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ALFALFA WEEVIL

BY RAY L. JANES
Extension Specialist, Entomology

ROBERT F. RUPPEL
Professor, Entomology

A native of Europe, the alfalfa weevil, *Hypera postica* (Gyllenhal), was first found in the United States near Salt Lake City, Utah, in 1904. Over the years, the insect has spread slowly and is now found from the West Coast to the Dakotas and Colorado. In Maryland, a new variety of this same pest was found in 1950, and has since spread to Wisconsin, Louisiana, and the New England States.

In Michigan, the alfalfa weevil was first discovered in 1966, and was present in 1967 in small numbers in 25 counties of the state. In 1968, an estimated 6,000 acres of alfalfa were treated for the pest. Thus, the insect can increase very rapidly, and must be watched carefully for seasonal and future population developments.

Damage to Alfalfa

Damage to the alfalfa plant is done mainly by the larvae (grubs) of the weevil. They skeletonize the leaves, leaving only the big veins. Heavily damaged leaves appear tattered and silvered. Other tell-tale signs of alfalfa weevil injury are stunted growth and rosetting of the leaves. Tattering and silvering appear first at the tip of the plant, then stunting is evident as the plant grows and the damage becomes more intense.

Photos courtesy Ohio Agr. Exp. Sta., Wooster, Ohio.

Life Cycle

In Michigan, the alfalfa weevil overwinters mainly as an adult near the base of alfalfa plants. Adults become active in early spring and fly about a great deal, but do much less of this when they start to lay eggs. They move about at night and hide in the crowns of the plants during the day.

Feeding is done primarily on the leaves and new growth of alfalfa. Minor feeding also occurs on Ladino, sweet, red and white clovers, vetch, and on soybeans, snapbeans, and even on strawberries, especially when the insect's populations are high.



Skeletonized alfalfa leaves (right); unaffected leaves (left).

The weevil eats a cavity in a growing alfalfa stem and lays from 2 to 25 eggs in it. A single female can lay as many as 800 eggs during her life-time, although 500 eggs may be more near the average. The eggs hatch in one to two weeks, depending mostly on the temperature. The young larvae feed first within the bud, and move to the young leaves as they grow larger. Here the larvae may feed from three to four weeks, molting their skins three times during this period.

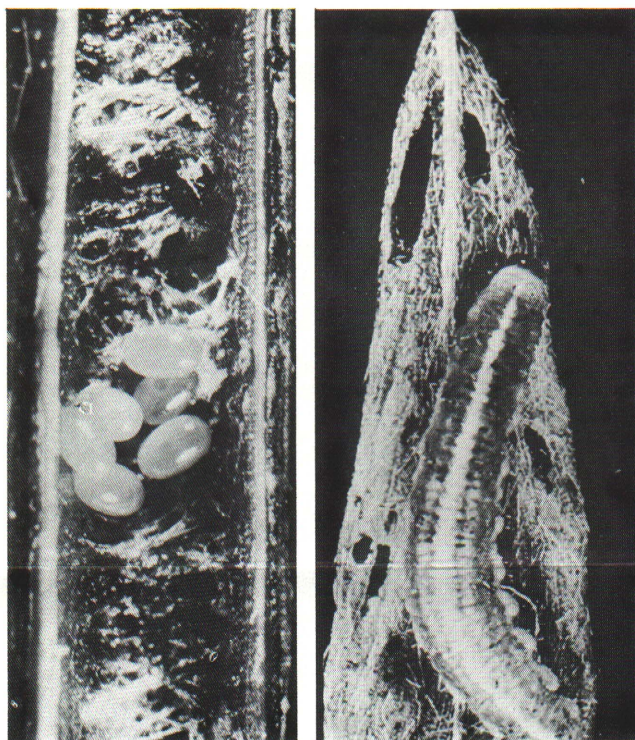
When the larvae complete their growth, they spin thin, silken, cocoons about themselves. These are spun on the alfalfa plant or in the litter under the plants. The larvae change to a motionless pupal stage within this cocoon, and the pupal period lasts about 10 to 14 days. Then, new adults emerge from the cocoons and feed heavily on alfalfa for two to four weeks.

