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G94-1208 Managing the Alfalfa Weevil

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Managing the Alfalfa Weevil

The identification and life cycle of the alfalfa weevil are discussed along with scouting techniques, economic thresholds, and other integrated pest management tactics.

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The alfalfa weevil is the primary insect pest of alfalfa in Nebraska. Management is essential to reduce crop losses, particularly during years when weevil infestation is high. Because there also are years when weevil damage is economically unimportant, it is necessary for growers to become familiar with sampling procedures, management guidelines, and control recommendations so control techniques are not used unnecessarily.

Integrated Pest Management

Figure 1. Alfalfa weevil larva.

Use integrated pest management (IPM) to reduce losses caused by the alfalfa weevil. Integrated pest management is a sustainable approach which combines biological, cultural, physical, and chemical tools in a way that minimizes economic, health, and environmental risks. Economic risks can be minimized by using approved alfalfa weevil scouting techniques and economic thresholds to make management decisions. Health risks can be minimized by avoiding pesticide use, but when pesticides are necessary, follow all safety directions provided on product labels. Minimize environmental risks by avoiding pesticide use when possible and by following all environmental or wildlife safety guidelines provided on the pesticide label when chemical use is necessary. This is of particular importance to alfalfa weevil management where weevil resistant alfalfa varieties are available and early cutting is often preferable to pesticide application.

Injury and Damage

Figure 2. Alfalfa weevil adult.

The first indications of weevil injury are small holes eaten in leaves at the growing tip during April and May. This injury becomes more apparent as weevil larvae grow. Severely damaged fields have a white or gray appearance because of the drying of skeletonized upper leaves and buds. Damage is most severe to the first crop or cutting of the season and/or to the regrowth of the second crop. Larvae generally damage the first crop, while adult weevils damage regrowth by feeding on the developing crown buds, retarding growth and preventing fields from greening up after harvest. The severity of damage is influenced by alfalfa variety, stand health, weather, growing conditions, and the degree of parasitism of the weevil.

Biology

The life cycle of the alfalfa weevil consists of four stages: egg, larva, pupa, and adult beetle or weevil (*Figures 1-4*). The insect usually overwinters as an adult in protected areas outside of fields, such as windbreaks, wooded areas, or other protected habitats. Some eggs are laid in the fall, but most are deposited in the spring when weevils re-enter fields. The female weevil chews a hole into the alfalfa stem and deposits a mass of 2 to 25 eggs. The average female weevil is capable of laying 500 to 2,000 eggs during her lifetime. The eggs vary in color from yellow to brown, becoming darker as they mature, and hatch 7 to 14 days after they are laid. (Fall-laid eggs will not hatch until spring.) Young larvae are yellow to light green and molt or shed their skins three times, growing at each molt. When the legless larvae are mature, they are green with a white stripe down the back, have a black head, and are approximately 3/8 inch long. After feeding 14 to 21 days, most mature larvae move to leaves near the base of the plant or to debris on the soil surface where they form loosely woven cocoons of silk and bits of plants. The larvae then transform to the pupal stage, from which the adults emerge in about 7 to 14 days.

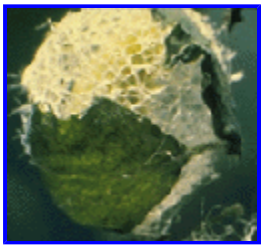

Figure 3. Alfalfa weevil pupa.

Adults are approximately 3/16 inch long and have a long snout, characteristic of the beetle group known as weevils. The body is light brown after emergence, with a darker brown stripe on the back extending from the front of the head to about half the length of the body. These markings vary somewhat with the age of the insects and may become less obvious as body scales are rubbed off and the color darkens. Adult weevils remain in the field for a few weeks and feed on newly emerging shoots or buds until they disperse to spend the summer in nearby protective areas. These adults sometimes move back into the alfalfa for a short time in the fall although no significant damage occurs at that time.

Managing Weevils with Integrated Pest Management

The following four tactics can be used to achieve integrated management of the alfalfa weevil.

