

WEEVIL AND WORM MANAGEMENT FOR LOW DESERT  
ALFALFA PRODUCTION

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WEEVILS

Alfalfa Weevil

Two species of alfalfa weevil exist in California and Arizona, the alfalfa weevil Hypera postica and the Egyptian alfalfa weevil Hypera brunneipennis. These two species are indistinguishable morphologically, and only the Egyptian alfalfa weevil is of economic importance to alfalfa hay production in the low deserts. The Egyptian alfalfa weevil was first discovered in Arizona and southern California in 1939, but did not cause serious damage to alfalfa in this region until 1952 when it seriously damaged several fields in the Imperial Valley of California.

Egyptian alfalfa weevil was controlled with insecticides (primarily parathion) in the 1950's and early 60's. This practice led to outbreaks of secondary pest problems, such as resistant alfalfa aphids. Along with the adverse effect of parathion on parasites and predators releasing secondary pests, it was also deleterious to honey bees. Unfortunately there has been little progress made in non-insecticidal controls for Egyptian alfalfa weevil over the nearly 50 years it has plagued California and Arizona alfalfa production. Although numerous exotic parasites have been released and extensive plant breeding programs have been conducted to develop cultivars resistant to the pest there has been only limited success and pesticides remain as the only tool to reduce economically heavy infestations within alfalfa fields.

Adult Egyptian alfalfa weevil cause little direct damage, but larval feeding can cause severe damage making weevil control a key economic element of a pest control program in the low deserts during late January through early April. Weevil adults become active in October or November when night temperatures begin to fall below 42°F. The adults then leave their summer aestivation sites and begin to migrate to alfalfa fields to feed, mate and lay eggs. Females chew holes in stems and eggs are deposited into a pithy center of the stems. The yellow eggs are smooth and shiny and may be found in live or dead stems. Eggs hatch in 5-10 days. Tiny yellowish green larvae crawl to the terminal growth of stems and feed in the area of the terminal bud where they are often hidden by the unfurled developing young leaves. As larvae grow they become darker green and are characterized by a white stripe extending from the dark brown head capsule down the back. Larval development is usually completed in 3 to 4 weeks. Full-grown larvae, which are about 3/8 inch long, stop feeding drop to the ground and spin a round, coarsely woven white cocoon for pupation.

The duration of the pupal stage lasts about 10 days to several weeks. Newly emerged adults are light brown with dark brown and grey markings on their backs. After feeding for 2 to 4 weeks adults seek sites outside of alfalfa fields to aestivate, usually in wind breaks, buildings, or other protected areas. The adults are then inactive until temperatures again fall below 42°F to begin another generation. In the Imperial Valley of California aestivation usually lasts from June to November.

Two kinds of damage are caused by alfalfa weevils: 1. defoliation caused by third and fourth instar larvae often referred to as skeletonization, and 2. stunting caused by first and second instar larvae feeding between the terminal growth and young leaves as well as feeding by older larvae. Skeletonizing reduces yield and the photosynthetic capacity of the plant. Heavily weevil damaged hay is a lower quality stemmy product. Adult feeding is of little economic significance but is characterized by scarring on the stems.

When a heavy weevil population is present or hay lies in windrows for several days severe damage to regrowth may occur. The feeding under windrows retards regrowth.

Alfalfa fields should be monitored for Egyptian alfalfa weevil larvae from January through April using a standard sweep net. Check fields every 2 to 4 days after weevil larvae begin to appear. Divide fields into 4 sections and take 5 sweep samples in each section. Fields 80 acres and larger may require more sectioning. Average the weevil

larval counts for all samples in the field. Fields with average counts of 20 or more larvae per sweep need an insecticide treatment. If the crop is nearing harvest and weevil populations are approaching damaging levels early harvest is an option many growers choose over insecticide treatment. This option will minimize the killing of beneficial insects including predators and parasites of aphids, but is not always economically practical. In the Imperial Valley weevil and aphid populations are present during the same growing period between cuttings. Often when one pest reaches an economically damaging level and the other pest species is nearing damaging levels and two insecticides will be used, one insecticide selective for each pest species.

Vigorous relatively weed-free stands can tolerate more weevils per sweep than a weedy or sparse stand of alfalfa. Reliable population estimates can not be made from sweeping young plants or stubble following cutting. If weevil feeding is stunting hay an insecticide treatment is needed. When hay with an economically damaging population is cut a combination swather-sprayer may be used at harvest time. The equipment should treat a 40 inch band of stubble just under the swath and before the swath or windrow is dropped.

