

4-10 Insects: Forages: Alfalfa and Other Legumes

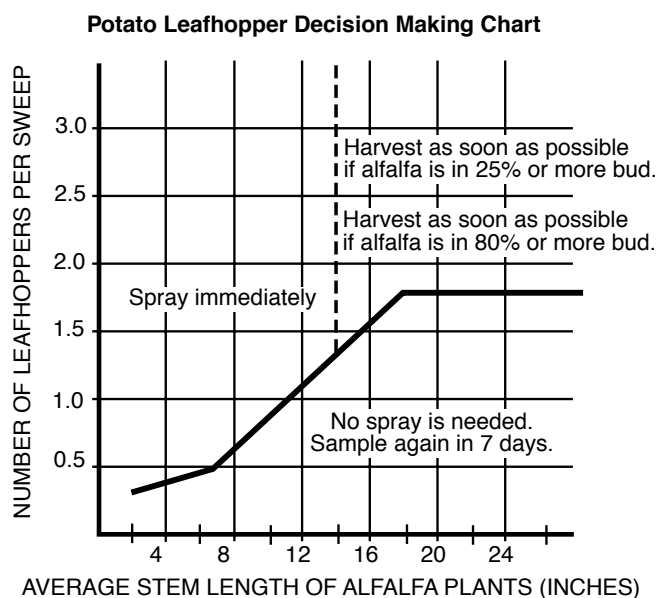


Fig. 4.3. Decision-making chart for determining the need to apply insecticides for potato leafhopper control. Average number of leafhoppers per sweep are plotted on the vertical axis; average alfalfa stem length is plotted on the horizontal axis.

Grasshopper

Table 4.5 - Grasshopper

Insecticide (Formulation)	Amount active ingredient per acre	Amount product per acre	Time limits: days before harvest	Remarks
beta-cyfluthrin (Baythroid XL)	0.0155-0.022 lb	2.0-2.8 oz	hay harvest: 7 grazing: 7	RESTRICTED USE. Maximum product allowed per cutting is 3.2 oz/A. Maximum product allowed per crop season is 12.8 oz/A. Minimum application volume (water): 10 gal/A by ground, 2 gal/A by air.
carbaryl (Sevin 80S) (Sevinmol-4 [4 lb/gal])	0.5-1.5 lb 0.5-1.5 lb	0.67-1.875 lb 0.5-1.5 qt	7	Grasshoppers usually cause problems only during drought and in new fall seedlings. Use the lower rate for nymphs on small plants or sparse vegetation. Use the higher rate for adults or applications to dense vegetation.
lambda-cyhalothrin (Karate [2.08EC]) (Warrior II [2.08EC])	0.02-0.03 lb	1.28-1.92 oz	forage harvest: 1 hay harvest: 7	RESTRICTED USE. Apply as required by scouting. Ground application: use 10 to 20 gal water/A. Aerial application: use 2 to 10 gal water/A. Apply in sufficient water for full coverage. Do not apply >0.12 pt/A/cutting. Do not apply >0.48 pt/A/season.
malathion (Malathion 8EC)	1-1.5 lb	1-1.5 pt	0	Spray may be applied by air or ground equipment. Dilute application: use 20 to 60 gal water/A. Concentrate application: use ≥5 gal water/A.
carbofuran (Furadan 4F)	0.125-0.25 lb	0.25-0.50 pt	7	RESTRICTED USE. Follow label directions closely.
zeta-cypermethrin (Mustang Max [0.8EC])	0.017-0.025 lb	2.8-4.0 oz	cutting/grazing: 3 seed harvest: 7	RESTRICTED USE. Minimum 7 days between applications. Maximum 0.025 lb AI/cutting. Maximum 0.075 lb AI/season.

Armyworm, Cutworm

Table 4.6 - Armyworm (AW), Cutworm (CW)

