CHAPTER SEVEN

INSECTS

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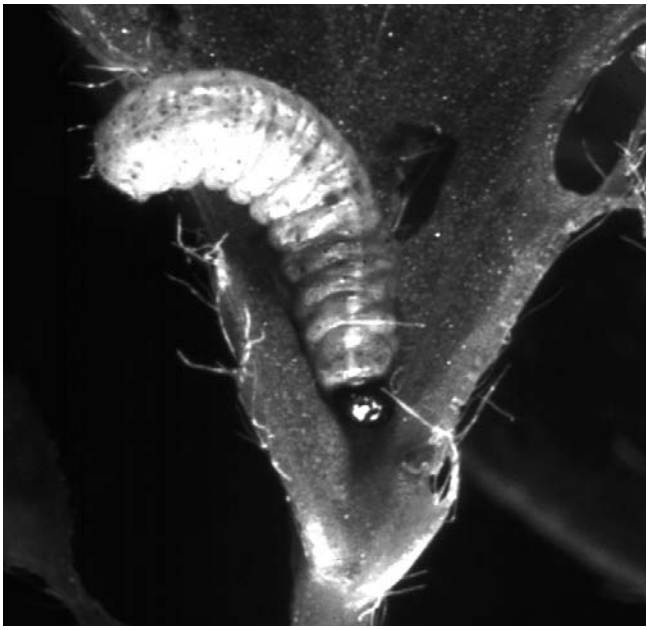
One of the advantages of the intermountain environment as compared with other alfalfa production areas is that insect pests are rarely a problem. Harsh winters and cool nights slow the development of insect pests. Therefore, in most years, insect populations do not reach levels that necessitate treatment. On the rare occasions when insect pests are present in significant numbers, their damage can be devastating to yield and quality. In fact, damage caused by insect feeding often surpasses yield losses due to poor variety selection, low fertility, and mismanagement. An effective pest management program can preclude significant yield losses.

A pest management program should include the following:

- correct identification of both harmful and beneficial insects
- proper monitoring or surveillance of fields
- reliable treatment thresholds
- effective prevention and control methods

INSECT IDENTIFICATION

The importance of proper insect identification cannot be overstated. You must be able to distinguish beneficial, innocuous, and harmful insects before you can choose methods to encourage beneficial ones and prevent damage from harmful species. Insecticide treatments can sometimes be avoided when sufficient populations of beneficial insects are present (Figure 7.1). Effective prevention and control strategies have been developed for most insect pests of alfalfa. The preferred pest management method varies depending on the pest, its population density, and environmental conditions. Pest management methods include planting resistant varieties, harvesting at a time that lessens pest damage, and using biological controls and insecticides.



JACK CLARK

Harmful insect populations must be kept below threshold levels. The threshold is that point at which economic damage by an insect population is imminent and treatment is recommended. The University of California (UC) has developed treatment thresholds for most of the major insect pests. The thresholds are linked to the value of the crop and can be adjusted in accordance with the anticipated market price. The ability to apply threshold data successfully depends on the frequency of field monitoring, which in turn depends on the season and the pest. At the very least, you should sample fields once a week when pests are likely to occur (Figure 7.2).

