

AGRICULTURAL GUIDE

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Insect control
in alfalfa

Controlling the alfalfa weevil—1984

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Alfalfa weevil larvae caused moderate to heavy damage in 1983 to the first cutting of alfalfa over the entire state. Adults and late developing larvae also caused some heavy damage to regrowth following removal of the first cutting over much of the state. Alfalfa acreage in Missouri is now about 600,000 acres.

Effective, economical control of the alfalfa weevil may be difficult during some seasons, but it can be accomplished by following a schedule of cultural practices and properly timed use of insecticidal sprays. Gradually increasing natural controls are afforded by biological agents.

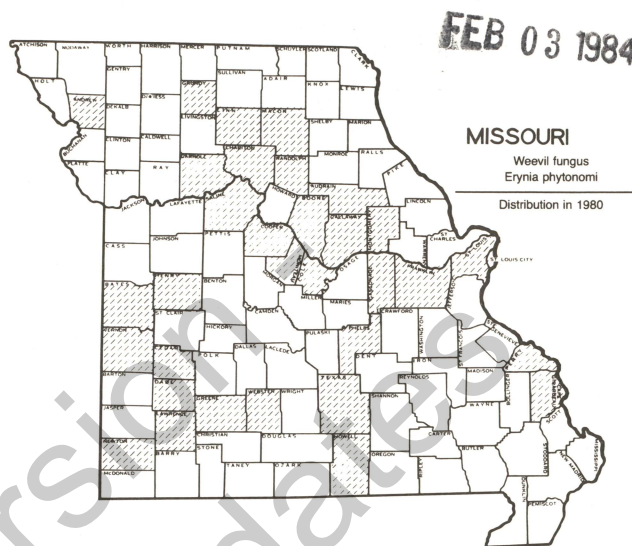
Plants attacked

Alfalfa is the primary and favored host plant for the alfalfa weevil. In addition to alfalfa, larvae and/or adults have been taken from hairy vetch, sweet clover, red clover, ladino clover, and white or Dutch clovers.

Life cycle and damage

There are four stages in the life cycle of the alfalfa weevil—egg, larva, pupa and adult. Normally, there is only one complete generation a year, but occasionally some fall-laid eggs may hatch during extended warm periods in fall months. Some of these larvae may complete growth and development in southern counties of the state, depending on the weather.

The alfalfa weevil overwinters as an adult in alfalfa fields and as eggs within dead alfalfa stems. The overwintering eggs begin hatching in late February and March or about the time alfalfa begins growing in the southern counties. Adult weevils return to alfalfa fields in the fall to overwinter. These adults start laying eggs upon their return and may continue egg deposition throughout the winter during extended warm periods. In spring, egg laying is resumed or continued.



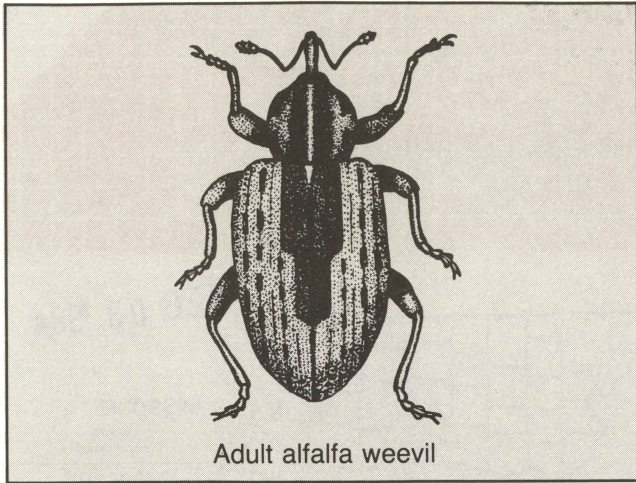
Fungus disease may help control alfalfa weevil larvae.
See the section on weevil disease on page 3.

Overwintering eggs will hatch before those laid in the spring. The very small, yellowish-green larvae with shiny black heads crawl from inside the stem to the growing terminal where they begin feeding. After several days of feeding, the larvae become light green in color with a white stripe down the middle of the back. When full grown, the larvae are about $\frac{3}{8}$ inch long.