Most of the adults move from the alfalfa fields to the field borders, woodlots, and other shaded areas where they spend the remainder of the summer. During this period of summer inactivity, the adults are fully formed but are still sexually immature. They begin moving back into the alfalfa field during early fall where they feed, become sexually mature, mate, and lay eggs during this season. Only a few of these eggs are expected to survive Michigan winters. The cold weather sends the adults to the crowns of the alfalfa plants, or to litter under the plants where they spend the winter. The dates on which the different stages of the alfalfa weevil become active are not yet well established in Michigan. However, peak seasonal appearance of the different stages of the insect are as follows: the overwintered adults persist till mid-June and then die off; eggs are abundant during May to early June; larvae from mid-May to late June; pupae during June to early July, and the new adults emerge during mid-June to late July, eventually overwintering.

Description

Eggs — Oval-shaped, about 1/25 of an inch long, bright, lemon-yellow when first laid, the eggs turn darker near the time they hatch. Some are laid in the alfalfa stems or in the hollow stems of other plants, but most are deposited in growing alfalfa. They hatch in one to two weeks, depending mainly on temperature.

Larvae — When first hatched, the larvae are about 1/20 inch long, and white to yellowish-white in color. As they grow, they turn green and acquire a single white stripe along the top of their backs. Their heads are black. There are no true legs on the undersurface of the body, only fleshy ridges. The larvae mature in three to four weeks, and are about 3/8 inch long at this stage.



Eggs laid in cavity of alfalfa stem (left); larvae feeding on alfalfa leaf (right).

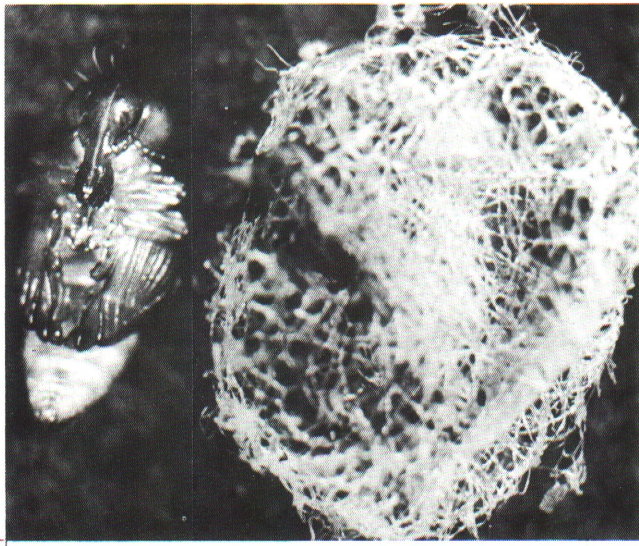
Pupae — The larvae spin round, net-like cocoons, mainly in the litter under the alfalfa plants. Within these, they gradually change to the adult weevil in 10 to 14 days.

Adults — Adults are rather common-looking snout beetles. They are about 1/4 inch long, have a slender snout, and are usually brown. A wide, black band begins at the head end and runs down the middle of the back almost to the center of the wings. Newly emerged adults are chestnut to light-brown in color. They darken with age, with many older adults being a nearly uniform brown to black.

Inspecting Fields

Begin inspecting fields for alfalfa weevil larvae during late April and early May. This can be done by: (a) walking through the fields looking for tattered and whitened (skeletonized) new growth; (b) examining such growth for cylindrical thick-bodied larvae that are: (1) about 1/4 to 3/8 inch long; (2) green with a white stripe down the back; (3) black-headed; (4) have fleshy ridges instead of legs (a hand lens is needed for this determination).

If help is needed for identification, place the larvae in a small, tightly closed paper box with some fresh tips of alfalfa. Take this to your County Agricultural Agent, the Entomology Department, Michigan State University, or a representative of the State Department of Agriculture.



Pupa (left) and pupal cell (cocoon) of the alfalfa weevil (right).

Insecticide Control

The only present method for alfalfa weevil control in Michigan is the proper selection and application of an insecticide. The use of an insecticide implies: (1) a cost of about \$8 to \$12 per acre per year for materials, equipment, and labor; (2) extra work to use the insecticide during May and on the second cutting when needed; (3) an extra effort to harvest infested first cutting alfalfa, and (4) the purchase of safety devices such as rubber gloves and a respirator, in some cases.

