



Alfalfa Weevil Control in Alfalfa

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Description

Adult - 1/4 inch long, mouth part “snout” like, brown with a dark stripe down its back (fig. 1)

Larva - up to 3/8 inch long, yellowish–green with a white stripe down the middle, black head (fig. 2)

Egg - orange, laid in clusters of 2-25 in alfalfa stems (fig.3)

Life History and Phenology

The alfalfa weevil (AW) overwinters in both the adult and egg stages. Eggs are laid in Fall and Spring in alfalfa stems. Embryo development occurs when temperatures are above 48 degrees F (fig. 3). AW lays more eggs in new growth (6-7 inch alfalfa) compared to bud stage and stubble (Dively 1970). Egg hatch occurs at around 300 degree days (base temperature 48 F), but as eggs laid in the Fall partially develop before winter, egg hatch can occur very early in the spring. Warm fall and winter temperatures can result in egg hatch in late February or early March, and economic populations as early as mid-March.

Alfalfa weevils generally have one generation per year. A weevil larva passes through four larval stages in approximately 3 weeks, then spins a cocoon on the leaves of alfalfa plants or on the ground (fig. 4). Eggs laid in the spring emerge as adults around mid-June and feed for a few weeks, but do not produce a second larval generation. Alfalfa weevil can feed on other legumes such as clovers but will prefer alfalfa for feeding and reproduction (Pellissier *et al.* 2017).

Damage

Alfalfa weevil is primarily a pest of the first cutting, but high populations at the time of the first cutting can damage the regrowth of the second cutting. Larvae feed on the tips of plants and on leaves, resulting in a skeletonized plant (fig. 5). Severe damage causes the leaves to turn gray and appear “frosted”. Damage from larval feeding results in reduced yield and quality of the first cutting, and extensive damage to the first cutting may result in season-long yield loss and reduce the life of the stand.

Adults also feed on leaves but are less likely to cause economic loss. If alfalfa is less than 12 inches tall when the weevil population peaks, fewer than 2 larvae per stem can defoliate a crop. In comparison, alfalfa greater than 18 inches tall can tolerate significantly higher populations. **Note:** overwintered egg hatch can result in highly damaging populations before alfalfa has any significant spring growth.

If fields are monitored routinely and sprayed only when economic levels are present, natural enemies may be able to suppress weevil populations below an economic level in subsequent years.

Sampling and Decision Making

Begin sampling in late February - early March and continue on a weekly basis until the first cutting. Fields should also be checked within one week of the first cutting of both larval and adult damage to the re-growth. During the first visit, examine 5-10 stems for damage and larvae. A full stem sample is not needed until damage or larvae are found on the plants. If alfalfa is less than 6 inches tall and half of

the stems exhibit signs of fresh leaf feeding damage, spray as soon as possible (Laub 2017)

If leaf feeding is present, randomly collect 30 stems throughout the field. Grasp stems at the base and place each stem upside down in a bucket. After collecting the stems, separate them into 3 or 4 bundles and beat them against the inside of the bucket to dislodge larvae from the stems. Count and record all larvae found per 30 stems. Note that small larvae may be hiding deep in stem terminals and may not dislodge. Measure 10 of the 30 stems and record the average stem height. Also, note if buds or flowers are present to determine the percentage of plants in the bud or flower stage.

If alfalfa is in the full-bud stage and economic levels are present, early harvest is an alternative to spraying. If harvest is not possible within 3 days and

populations are increasing, use a short residual insecticide. If economic levels of alfalfa weevil are present before harvest and you decide to cut instead of spray, be sure to check fields within one week of cutting for damage to the re-growth.

If temperatures remain cool after cutting, there is often not enough “stubble heat” to control populations with early cutting. In some cases, damage to re-growth can be significant. A stubble treatment will be needed if you find 2 or more weevils per stem and the population levels remain steady. Early harvesting should only be done once in the season, and subsequent cuttings should be done after 10% bloom.

Use the following tables to determine the proper threshold for the number of weevils per 30 stems.