Not every field in the low deserts requires a treatment for Egyptian alfalfa weevil each year. Fields developing economically damaging weevil populations can usually be controlled with a single insecticide treatment and will not usually require further treatment in subsequent cuttings for that year.

UNIVERSITY OF CALIFORNIA IPM TREATMENT GUIDELINES ARE AS FOLLOWS

ALFALFA WEEVIL AND EGYPTIAN ALFALFA WEEVIL

Pesticide (Commercial name)	Amount to Use (dosage/acre)	P.H.I.+ (days)	Comment
A. CARBOFURAN * <sup>^</sup> (Furadan) Flowable	0.5 pt (1 pt)	7 14	If larval numbers exceed 20 per sweep, 4 or more weeks before the expected date of harvest, increase carbofuran rate to 1 pt. Carbofuran will also kill aphids. Do not apply more than 2 times per season. Follow plant-back restrictions on label.
...OR...			
B. PHOSMET <sup>^</sup> (Imidan)WP	1.5 lb	14	Phosmet is less toxic to natural enemies than the other materials listed here. It is not effective on aphids. Do not apply more than once per cutting.
...OR...			
C. CHLORPYRIFOS <sup>^</sup> (Lorsban)4EC	1 TO 2 PT	14 FOR 1 pt 21 for >1 pt	Will also kill aphids. Do not make more than 4 applications per year.

...OR...				
D. MALATHION SEC <sup>^</sup>	1.5 to 2 pt	5		Use only when carbofuran, phosmet, or methoxychlor cannot be used. Where populations of 10 to 15 larvae per sweep are present at the time of cutting, malathion 1.5 pt per acre can be applied as an under-the-windrow treatment. This treatment reduces the larval population as it filters down to the stubble from windrowed alfalfa. Thus, feeding damage to new regrowth is reduced and the alfalfa's vigor is preserved. Under-the-windrow treatment requires mounting a spray unit on the swathing machine.
...OR...				
E. METHOXYCHLOR EC	2 qt	7		
...OR...				
F. METHOXYCHLOR EC* <sup>^</sup>	1 TO 2 PT	14		Will also control aphids.

**WARNING!**

ETHYL and METHYL PARATHION\* formulations have been evaluated for control of pea aphid, blue alfalfa aphid, and for both alfalfa and Egyptian alfalfa weevil larvae. The materials are registered for use and are effective against these pests. They are NOT recommended for use against them at the time of the first cutting because of the potential hazard of excessive pesticide residues. Penncap-M, and encapsulated formulation of methyl parathion\*, has also proved effective against early-season aphid and weevil populations: however, this formulation is NOT recommended because of its hazard to honey bees.

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- \* Permit required from Co. Agr. Commissioner for purchase or use.
  - <sup>^</sup> Do not apply when bees are present.
  - + Pre-harvest interval. Do not graze or cut hay within this many days of application

Clover Root Curclio

The clover root curculio Sitona hispidula is a beetle which in the adult stage is occasionally mistaken for alfalfa weevil. Little is known about the damage potential of this insect. Adult weevils are small grey-brown beetles with a blunt snout dissimilar from alfalfa weevils which have long snouts. The adults feed on foliage and stems but do not cause economic damage. The larvae are grubs which feed on roots, but are not known to cause serious economic damage.

## WORMS

### Alfalfa Caterpillar

The alfalfa caterpillar Colias eurytheme is a spring and summer pest in the low desert alfalfa production areas of Arizona and California. The adults, alfalfa butterflies, are often abundant during summer months, and migrate in mass from alfalfa fields close to harvest, or those being harvested, to alfalfa stands which have just begun regrowth after a cutting. This pest can seriously damage or completely defoliate a hay field if it is not controlled.

The adult alfalfa butterfly is yellow with black markings at outer wing margins. Males are distinguished from females by their slightly smaller size and by the solid black border on the upper, outer surface of the wings. In females the border is broken by spots of the base color of the wings, usually yellow, but varying from white to orange.

The behavior and biology of the alfalfa caterpillar is very interesting and it is important to understand this before an attempt is made to initiate control measures. The female alfalfa butterfly seeks out short (usually 6 inches or less) alfalfa upon which to lay her eggs. The small, white cigar-shaped eggs are laid singly on the upper surface of the leaves. Within 3 to 5 days the eggs hatch and the small velvety-green larvae begin feeding on the alfalfa leaves. When the worms are small, the injury appears as small circular holes in the alfalfa leaflets. As the worms grow larger whole leaves are eaten to the point that only bare stems may be left.