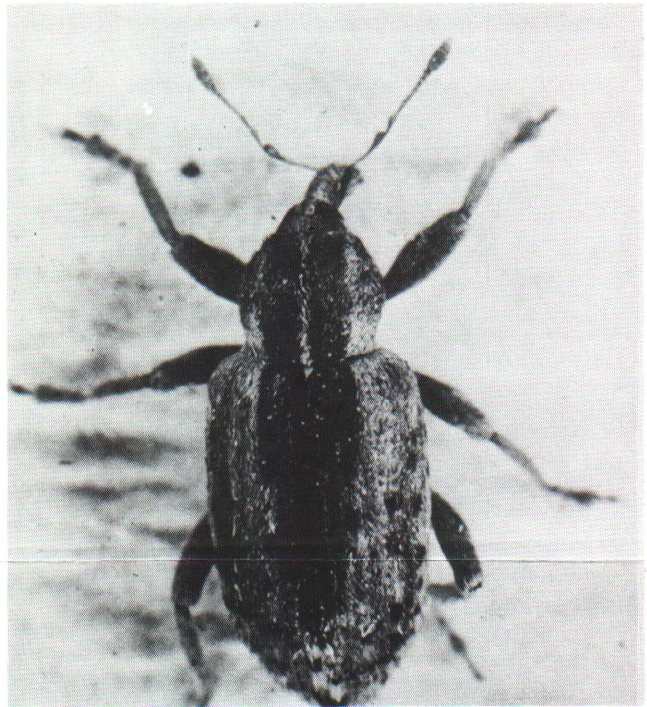
The additional costs and work involved in control of the alfalfa weevil have made alfalfa growing unprofitable in areas of low yield in other states. It is expected that a yearly yield of at least two and one-half tons of hay per acre will be needed to justify added expense of alfalfa weevil control in Michigan.

Where alfalfa yields are moderate to high, extra cost for control of the insect will require additional effort and money to increase production. Where alfalfa production is low, it may be more profitable to grow crops other than alfalfa (when the added cost for weevil control is considered). However, panic decisions to switch to other crops have been unsatisfactory for the most part. The decision to switch to alternative crops for alfalfa should be very carefully considered, in spite of the problems created by the alfalfa weevil.

A table of the insecticides currently suggested for control of the weevil follows on page 4.

Timing of Insecticide Treatments

Proper timing of insecticide application can be made by scouting the fields periodically during May. Select



Adult alfalfa weevil.

at random the tips of ten alfalfa plants. Examine the tips in each of five widely separated areas of the field. (This makes a total of 50 plants for each field.) Apply a spray when about 25 to 50 per cent of the tips (15 to 25 tips of the sample) show feeding by the larvae of the alfalfa weevil. A second spray may be needed when the larvae are abundant in the first cutting. A spray to the stubble following the first cutting may be needed to prevent damage to the regrowth. Note: *Late treatment* for alfalfa weevil when the alfalfa crop is in bloom, only kills bees and gives no appreciable return for money spent on control.

Application Equipment and Methods

Weed-type sprayers, as well as other kinds of ground equipment, can be used for applying the insecticide for alfalfa weevil control. Before using weed sprayers, thoroughly clean them of all weed killers. Fit the spraying equipment with either fan-shaped or cone-shaped spray nozzles. Good coverage of the alfalfa with the spray is very important. Adjust the boom heights so that the spray streams overlap slightly below the tips of the plants. Calibrate the pressure and tractor speed to apply at least 12 to 20 gallons of mixed spray per acre. Use the higher rate to assure complete spray coverage of tall, lush growth of alfalfa.

Applications of Diazinon, methoxychlor, malathion (and their mixtures), and carbaryl (Sevin) can also be made by airplanes. Avoiding drift of the insecti-

cides onto adjacent crops and livestock is a must. Good air application (like good ground application) means complete coverage of the alfalfa plants. The hazard of contaminating adjacent meadows or crops and even of accidental poisoning, makes methylparathion and azinphosmethyl (Guthion) especially dangerous for aerial applications. Use aerial application of methylparathion and azinphosmethyl only in fields where their hazards will be minimal.

Other Control Methods

Many other ways of controlling the alfalfa weevil are under investigation. These include: (1) flaming (burning) of fields in early spring to destroy the eggs of the weevil; (2) searching for varieties of alfalfa resistant to the weevil; (3) using natural insect enemies of the weevil to control it, and (4) utilizing insect hormones to control the pest.