1. **Plant Resistance**

   Several alfalfa varieties are promoted as being resistant to the alfalfa weevil. A variety is considered resistant when pest infestation and subsequent injury does not significantly reduce

yield, except under the most severe conditions.

The type of alfalfa weevil resistance available today is referred to as tolerance. Alfalfa varieties with tolerance and those that are susceptible may be infested with a similar number of weevils, but tolerant varieties produce satisfactory yields despite weevil feeding. First cutting forage yields of resistant varieties (ie. Perry, Arc, Gladiator and Team) were 22 to 33 percent higher than those of the most susceptible varieties in Nebraska tests. Wrangler, a variety with weevil resistant parentage, also is available, but has not been field tested under severe weevil infestation. Refer to NebGuide *G77-357, Selecting Alfalfa Varieties for Nebraska*, for detailed information on alfalfa variety performance.

2. **Cultural Control**

Many insect pests of alfalfa, including the alfalfa weevil, can be at least partially managed by timely cutting of hay. Occasionally, cutting can eliminate the need for insecticides. Many larvae, particularly smaller ones, will be killed if exposed to direct sunlight and high temperatures at the soil surface. In addition, the plant material remaining after cutting will not sufficiently sustain weevil larvae until regrowth begins, so many will starve.

Alfalfa can be cut at various growth stages in the presence or absence of weevils. The short- and long-term effects of various cutting practices on yield, quality and persistence are well known. Repeated cutting earlier than 1/10 bloom often results in reduced dry matter yields and an increased potential for earlier stand decline. However, the forage harvested is of somewhat higher quality when cutting occurs early. If the field has reached the bud or early bloom stage, immediate cutting is the most practical and efficient way to deal with a weevil problem.

The pupae and adults are much hardier than larvae, and many survive after cutting until regrowth begins. Remove hay windrows or bales as soon as possible to reduce protection for susceptible weevil stages. Although highly favorable to regrowth, cool and moist conditions following cutting also favor weevil survival.

Figure 4. Alfalfa weevil eggs.

Although most eggs are not laid until spring in Nebraska, late fall harvesting or grazing reduces the number of fall-laid weevil eggs that successfully overwinter.

Another sound cultural practice is to maintain a uniform, dense and vigorous stand of alfalfa through proper cutting intervals and fertilizer applications. Sturdy plants with well-developed root systems will withstand more weevil feeding, even under stress conditions. Crop rotation also helps reduce many insect and disease problems by interrupting life cycles and reproduction.

3. **Biological Control**

A small parasitic wasp, *Bathyplectes curculionis*, has been imported from Europe to help control the alfalfa weevil. It was released in other areas of the United States and has spread with the weevils to Nebraska. Occasionally, under favorable conditions, this wasp may kill as many as 80 to 90 percent of the weevil larvae.

Other species of wasps, including a closely related *Bathyplectes* (*B. anurus*) and a parasite of the adult weevil (*Microctonus aethiopoides*), have been introduced into Nebraska. Hopefully, these natural enemies eventually will help keep infestations below economically damaging levels.

There is also a fungal pathogen, *Entomophthora phytonomi* (also called *Erynia* sp.), that will kill large numbers of weevil larvae, particularly when warm, moist conditions occur.

4. **Chemical Control**

The presence of alfalfa weevils in an alfalfa field does not in itself justify pesticide application. Chemical control should not be used unless weevil damage approaches the level that will reduce net profit by at least the cost of a pesticide application. Fields should be scouted weekly, beginning in April, to determine the degree of infestation before management decisions are made. To aid in decision making, economic thresholds have been developed for weevil larvae and adults. There are three decision-making methods for larvae and one method for adults.

A general economic threshold for larvae is to consider treatment if 30 to 40 percent of tips are damaged by weevil feeding, larvae are present, and early harvest is more than one week away. More precise economic thresholds are based on weevil infestation estimates made by using the sweep net or stem-count methods.

If the sweep-net method is used, randomly select at least five sample sites from across the entire field. At each sampling site, take at least ten sweeps while walking at a steady pace. Empty the contents of the net on a clean surface and count the number of weevil larvae. Calculate the average number of larvae per sweep. If there are 20 or more larvae per sweep and early harvest is more than one week away, treatment may be warranted.