The larvae complete their development in 10 days to 2 weeks and then pupate. The pupa of the alfalfa butterfly is called a chrysalis and is attached to the alfalfa stem. After about a week the chrysalis splits open and the adult butterfly emerges. Mating takes place soon after emergence and the females leave the field to find short alfalfa where they lay eggs. Newly laid alfalfa butterfly eggs are pearly white and look like tiny cigars standing on end on the upper sides of the alfalfa leaves. Large numbers of butterflies flying over short alfalfa is an indication of a potential worm problem in that field within ten days. Large numbers of butterflies flying over tall alfalfa are not a threat to that field. Adults flying over tall alfalfa generally have recently emerged from the pupal stage having already passed through the damaging larval stage.

Frequently large numbers of eggs are laid on alfalfa, but a damaging worm population does not develop. This situation usually results from the activity of parasites. A minute wasp, Trichogramma, parasitizes the alfalfa butterfly eggs. Eggs which are ready to hatch are a greyish color. Parasitized eggs are shiny black. Watching the eggs for a few days following a flight of butterflies and observing the percentage of parasitized eggs is helpful in monitoring for worm problems.

Another important parasite is Apanteles, a dark brown to black wasp about 1/4 inch long. The female wasp stings the very small alfalfa caterpillar and lays an egg inside. The egg hatches and the wasp larva consumes the body contents of the caterpillar. A parasitized caterpillar dies before it reached 1/2 inch in length. A parasitized caterpillar is recognized by being lighter than normal in color, somewhat shiny rather than velvety on the surface and swollen toward the rear. By pulling off the head of the caterpillar and squeezing out the body contents, the small shiny, white parasite larva can be seen.

Insecticide treatment for alfalfa caterpillar are warranted when the hay is more than one week from a normal cutting and the larval count averages 10 non-parasitized worms or more per sweep using a standard insect net. Treatments within a week of normal cutting will not pay as the tonnage gained will not be enough to offset the cost of the insecticide. It is better to cut such a field a little early, rather than with insecticide. A biological insecticide Bacillus thuringiensis, is effective for control of the alfalfa caterpillar and will not harm the beneficial insects.

UNIVERSITY OF CALIFORNIA IPM TREATMENT GUIDELINES ARE AS FOLLOWS

ALFALFA CATERPILLAR

Pesticide (commercial name)	Amount to Use (dosage/acre)	P.H.I. (days)	Comment
A. BACILLUS THURINGIENSIS (Dipel, Thuricide)	label rates	0	Bacillus will give satisfactory control of the alfalfa caterpillar, does not affect beneficial species, and leaves no undesirable residue on the hay. Upon ingesting Bacillus the caterpillar cease feeding but may remain on plants three to four days before dying. This treatment will not control beet armyworm.
...OR...			
B. TRICHLORFON (Dylox) 80 sp	4 OZ	1	Preferred over other chemicals (except Bacillus) because of low toxicity to natural enemies. USE IMMEDIATELY AFTER MIXING.

Armyworms

Two important worm pests of alfalfa hay production in the low deserts are the beet armyworm *Spodoptera exigua* and the western yellowstriped armyworm, *S. praefica*. Although these two pests are somewhat different in appearance similarities include damage symptoms life cycle and managed procedures. These pests exist throughout the year in southern California, but are generally most abundant from June through September. An unusual warm spring or fall may extend the period when control measures are likely to be implemented.

Female beet armyworm deposit masses of pink to pale green eggs on upper or lower surfaced of leaves usually near terminal growth. The eggs are covered with hair-like scales from the female moth. These scales are white for beet armyworm and grey for western yellowstriped armyworm. Under hot summer conditions eggs hatch within a few days and larvae grow rapidly reaching their full size in 2 to 3 weeks, after which they pupate on the surface or within the soil. There are 5 or more generations per year in the low deserts.

Beet armyworm larvae range in color from olive green to bright green to purplish green, and larvae have a pale yellow stripe down each side. The beet armyworm has a smooth skin unlike the alfalfa caterpillar which is velvety. The larvae of beet armyworm have a black spot just above each of the spiracle on the second thoracic segment. The western yellowstriped armyworm caterpillar is usually black with two prominent orange yellow stripes and many narrow striped down each side. In addition there is a black spot on each side of the first legless segment.

Young larvae of both beet armyworm and western yellowstriped armyworm skeletonize leaves in the area of the egg mass and then disperse to other parts of the plants. The skeletonization of leaves where the veins remain intact readily distinguishes beet armyworm damage from alfalfa caterpillar which consume leaves vein and all. Egyptian

alfalfa weevi also skeletonize leaves, but are present in the winter rather than summer months.