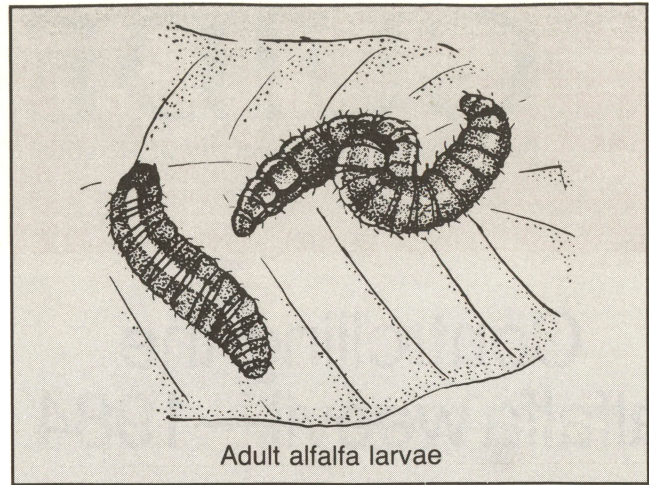
The larvae feed for three to four weeks, gradually working their way from the terminals to newly opened leaves and then onto older foliage. This feeding consists mainly of eating the green from the leaf surface and leaving a skeletonized, grayish-white leaflet. As few as two larvae may defoliate a stem completely and kill the growing terminal.

Once the larval feeding and growth period is complete, each larva spins a thin, net-like cocoon which is attached to the lower leaflets, the stem, or most usually to the debris on the soil surface. The larvae change into the pupal stage within these cocoons. Adult weevils emerge in a week to 10 days. Newly emerged adults are light reddish-brown with a darker brown stripe down the middle of the back and are about $\frac{1}{4}$ inch long. As the adults age, they assume a darker brown color, and the stripe also becomes darker brown to black.

By the time the first cutting is ready for harvest, eggs, larvae, pupal cocoons, and old and new adult weevils are usually present. After hay removal, the remaining larvae and adults will continue feeding on stubble and especially on new growth. This feeding on



Adult alfalfa weevil



Adult alfalfa larvae

new growth may delay the second cutting from one to three weeks, and some of the weaker, more heavily damaged plants may die. Later cuttings are not usually damaged by the alfalfa weevil, although some larvae may be found on alfalfa during early fall months and feeding injury may be noticeable.

Newly emerged adult weevils will feed on alfalfa for a few days up to several weeks, depending upon food availability and temperatures. Cooler temperatures prolong this adult feeding while higher temperatures force the weevils into summer estivation. Most of these adult weevils leave the alfalfa fields by flight in June. These adults enter surrounding vegetation where they remain inactive during the summer, but they move back into alfalfa in late summer and fall to resume feeding and begin egg laying.

Control measures

Alfalfa weevil control can be costly and time consuming because of the long period of egg hatch, the long period of larval feeding on first cutting, and larval and adult feeding on new growth following the removal of first cutting. Good management practices and natural and/or biological controls are helpful but cannot be relied upon to control this pest effectively every spring.

A spray program may be necessary over the entire state since the weevil is now present in every county. The insecticides presently registered and recommended are affected adversely by cool temperatures, and all have short to moderately short residual activity. Therefore, under Missouri conditions, at least one spray may be needed on the first cutting growth. Also, you should harvest the first cutting as early as possible. A stubble spray following removal of the first cutting may be needed in some areas or during some seasons to prevent excessive regrowth injury.

Crop management practices

The proper time to cut alfalfa for best results in terms of quality, quantity and overall health of the plant is when it reaches the $\frac{1}{10}$ bloom stage.

While it may be desirable to cut alfalfa in the bud stage to control the alfalfa weevil, such early cutting may result in extremely slow regrowth, and/or complete loss of the stand unless the alfalfa is in a healthy, vigorous condition. In areas where the alfalfa weevil is a problem and early cutting is a possibility, it is important that (1) the alfalfa not be harvested after September 15 in the previous fall and (2) that fertilizer such as 0-40-200 be applied during the late summer or early fall months. These management practices are necessary for winter survival and for vigorous alfalfa plants the following spring.

Alfalfa fields that have suffered stress from winter injury, heaving, lack of fertilizer the previous fall, or late cutting, should not be cut in the bud stage. These alfalfa plants should be treated with a properly timed application of insecticide to control the weevil and be permitted to stand until they have reached the $\frac{1}{2}$ bloom stage. At this point the root reserves are replenished so that the alfalfa plant will regrow adequately.