Economic thresholds developed for the stem-count method are based on the number of larvae per stem, stem height, and crop value. To use this method, randomly select at least five sampling sites from across the entire field. At each site, gently pick or cut at least ten alfalfa stems at ground level. Shake the larvae off of the stems by beating the stems into a deep-sided bucket. Make sure to check for small larvae that may be enclosed in new, folded leaflets at the tips of the stems. Count the larvae and determine the average number of larvae per stem. Measure stem lengths and determine the average stem height. Compare the average stem height and the average number of larvae per stem with the graphs provided (*Figure 5*) to determine appropriate action.

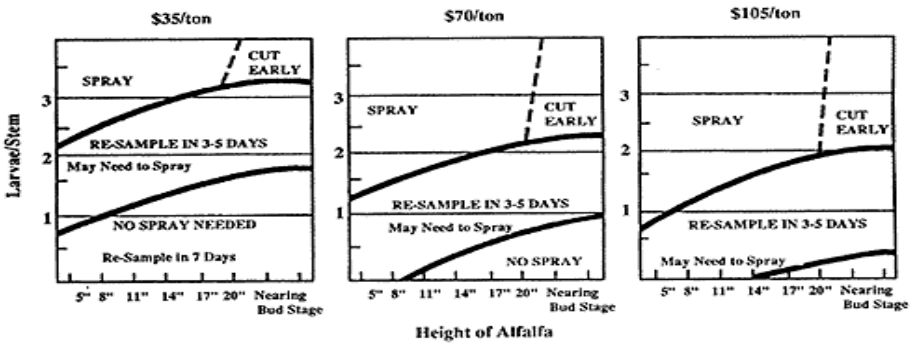

Figure 5. Estimating economic treatment thresholds for the stem count method.

Each decision graph was developed assuming a different alfalfa value. Choose the graph that uses a crop value that is nearest to your estimated crop value. If your estimated value is below the

value of the graph, raise the decision curve accordingly. If your estimated crop value is above the value of the graph, lower the decision curve. Please note that it is probably more profitable to harvest the alfalfa than to treat it with an insecticide when the crop is near or beyond the bud stage.

After harvest and hay removal, examine the stubble in several areas to determine if adults are present and feeding. If adult feeding prevents normal field green-up, use *Table I* to help determine if an insecticide treatment may be necessary.

Any one of several insecticides can be used for control of alfalfa weevil larvae or adults when treatment is justified. Consult the current edition of the University of Nebraska-Lincoln *Insecticide Treatment Tables for Field Crops Pests* for a list of insecticides registered for alfalfa weevil control. **Always read insecticide product labels thoroughly and follow all instructions, restrictions and precautions.**

Do not expect perfect control. A few surviving weevils will not seriously harm the crop and actually may be beneficial because their survival encourages the survival of natural enemies.

Chemical control may be adversely influenced by cool weather, non-uniform or inadequate coverage, heavy rainfall shortly after application, and poor choice of insecticides. To evaluate the effectiveness of chemical controls, carefully examine new growth several days after treatment. If the new growth is not damaged, the control probably was effective.

All insecticides are toxic to bees and should not be used if alfalfa is in bloom or if the stand contains flowering weeds. Instead, consider cutting. If the field must be treated with an insecticide, notify any beekeeper with hives within a three-mile radius of the field so the hives can be covered or moved. Also, apply the insecticide in the evening when most of the bees will have returned to the hive.

Table I. Alfalfa stubble threshold calculation chart.

Factors	Example	Your field
A. Insecticide plus application cost ($/acre)	$7.00	
B. Value of hay ($/ton)	$100.00	
C. Loss factor (1st bloom harvest = 0.0198; 28-day harvest = 0.0345)	0.0198	
D. Days of complete defoliation that can be tolerated*	3.5	

*To estimate **D**, multiply **B** times **C** and divide into **A**. The above example is then calculated as follows:
D = A/(BxC) = 7.00/(100 x 0.0198) = 7.00/1.98 = 3.5 days.

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