Pure Stand Alfalfa

Value of Hay (\$/ton)	Plants 12-18 inches AND Control costs (\$/acre)				Plants 18-24 inches AND Control costs (\$/acre)				Plants 24-30 inches AND Control costs (\$/acre)			
	\$14	\$16	\$20	\$25	\$14	\$16	\$20	\$25	\$14	\$16	\$20	\$25
	\$300	32	36	47	59	35	40	51	64	37	42	53
\$320	30	34	44	55	32	38	48	61	35	40	49	62
\$340	28	32	41	52	31	36	45	57	33	37	47	58
\$360	26	30	39	49	29	34	43	54	31	35	44	55
\$380	25	28	37	47	27	32	41	51	29	33	42	52
\$400	24	27	35	44	26	30	39	49	28	32	40	50
\$420	23	26	34	42	25	29	37	47	27	30	38	47
\$440	22	25	32	40	24	28	35	45	25	29	36	45
\$460	21	23	31	39	23	26	34	43	24	28	34	43
\$480	20	22	29	37	22	25	33	41	23	26	33	41
\$500	19	22	28	36	21	24	31	40	22	25	32	40
\$520	18	21	27	34	20	23	30	38	22	24	31	38
\$540	18	20	26	33	19	23	29	37	21	24	29	37
\$560	17	19	25	32	19	22	28	36	20	23	28	36
\$580	16	19	24	31	18	21	27	34	19	22	27	34
\$600	16	18	24	30	17	20	26	33	19	21	26	33
\$620	15	17	23	29	17	20	25	32	18	21	26	32
\$640	15	17	22	28	16	19	25	31	18	20	25	31
\$660	14	16	22	27	16	18	24	31	17	19	24	30

If alfalfa is under drought stress or growing very slowly, reduce thresholds by 0.5 to 1 weevil per stem.

Mixed Stand Alfalfa

The number of weevils per 30 stems in the table below should be adjusted based on the % of alfalfa in a mixed stand. For example, if a threshold below 40 weevils, but alfalfa only comprises ¾ or 75% of the hay, divide the

threshold number by the proportion of alfalfa (ex $40 \div 0.75 = 53$ larvae per 30 stems). Weevil control is generally not justified once the proportion of alfalfa in a mixed stand is below 50%.

Value of Hay (\$/ton)	Plants 12-18 inches AND Control costs (\$/acre)				Plants 18-24 inches AND Control costs (\$/acre)				Plants 24-30 inches AND Control costs (\$/acre)			
	\$14	\$16	\$20	\$25	\$14	\$16	\$20	\$25	\$14	\$16	\$20	\$25
120	79	91	114	143	87	100	124	152	91	105	130	163
140	68	77	99	123	75	86	107	134	78	90	112	140
160	60	68	86	108	65	75	93	116	68	79	98	123
180	52	60	77	97	58	67	84	105	61	70	87	109
200	48	54	69	86	52	60	76	95	55	63	79	99
220	43	49	63	79	47	55	69	87	50	57	72	91
240	40	45	58	73	43	50	63	79	46	53	66	83
260	37	42	54	68	40	46	59	74	43	49	61	77
280	34	39	50	63	37	43	55	69	40	45	56	70
300	32	36	47	58	35	40	51	64	37	42	53	67
320	30	34	44	55	33	38	48	61	35	40	49	62
340	28	32	41	51	31	36	45	57	33	37	46	58
360	26	30	39	49	29	34	43	54	31	35	44	55
380	25	28	37	46	27	32	41	52	29	33	42	53
400	24	27	35	45	26	30	39	49	28	32	39	49

Scout again one to two weeks after an insecticide application, as spring-laid eggs and late pupae may have avoided contact with the application and emerged afterward, requiring a second application.

Chemical Control

Once thresholds have been exceeded, pay attention to weather conditions before and after an application. Delay application a couple of days after cold or freezing weather to allow weevils time to warm up and resume activity and come into contact with insecticide residue. Weevil activity resumes once temperatures are in the high 40s.

Insecticides Labeled for Alfalfa Weevil								
Product	MOA Group	Active Ingredient	Amount product per acre	PHI Days	REI (hrs)	Remarks	Parasitoid/pollinator toxicity	
Carbaryl 4L	1A	Carbaryl	1.5 qt	7	12	CAUTION May cause temporary, non yield-limiting bleaching, does not control adults. DO NOT apply more than once per cutting	L-H/H	
Lannate LV	1A	Methomyl	3.0 pt.	7	48	DANGER Do not apply when temps >50F	H/H	
Imidan 70-W	1B	Phosmet	1.0 to 1.3 lb	7	120	WARNING, DO NOT apply more than once per cutting, Do not use stickers, extenders or latex, pineolene based adjuvant		
Fastac EC	3	Alpha-cypermethrin	2.2 to 3.8 fl. oz.	Cutting/ grazing: 3 Seed:7	12	DANGER DO NOT apply more than once per cutting		
Baythroid XL	3	Beta-cyfluthrin	1.6 to 2.8 fl. oz.	7	12	WARNING	H/H	
Tombstone 2EC	3	Cyfluthrin	1.6 to 2.8 fl. oz.	7	12	DANGER		