Cleanly cut all first cutting alfalfa and mow as close to ground level as possible. The closeness of mowing must be based on the height of crowns and amount of winter heaving. Remove the hay crop from the field as rapidly as possible. Some of the larvae, pupae and adult weevils will be destroyed by lack of food and exposure to sunlight and various predators. Return to the field in four or five days after cutting to determine whether weevils are still present and actively feeding.

Beneficial insects

At least one parasitic wasp moved into Missouri along with the alfalfa weevil and has state-wide distribution. These tiny wasps, known as *Bathyplectes curculionis*, inject their eggs into young weevil larvae. The egg hatches and the larval parasite feeds inside the host and reaches its cocoon stage at the same time as the weevil. As the weevil larva spins its cocoon to transform into the pupa, the parasite emerges, killing the host. Therefore, practical results in reducing populations of weevils occur the next year because the parasitized larvae continue to feed during their existence but produce no adults.

1984 Alfalfa Weevil Insecticide Recommendation Chart

Insecticide	Formulation	Actual rate of insecticide per acre	Rate of formulation per acre	Required preharvest interval (days)	Possible length of control (days)
carbofuran (RU) (Furadan)	4F. 4 lb. per gallon	0.25 lb.	½ pt.	7	7-10
		0.5 lb.	1 pt.	14	12-14
		1.00 lb.	2 pts.	28	21-24
methomyl (RU) (Lannate-Nudrin)	1.8L 1.8 lb. per gallon	0.9 lb.	2 qts.	7	7
		0.45 lb.	1 qt.	7	3-5
methomyl (Lannate-Nudrin)	90S 90% soluble powder	0.9 lb.	1.0 lb.	7	7
		0.45 lb.	0.5 lb.	7	3-5
methyl (RU) parathion	25% or 44% EC	0.5 lb.	1 qt. or 1 pt.	15	12-14
Pennacap M (RU) (encapsulated methyl parathion)	Encap 2 lb.	0.5 lb.	2 pts.	15	15
diazinon + methoxychlor (Alfa-tox)	EC 2.4 lb. per gallon 10% diazinon 20% methoxy- chlor	0.4 + 0.8 lb.	2 qts.	7	8-10
		0.6 + 1.2 lbs.	3 qts.	10	10
phosmet (Imidan)	50-WP 50% wettable powder	1.0 lb.	2 lbs.	7	14
malathion	57% EC	1.25 lbs.	1 qt.	0	3-5
malathion + methoxychlor	22% EC	1 + 1 lbs.	2 qts.	7	10-14
		1.5 + 1.5 lbs.	3 qts.	7	12-16
methidathion (RU) (Supracide)	2E 2 lb. per gallon	0.5 lb.	2 pts.	10	12-14
		1.0 lb.	4 pts.	10	21
chlorpyrifos (Lorsban)	4E 4 lb. per gallon	0.5 lb.	1 pt.	14	14
		1.0 lb.	2 pts.	21	20

*Any insecticide followed by RU (Restricted Use) means that all or some uses of this product have been restricted by the Environmental Protection Agency. Any applicator must be certified and licensed before purchasing restricted use products.

Weevil populations having more than 50 percent of the larvae parasitized have been found in Missouri, but the average parasitism within the more heavily infested areas of the state is close to 15 to 20 percent. This type of attrition, coupled with sound control and management, could reduce the overall problem greatly. Most insecticides are toxic to these wasps; however, well-timed spray applications have minimal impact on the parasites.

Other parasites have been imported and initial releases made in Missouri. One of these is another parasitic wasp which attacks the adult weevils in much the same manner as *Bathyplectes*. Some of these parasites have become established and are being moved around the state.

Weevil disease

A fungus disease of the alfalfa weevil is present in many parts of the state (see map for known distribution). The disease organism is quite likely present state-wide. Reductions in the number of alfalfa weevil larvae as a result of this disease are often quite dramatic, but they usually occur after the alfalfa has been seriously damaged (around May 20 in central Missouri). Before treating this season, consider

- the nearness of harvest,
- accepting some additional feeding if the numbers of larva per stem average one or less, and
- whether the weevils present appear abnormal and sluggish, perhaps discolored by disease. (Cool, wet weather can also make them sluggish.)

