



The Alfalfa Weevil in Utah

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Edward W. Evans

Extension Entomologist

Introduction

The alfalfa weevil is a major pest throughout Utah. It is a beetle with one generation per year. Eggs hatch in the spring, and the grub-like immature weevils (larvae) feed by chewing on the alfalfa foliage. In high numbers, alfalfa weevils can cause severe damage to Utah alfalfa. In any given year, however, the weevils are few enough in number in many fields to cause only minor damage. Alfalfa can often tolerate this damage with little loss in yield or quality. In fact, in low numbers, alfalfa weevils may stimulate a moderate increase in production as their feeding results in greater stem branching.

Typically, the weevils cause most damage before the first cutting. They are most likely to be a problem following a warm spring. In cool springs (when the temperature lingers between 40 and 48xF), the alfalfa is able to grow while the weevil is inactive and thus "outgrow" the pest. Under such circumstances, the weevils are still too young at cutting to have inflicted significant damage to the crop. It is difficult to predict very far in advance, however, whether alfalfa weevils will threaten a particular alfalfa field in any given year. Late frosts, for example, may set back alfalfa growth, thus preventing the crop from "outgrowing" the weevil. Therefore, growers need to check their fields regularly as the first crop matures to determine whether weevil control is called for.

When necessary, the weevil can be controlled effectively with insecticides, but insecticides should be applied only when weevils threaten economic damage. Insecticides are costly to apply. They can be hazardous to human health and must be used with great care. Application by ground equipment can cause considerable physical damage to the alfalfa crop. Insects develop resistance to insecticides used heavily and frequently. Early season applications of dieldrin and heptachlor (now banned) to control alfalfa weevils, for example, became ineffective in Utah in the early 1960s as the weevils developed resistance. Insecticides that have lost their effectiveness from overuse cannot easily be replaced (and the cost of doing so must often be passed on to the grower in the form of higher prices for new insecticides). Most insecticides kill beneficial pollinating and predatory insects along with the target insect pest, leading to other problems. For example, spraying kills ladybeetles and other aphid enemies along with alfalfa weevils, in some cases leading to an aphid outbreak on the second crop. Insecticides are valuable weapons in minimizing crop losses to insects, but they will remain so only if used wisely and selectively. This bulletin is intended to inform the grower about the alfalfa weevil and to aid the grower in making sensible decisions concerning alfalfa

weevil management.

How to Recognize the Alfalfa Weevil

The adult alfalfa weevil is a brown, oval insect about 3/16" long. The young adult is light brown with a dark stripe extending from its head most of the way down its back. As it ages, the adult gradually loses light-colored scales and becomes dark brown to black. The adult's head is extended forward as a highly distinctive "snout" (at the tip of which are the chewing mouthparts).

The weevil larvae are tiny (1/20" long) when they hatch, but reach 3/8" in length when full grown. Larvae have a distinctive white line down the center of their backs (and a white line running along each side of the body). Young larvae are cream-colored while older larvae become bright green (with contrasting dark heads).

Photographs of alfalfa weevil adults and larvae are printed in Bulletin 494 of the Utah Agricultural Experiment Station, available from Utah State University (see ADDITIONAL INFORMATION below).

Life History in Utah

The alfalfa weevil [*Hypera postica* (Gyllenhal)] is native to the Old World. It was first discovered in the U.S. in 1904 near Salt Lake City and rapidly spread throughout the Intermountain West. Subsequently, two more strains of alfalfa weevil were introduced to the U.S.: the Egyptian alfalfa weevil in Arizona (1939) and then California, and the eastern alfalfa weevil in the East in the 1950s. The strain found first in the U.S. (the western alfalfa weevil) now occurs throughout Utah. A second strain (believed to be the Egyptian alfalfa weevil) occurs in southwestern Utah (especially Washington Co.). The eastern alfalfa weevil has not been identified to occur in Utah. The three weevil strains differ somewhat in the details of their biology, leading to different recommendations for controlling weevils in different parts of the country.

The alfalfa weevil has only one generation each year. The adults overwinter, often in leaf litter near field margins. Some adults overwinter in canyons several miles from alfalfa fields. They migrate to the fields in the spring to feed and lay their eggs. They appear in fields and commence feeding soon after the alfalfa breaks dormancy. The economic impact of this early feeding by adults is unknown. Egg-laying in Utah generally begins when the alfalfa is 3-4" high. The female chews a hole in an alfalfa stem, then inserts the tip of her abdomen to lay 10 or so oval, yellow eggs in a cluster in the stem. Eggs can be located in the field by finding the dark puncture spot on the stem that develops around the hole chewed by the female.