Declare	3	Gamma-cyhalothrin	1.02 to 1.54 fl. oz.	Forage harvest: 1 Hay harvest: 7	24	CAUTION DO NOT apply more than once per cutting	
Warrior II or OLF	3	Lambda-cyhalothrin	1.28 to 1.92 fl. oz.	Forage harvest: 1 Hay harvest: 7	24	WARNING; DO NOT apply more than once per cutting	H/H
Pounce 25WP or OLF	3	Permethrin	6.4 to 12.8 fl. oz.	≤ 0.1 lb. AI/A (6.4 oz): 0d > 0.1 lb. AI/A: 14d	12	CAUTION; A maximum of 12.8 fl oz may be applied per cutting DO NOT apply to mixed forage	H/H
Mustang Maxx	3	Zeta-cypermethrin	2.24 to 4.0 fl. oz.	3	12	WARNING	M/H
Steward EC	22	Indoxacarb	6.7 to 11.3 fl. oz.	7	12	GENERAL USE; A maximum of 11.3 fl oz may be applied per cutting	L/H
Malathion 57 EC	1B	Malathion	2.0 pt/A	0	12	GENERAL USE	H/H

The label is the law. Always consult product label for most up to date application guidance. Check EPA bulletins for live changes to product restrictions.

Natural enemy and pollinator impact based on University of California IPM:

<https://ipm.ucanr.edu/agriculture/alfalfa/relative-toxicities-of-insecticides-and-miticides-used-in-alfalfa-to-natural-enemies-and-honey-bees/#gsc.tab=0>.

Insecticides not rated are generally assumed to have high impact to both natural enemies and pollinators.

When populations are well over threshold Steward is recommended to bring populations back under control. Results of successful control should be apparent by a drop in population 5 days after treatment. Steward has been the most consistent product tested in UD spray trials, many of which can be found at

<https://www.udel.edu/academics/colleges/canr/cooperative-extension/sustainable-production/pest-management/insect-management-reports/>. Please note

that often winter annual weeds are highly attractive to pollinators and thus there may be considerable pollinator and beneficial insect activity present in a field at the time of application. Use lower impact

insecticides if possible and treat late in the day or evening if possible to reduce impact on beneficials.

Biological Control

Alfalfa weevils are the target of several braconid parasitoids in the genus *Bathyplectes* (introduced in 1911), which form distinctive football-shaped cocoons with a lateral white band. Weevil larvae are preyed upon by generalist predators such as lady beetles, lacewings, and damsel bugs, but these predators may opt to feed on aphids instead of weevils if present (Pellissier 2017). The most successful *Bathyplectes* species, *B. anurus*, requires approximately 21-25 days to complete larval development (Bartell and Pass 1980).

Wasps oviposit primarily in 2nd and 3rd instar weevil larvae. These wasps are generally believed to keep AW in check in large areas of the Eastern United States. Parasitoid peak emergence from overwintered cocoons occurs between 350-400 degree days, approximately when alfalfa is 10-15 inches high (Eklund and Simpson 1977, Barney 1977). Recent AW outbreaks on Delmarva begs the question if

overwintered late-winter larval hatch occurs before parasitoid activity resumes in spring (hypothesized by Kuhar et al. 1999 in Virginia) or if current insecticide use patterns suppress parasitoids more currently than previously.

Under certain conditions, a fungal pathogen, *Zoophthora phytonomi*, can destroy a large portion of AW larvae which may reduce AW pressure in the following year (figure 6). Other parasitoids were introduced, targeting eggs, larvae, and adults (Cornell Biological Control).



Figure 1. Alfalfa Weevil Adult



Figure 2. Alfalfa Weevil Larva



Figure 3. Alfalfa Weevil Eggs



Figure 4. Alfalfa Weevil Cocoon

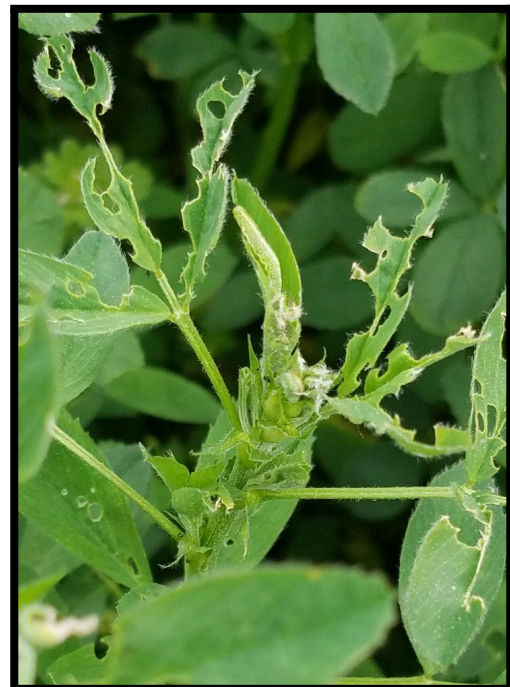


Figure 5. Alfalfa Weevil Damage



Figure 6. A pair of fungal-infected alfalfa weevil larvae, April 24, 2024, Georgetown, DE.

References

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