Missouri insect control recommendations are revised annually and are subject to possible change during the growing season. Therefore, this guide is intended for use during the 1984 season only.

Insecticidal control

Results of demonstrations indicate that one properly timed spray application of most of the recommended insecticides, followed by timely harvest, will give 75 to 100 percent weevil control and result in fair to good quality hay. More than one application will be likely required when malathion is used for short-term protection.

A stubble spray following removal of the first cutting may also be needed in some areas or during some seasons so that new growth may recover quickly without extensive damage by larval and adult feeding. During those seasons in which the overwintering egg hatch begins early and population pressure is high, two spray applications to the first cutting may be needed. The producer must decide this by frequently observing the infestation and damage.

Insecticidal control of the alfalfa weevil is timed for and used against the larval stage. Therefore, most of the recommended insecticides and dosages will not give acceptable control of heavy numbers of newly emerging adults on regrowth following first cutting.

When to spray

The first application should be made when 25-30 percent of the plant terminals (growing tips or buds) show feeding injury **and** the beginning of leaf skeletonizing on a few of the fully expanded leaflets in the top third of the plants. See the section on weevil disease on page 3 for additional considerations. This should occur about April 1 to 15 in the extreme southeastern counties, about one week later over the southern third, about two weeks later over the central third, and about three weeks later over the northern third of the state. Should heavy feeding damage reoccur and the first cutting is not ready or cannot be harvested, make a second spray application in 10-14 days or as needed. (See preharvest intervals and restrictions in recommendation chart.)

The stubble or new growth spray should be made within a few days following removal of first cutting from the field. Personal observation and weather conditions should be used to determine the necessity for and timeliness of this application. Bright sunlight and high temperatures will destroy some of the surviving larval populations, while cool and cloudy conditions offer better survival situations. Avoid spraying during bloom stage as pollinators may be affected adversely. Even if the alfalfa is not blooming, there are often weeds in bloom in the field. Sprays applied in the early morning or evening hours reduce the risk to bees. Alert nearby beekeepers of your intentions to spray. Check the label.

How to spray

Calibrate the sprayer to apply sufficient gallonage and at a speed to give complete coverage of all foliage. Then add the per-acre dosage of any of the insecticides

listed in the recommendation chart. Normally, 12-15 gallons of spray are required per acre of alfalfa 8 to 12 inches high, and from 15-20 gallons when growth is rank and dense. For stubble spray following removal of the first cutting, 10-12 gallons per acre are sufficient to give complete coverage.

Aerial application requires the same dosages as listed for ground equipment. Apply the aerial spray in at least 2 gallons of water per acre when used early in the growing season and on the stubble, and increase the gallonage for applications made when alfalfa is rank and dense.

For best larval control, apply all recommended insecticides during the daytime in temperatures of 60 degrees F or above. Don't spray when wind velocities exceed 12 mph or immediately preceding an obvious or high probability of rainfall. Avoid spray drift into gardens and surrounding crops, especially into forages and pastures being grazed by livestock.

Where liquid fertilizers are to be applied to the stubble immediately following removal of the first cutting, it is possible to mix certain of the recommended insecticides (particularly those having a formulation designed specifically for this purpose) with the fertilizer. Constant agitation of the mix and complete ground coverage is required with this fertilizer-insecticide stubble spray.

Insecticides

The accompanying chart lists the recommended insecticides, formulation, dosage of actual chemical per acre, expected length of control, interval between application and harvest and other comments. Many of these sprays are highly toxic to bees exposed to direct treatment or residue on the crop. Treatment in the morning or evening is recommended.

Precautions

Always handle insecticides with caution. Read, understand and follow the directions on the label concerning use and safety measures. Wear protective clothing and devices when suggested on the label. Avoid breathing vapors, dust, or contact with the skin. If the insecticide concentrate contacts or contaminates the skin, wash the affected area with soap and plenty of water immediately, and change clothing.

Store insecticides in their original container with legible label securely attached. The storage area should be dry and locked at all times when not actually in use.

Promptly and properly dispose of empty containers as directed on the label. Burn combustible containers, but don't stand in the smoke or breathe fumes from the fire. Crush containers that will not burn and bury under 18-24 inches of soil in an area where drainage will not contaminate surrounding crops, water or wildlife habitat.