The eggs hatch in 4-21 days, depending on the temperature (cool weather can delay egg hatch considerably, allowing the alfalfa to grow well ahead of the weevil). The newly hatched larvae emerge through the hole through which they were inserted in the stem as eggs, and climb to the plant terminal. They mature by consuming the alfalfa foliage. They periodically molt (shed their exoskeleton) as they grow, completing four larval stages termed instars before transforming into adults. The young larvae (first and second instars) feed in protected locations within the tightly folded young leaves of expanding terminals. The casual

observer will likely not see these young larvae nor detect their damage (scattered pinholes in the leaves). The older larvae (third and fourth instars) feed in exposed locations on open leaves, especially near terminals.

The larvae consume progressively more as they increase in size. Each subsequent instar ingests 4-5 times as much foliage as the previous instar. Consequently, most of the total forage loss to weevil larvae occurs during the relatively brief period each spring when most of the larvae are fourth instars and are feeding voraciously. This period usually occurs near the time of first cutting. When it occurs before the first cutting and weevil numbers are high, damage to an alfalfa field may be severe. In cool springs when weevil development is delayed, the alfalfa is often cut (and the weevil larvae killed) before the larvae reach this highly destructive fourth instar. In warmer springs, fields may still sustain only minor damage before cutting as too few weevil larvae are present to cause significant defoliation collectively even as ravenous fourth instars.

After completing its larval growth, the alfalfa weevil enters a transition stage, called the pupa or pupal stage, during which its body tissues are rearranged and from which it emerges as an adult. The larva descends the plant to pupate near or on the ground. Before pupating, the larva spins a loosely woven, net-like white cocoon. Inside the cocoon, the larva then produces a brown capsule-like pupal case within which it transforms into an adult.

The pupal stage lasts 10-14 days. New adults appear in early summer (late June in northern Utah). They feed mostly at night for several weeks (cool weather limits night feeding earlier in the season). At high numbers, they can cause considerable damage. However, if the weevils as larvae were not sufficiently numerous earlier in the growing season to warrant control, they are unlikely to cause economic damage as feeding adults. By midsummer the adults begin leaving the fields to seek the sheltered sites in which they will remain until the next spring. Often the second cutting serves to trigger the adults' emigration from the field. They lay few if any eggs before emigrating.

Natural Enemies:

Introduction and enhancement of weevil enemies is an attractive alternative to chemical control of alfalfa weevils. Since about 1920, a series of parasitic wasps that attack the alfalfa weevil has been introduced to Utah. Only one species, *Bathyplectes curculionis* (Thomson), has so far become well established. Adults of this small dark wasp (1/8" long) seek out weevil larvae and quickly lay their eggs inside the protesting larvae. Only one parasite, a white grub-like creature, develops in each host. The weevil larva is not paralyzed, but continues to feed at nearly the same rate as unparasitized larvae (thus the wasp does not prevent damage from the weevil larva this year, but rather it reduces damage next year by preventing the weevil from becoming an adult and laying eggs). Upon completion of feeding as a fourth instar, the parasitized larva begins to pupate by spinning its white cocoon. At this point, it succumbs to the parasite, which spins its own cocoon inside the host cocoon. Inside its cocoon, the parasite larva pupates in a brown case (easily distinguished from the host pupal case by a white midband). It may emerge as a winged adult later in the summer to seek out late developing weevil larvae, or it may remain in the pupal case through the winter, emerging the next spring to parasitize the next generation of weevil larvae.

This parasitic wasp kills up to 70% of the weevil larvae in a field (had the wasp not been

introduced, the alfalfa weevil would be a much greater pest than it is at present in Utah). In addition, a variety of predatory insects, including ladybeetles and damsel bugs, consume weevil larvae, as do several species of spiders and birds. Despite the presence of these natural enemies, conditions are such in Utah (and elsewhere) that alfalfa weevils on occasion must be controlled with insecticides. The key question thus becomes, when to spray?