Flaming has been beneficial in the southern states, but since the eggs of the weevil will not successfully overwinter in Michigan, it probably would have little value here. The insect parasite *Bathyplectes curculionis* has reduced the number of alfalfa weevils in some other states. A program for release of this species and other parasites is underway in Michigan. Other possible methods of control have not been developed to the point that they can be suggested as yet. They will be tested in Michigan and recommended as soon as they prove reliable.

WARNING

- *Keep records of all insecticide use.* Include: field, crop, and stage of growth; insecticide and amount applied; equipment and amount of water used; date and time of application; temperature and wind direction and velocity at the time of application; the insect(s) controlled.
- *Read the package label carefully before using any insecticide.* Store where children and animals cannot come in contact with the insecticide, and where the insecticide can not contaminate other products. Handle the concentrated insecticide with great care to avoid spilling it on the skin or in the eyes. Wash hands thoroughly before eating and smoking, and clean clothes after each use. Apply when the wind velocity is low (no more than 8 miles an hour) to avoid drift onto adjacent pastures and crops. Smash and bury the empty containers away from any water supply.
- *Do not kill bees.* Do not apply insecticides to alfalfa in bloom. This practice is not necessary or desirable for control of the alfalfa weevil. All insecticides suggested for control of the insect are highly toxic to honey bees, except methoxychlor. Honey bees are needed to pollinate important Michigan crops. Beekeepers cannot take the heavy economic losses of bees that can result from the spraying of alfalfa in bloom.

INSECTICIDE SUGGESTIONS

Ranked from top to bottom in order of general effectiveness. (Use only one insecticide or one combination at a time).

INSECTICIDE	Formulation ^{4,5}	Amount of formulation to apply per acre	Apply no closer to harvesting or grazing than:
METHYL PARATHION ¹	2.0 EC	1 Qt.	15 days
METHYL PARATHION	4.0 EC	1 Pt.	15 days
AZINPHOSMETHYL (GUTHION) ²	2.0 EC	1 Qt.	16 days
MALATHION plus METHOXYCHLOR	5.0 EC plus 2.0 EC	1 3/4 Pts. plus 2 Qts.	7 days
DIAZINON plus METHOXYCHLOR (ALFA-TOX MIXTURE)	0.8 EC plus 1.6 EC	3 Qts.	7 days
MALATHION	5.0 EC	1 Qt.	0 days
METHOXYCHLOR	2.0 EC	3 Qts.	7 days
CARBARYL (SEVIN) ³	80 WP	2 Lbs.	0 days

^{1,2} Methyl parathion and azinphosmethyl are very poisonous. They can be used safely *only* by following all precautions. Experienced operators are best equipped to use them. Before using, consult your doctor or hospital for the telephone number of a Poison Center or emergency medical service nearest to you. When handling or applying either of these insecticides, wear protective clothing, rubber gloves and boots, goggles, and a respirator with filters suitable for organic phosphate insecticides. *Keep out of sprayed fields for at least two days following application of the insecticide.*

² Use azinphosmethyl only once per cutting.

³ Carbaryl is effective for the larvae of the alfalfa weevil, but not for the adults. It does not adequately control pea aphid nor meadow spittlebug where these are a problem, and it is highly toxic to bees. Apply only for the control of alfalfa weevil larvae just prior to the first cutting.

⁴ EC (Emulsifiable concentrates) are liquids, containing the listed pounds (figures) of actual chemical per gallon.

⁵ WP (Wettable powders) are dry powders containing a percentage of actual chemical. Eighty WP means the insecticide contains 0.8 lb. of active ingredient for each pound of formulation.

A Reminder

Dairying is Michigan's largest farm business. The dairy industry is strongly dependent on the one and one-half million acres planted to alfalfa in the state. Michigan's alfalfa is now being threatened by the alfalfa weevil. This insect is undoubtedly the most severe pest of alfalfa in the United States. It feeds both in the adult and larval stages on alfalfa, but the larvae tend to be the most serious. Their feeding severely damages the first cutting of the crop and may reduce the yield of the second cutting. Heavy infestations of the pest can destroy stands. The alfalfa weevil has been found only in the southern part of Michigan, but it may spread over the entire state within the next few years. Growers are urged to check their fields for the presence of the alfalfa weevil, and to control it before they suffer loss of yield.