Insecticide (Formulation)	Amount active ingredient per acre	Amount product per acre	Time limits: days before harvest	Remarks
beta-cyfluthrin (Baythroid XL)	AW 0.0125-0.022 lb CW 0.0065-0.0125 lb	1.6-2.8 oz 0.8-1.6 oz	hay harvest: 7 grazing: 7	RESTRICTED USE. Maximum product allowed per cutting is 3.2 oz/A. Maximum product allowed per crop season is 12.8 oz/A. Minimum application volume (water): 10 gal/A by ground, 2 gal/A by air. Effective against small armyworm larvae up to 2nd instar.
carbaryl (Sevin 80S) (Sevinmol-4 [4 lb/gal])	1-1.5 lb 1-1.5 lb	1.25-1.875 lb 1-1.5 qt	7 7	Apply when insects begin to cause injury. A 5 % Sevin bait at 20 lb/A also is effective against cutworms.
lambda-cyhalothrin (Karate [2.08EC]) (Warrior II [2.08EC]) armyworm use: cutworm use:	0.02-0.03 lb 0.015-0.025 lb	1.28-1.92 oz 0.96-1.60 oz	forage harvest: 1 hay harvest: 7	RESTRICTED USE. Apply as required by scouting. Ground application: use 10 to 20 gal water/A. Aerial application: use 2 to 10 gal water/A. Apply in sufficient water for full coverage. Do not apply >0.12 pt/A/cutting. Do not apply >0.48 pt/A/season.
permethrin (Pounce 3.2EC) (Ambush 2E)	0.05-0.2 lb 0.05-0.2 lb	2-8 oz 3.2-12.8 oz	≤0.1 lb AI/A: 0 >0.1 lb AI/A: 14	RESTRICTED USE. Do not apply more than 0.2 lb AI/A/cutting. When honey bees are foraging, apply during early morning or evening.
methomyl (Lannate 1.8L) (Lannate 90WSP)	0.225 - 0.9 lb 0.225-0.9 lb	1-4 pt 0.25-1 lb	0 harvest 7 grazing/ feeding	RESTRICTED USE. Do not apply to dormant or semi- dormant alfalfa when minimum daily temp. is ≤50°F. Wait 7 days after application before grazing or feeding livestock.
zeta-cypermethrin (Mustang Max [0.8EC])	0.017-0.025 lb	2.8-4.0 oz	cutting/grazing: 3 seed harvest: 7	RESTRICTED USE. Minimum 7 days between applications. Maximum 0.025 lb AI/cutting. Maximum 0.075 lb AI/season.

Pea Aphid

Sampling/Decision Making

The need to treat for pea aphids is rare (1 year in 10) in Virginia, Maryland, and Delaware because lady bird beetles, wasp parasites, and other beneficial insects usually control this pest. The best sampling technique requires the same 15-inch sweep net used for potato leafhoppers. Ten sweeps at 10 random locations should be used to sample both the aphids and beneficials. If 50 or more aphids per sweep are collected and no beneficials are present, it is recommended that the field be cut early. Avoid spraying first crop because sprays will kill alfalfa weevil parasites.

Table 4.7 - Recommended Insecticides for Controlling Pea Aphids

Insecticide (Formulation)	Amount active ingredient per acre	Amount product per acre	Time limits: days before harvest	Remarks
beta-cyfluthrin (Baythroid XL)	0.022 lb	2.8 oz	hay harvest: 7 grazing: 7	RESTRICTED USE. Maximum product allowed per cutting is 3.2 oz/A. Maximum product allowed per crop season is 12.8 oz/A. Minimum application volume (water): 10 gal/A by ground, 2 gal/A by air.
dimethoate (Dimethoate 4EC) (Cygon 400)	0.25-0.5 lb	0.5-1 pt	10	Make only one application/ cutting.
malathion (Malathion 8EC)	1-1.5 lb	1-1.5 pt	0	RESTRICTED USE. Warm weather favors parasites and predators of aphids; thus control may not be required if the weather forecast predicts a warm trend. Spray may be applied by air or ground equipment. Dilute application: use 20 to 60 gal water/A. Concentrate application: use ≥5 gal water/A.
lambda-cyhalothrin (Karate [2.08EC]) (Warrior II [2.08EC])	0.02-0.03 lb	1.28-1.92 oz	forage harvest: 1 hay harvest: 7	RESTRICTED USE. Apply as required by scouting. Ground application: use 10 to 20 gal water/A. Aerial application: use 2 to 10 gal water/A. Apply in sufficient water for full coverage. Do not apply >0.12 pt/A/cutting. Do not apply >0.48 pt/A/season.
methomyl (Lannate 1.8L)	0.45 - 0.9 lb	2-4 pt	harvest: 0 grazing/feed- ing: 7	RESTRICTED USE. Do not apply to dormant or semi- dormant alfalfa when minimum daily temp. is ≤50°F. Wait 7 days after application before grazing or feeding livestock.
carbofuran (Furadan 4F)	0.25-1 lb	0.5 - 2 pt	0.5 pt: 7 1 pt: 14 2 pt: 28	RESTRICTED USE. Follow label directions carefully.
disulfoton (Di-Syston 15G)	1.0 lb	6.7 lb/A (broadcast)	28	RESTRICTED USE. Apply only one broadcast treat- ment, but not within 28 days of grazing or harvest. Only one application/crop/season.
permethrin (Pounce 3.2EC) (Ambush 2E)	0.05-0.2 lb 0.05-0.2 lb	2.0-8.0 oz 3.2-12.8 oz	≤0.1 lb AI/A: 0 >0.1 lb AI/A: 14	RESTRICTED USE. Do not apply more than 0.2 lb AI/A per cutting. When honey bees are foraging, apply during early morning or evening. When pea aphid densities are heavy, use maximum rate. A second appli- cation may be necessary if pest densities remain above the economic threshold.
zeta-cypermethrin (Mustang Max [0.8EC])	0.014-0.025 lb	2.24-4.0 oz	cutting/graz- ing: 3 seed harvest: 7	RESTRICTED USE. Minimum 7 days between applications. Maximum 0.025 lb AI/cutting. Maximum 0.075 lb AI/season.