Preservation of natural enemies provide good control of armyworms in most locations. Predacious bugs, spiders and lacewings feed on larvae. An important wasp parasite Hyposoter exigua is the most important parasites for armyworm control. Virus diseases are also important naturally occurring control agents. When diseased worms appear in the field an epidemic may soon reduce a potentially damaging population to sub-economic levels.

Fields should be monitored weekly from June through September and 2-3 times per week when heavy populations begin to build to economically damaging levels. Avoiding the use of insecticides whenever possible will help preserve predators and parasites. Skeletonized leaves of the apical stems from feeding of young larvae indicate that armyworm problems may soon develop. Larger larvae can be checked for parasitism. Monitoring larval populations for dead limp larvae hanging from foliage which readily liquify when disturbed indicate the possible onset of an epizootic viral disease.

Worms should be monitored by making 5 sweep counts at each of 4 to 5 locations in a field. Implement control measures when there are 15 or more nonparasitized 1/2 inch or larger armyworm larvae per sweep. Harvesting early is the best control when infestations appear late in the cutting cycle.

UNIVERSITY OF CALIFORNIA IPM TREATMENT GUIDELINES ARE AS FOLLOWS

Beet Armyworm

Pesticide (commercial name)	Amount to Use (dosage/acre)	P.H.I.+ (days)	Comment
A. METHOMYL* <sup>A</sup>		7	
(Lannate) WP	0.5 lb		
(Nudrin) WSP	0.5 lb		
(Nudrin) EC	2 pt		
...OR...			
B. METHYL PARATHION EC* <sup>A</sup>			
5 Miscible	8 oz	15	Will also control alfalfa caterpillar and western yellow- striped armyworm.

UNIVERSITY OF CALIFORNIA IPM TREATMENT GUIDELINES ARE AS FOLLOWS

Western Yellow-Striped Armyworm

Pesticide (commercial)	Amount to Use (dosage/acre)	P.H.I.+ (days)	Comment
A. TRICHLORFON (Dylox) 80SP	10 oz	1	USE IMMEDIATELY AFTER MIXING.
...OR...			
B. CARBARYL * <sup>A</sup>	1.25 TO 2 LB	3	

\* Permit required from Co. Agr. Commissioner for purchase or use.

<sup>A</sup> Do not apply when bees are present.

+ Pre-harvest interval. Do not graze or cut hay within this many days of application.

Cutworms

The variegated cutworm, Peridroma saucia and other species are occasional pests of seedling alfalfa and less frequently of mature stands. Cutworms can become particularly damaging and difficult to control when alfalfa is planted on beds rather than flat planted. Cut worms are most commonly a problem in the fall or spring.

Female cutworm moths lay white to gray eggs in irregular masses on leaves, plant stems, and other convenient places. Larvae grow to be 1 1/2 to 2 inches in length and cause damage by general feeding on stems, leaves, and new shoots. Cutworm larvae characteristically curl into a C-shape when disturbed. The caterpillars are yellow to brown with a row of 4 to 6 dull yellow or pink diamond-shaped spots down the back. They pupate in the soil and in the low desert there are 3 or more generations per year.

When severe infestations occur on flat planted seedling alfalfa or a mature stand with short regrowth after cutting, irrigation will usually provide adequate control. When alfalfa is planted on beds, as are many fields in the Imperial Valley of California, irrigation will not be efficacious in reducing cutworm populations. Insecticides registered for use on cutworms in alfalfa should be applied late evening or at night due to the nocturnal habits of the pest. Bait on bran with banana oil is attractive to cutworms and should be applied at night when cutworms are feeding on the plants as larvae hide under duff, just beneath loose soil, or in cracks during daylight hours.

Cutworms will clip the tops of young seedling and are capable of holding back regrowth of a mature stand when populations are heavy. Tillage is effective in limiting cutworm populations as is good weed control, especially around field margins.

UNIVERSITY OF CALIFORNIA TREATMENT GUIDELINES ARE AS FOLLOWS

Variegated and Other Cutworms

Pesticide (commercial name)	Amount to Use (dosage/acre)	P.H.I.+ (days)	Comment
A. CARBARYL* <sup>4</sup> (Sevin) Bait 5%	30 lb	3	Bait should be applied in late evening or at night.
...OR...			
B. TRICHLORFON (Dylox) Bait 5%	20 lb	14	Baits should be applied in late evening or at night when cutworms are on plants--during daylight hours the worms hide in soil, in cracks, and under trash.
...OR...			
C. TRICHLORFON (Dylox) 80SP	20 oz	1	USE IMMEDIATELY AFTER MIXING.