When to Spray

When damage from alfalfa weevils can be anticipated to be minor (as it is in many fields in many years in Utah), chemical treatment to control the weevil is not warranted. Growers are advised therefore to check their fields regularly, and spray only if and when alfalfa weevils become sufficiently numerous to require spraying. Two methods are presented here as alternative ways to determine when to spray.

1) Sweep Net Counts of Larvae

(A sweep net is required. It can be purchased at little cost from several biological supply companies. The county extension office can provide information on how to order a net.)

Once the alfalfa reaches 10" or more in height, sweep the plants with a 15 inch diameter net. Take a full sweep from side to side (180x) through the top of the foliage with the net, and then count the number of alfalfa weevils collected in the net. Move to a new location in the field and take another sweep. Repeat this procedure for a total of ten sweeps taken at scattered locations throughout the field. If more than 20 weevil larvae are collected on average per sweep (200 larvae in ten sweeps), then spraying is advised. If 10-19 weevil larvae are collected per sweep, the field should be swept again in 3-5 days. If less than 10 weevil larvae are collected per sweep, the field should be swept again in 7 days.

Sweeping will give most reliable results if restricted to calm, clear days (or evenings) with no more than a gentle breeze. Do not sweep when the foliage is damp or wet from rain or dew. Sweep vigorously, but not so vigorously that large quantities of alfalfa are torn off by the net.

For best success, alfalfa fields need to be checked regularly by sweeping before the first cutting. Typically, only older weevil larvae (third and fourth instars) are collected by sweeping. Young larvae are not easily dislodged by the net from their protected feeding sites inside the folded terminal leaves. If the grower sweeps his fields every few days beginning with 10" alfalfa growth, he may collect few weevil larvae at first (if the larvae are still young) even when many larvae are present. Later, as the weevil larvae reach the third instar and move to more exposed feeding sites, the catch in the sweep net will rise dramatically, and in some instances may indicate the need for spraying. Feeding damage will still be minor at this point (the young larvae consume relatively little plant tissue). The grower has 1-2 weeks (depending on the temperature) to spray or cut and kill the weevils before they become highly destructive as fourth instar larvae.

2) Stem Counts of Larvae

Once the alfalfa reaches 10" or more in height, break off 50 stems at ground level and shake them into a bucket to collect and count weevil larvae. Be careful not to knock larvae off the stem before shaking it in the bucket (cup your hand around the terminal to catch larvae should they drop from the plant). The stems should be gathered from scattered locations

throughout the field. For example, take ten stems from each of the four corners of the field (30-50 feet in from the field edge) and from the center of the field. Measure the height of the alfalfa at each of these locations. After ten stems have been shaken in the bucket, count the number of weevil larvae collected. Add the five counts of larvae together, and determine the average number of larvae collected per stem.

Control is warranted if (1) more than 2 larvae per stem occur on alfalfa 10- 14" high, (2) more than 2.5 larvae per stem occur on alfalfa 15-18" high, or (3) more than 3 larvae per stem occur on alfalfa more than 18" high. At lower numbers of larvae per stem, sample again in 3-5 days if more than one larva occurs per stem. Sample again in 7 days if less than one larva occurs per stem.

Early Cutting

If alfalfa weevils do not reach destructive levels (20 per sweep or 3 per stem) until sometime during the final two weeks before the expected time of first cutting, the grower should consider early cutting as an alternative to spraying. Use of many insecticides requires an interval of at least two weeks between spraying and cutting to minimize residue contamination of hay. Early cutting will kill young weevil larvae (first to third instars), but fourth instar larvae often survive to pupate (pupae present at cutting will also survive). If more than half of the weevils at early cutting are 1/4-3/8" in length (these are mostly fourth instars), the hay should be removed from the field as quickly as possible and the stubble should be sprayed.

Additional Information

Further information on the identification, biology, and management of alfalfa weevils (and other insects) in Utah alfalfa may be found in:

Insects and nematodes associated with alfalfa in Utah. D. W. Davis, editor. Utah Agricultural Experiment Station Bulletin 494 (1976). 59 pp. (with numerous photographs of insects and their damage)

(This publication is available at a small cost from the Cooperative Extension Service Publications office, UMC 5015, Utah State University, Logan 84322, telephone (801) 750-2251).

Utah forage and seed alfalfa pest management guide. T. P. Miller and S. V. Thomson. Cooperative Extension Service, Utah State University (check with the county extension office to receive a copy).

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