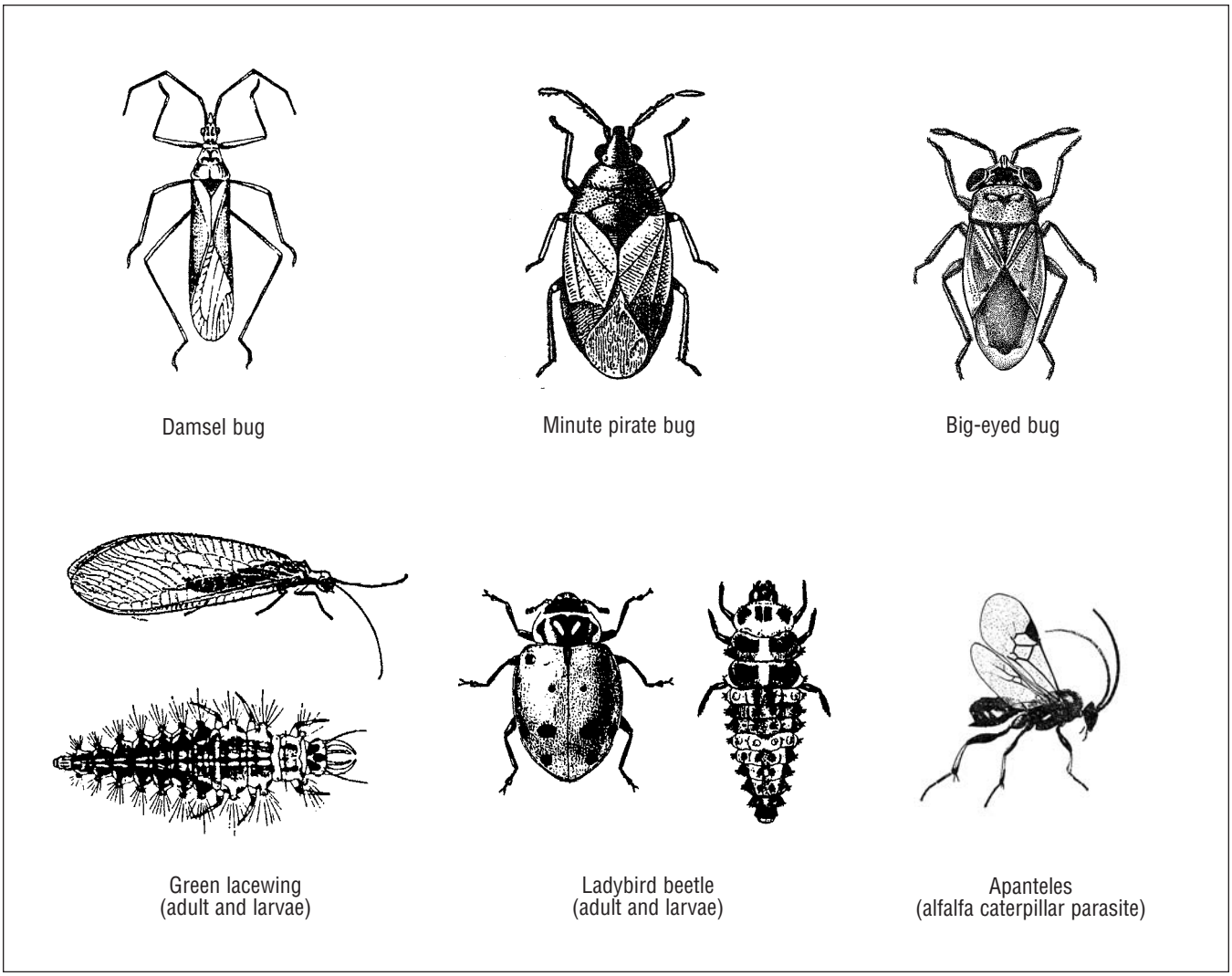
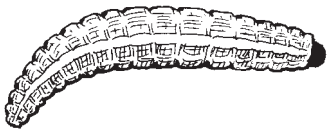


Figure 7.1. Beneficial insects commonly found in alfalfa.

The rest of this chapter describes the primary insect pests encountered in intermountain alfalfa fields. For each insect pest there is a description of its biology or life cycle, the damage it causes, monitoring techniques, and recommended management programs for the Intermountain Region. For more detailed descriptions and information (including color photographs) consult *Integrated Pest Management for Alfalfa Hay,* available from UC Cooperative Extension Offices.



ALFALFA WEEVIL

Alfalfa weevil (*Hypera postica*) is the most destructive insect pest in intermountain alfalfa fields. By chewing and skeletonizing leaves, this pest can dramatically reduce yield and quality. Larval feeding can be so severe that plants are defoliated, giving the entire field a gray cast. The alfalfa weevil is primarily a pest of the first cutting; when extreme population pressures occur, however, the effects of weevil feeding can carry over into the second cutting. Also, beware of alfalfa weevil damage in the second cutting if cool spring temperatures slow the development of the insect.

Depending upon temperatures, weevil larvae may appear in late March but are ordinarily most prevalent from mid-April to mid-June. A weevil larva is a small worm about ⅜ inch long when fully grown. It is pale green with a white stripe down the center of the body and a dark brown to black head (color photo 7.1).

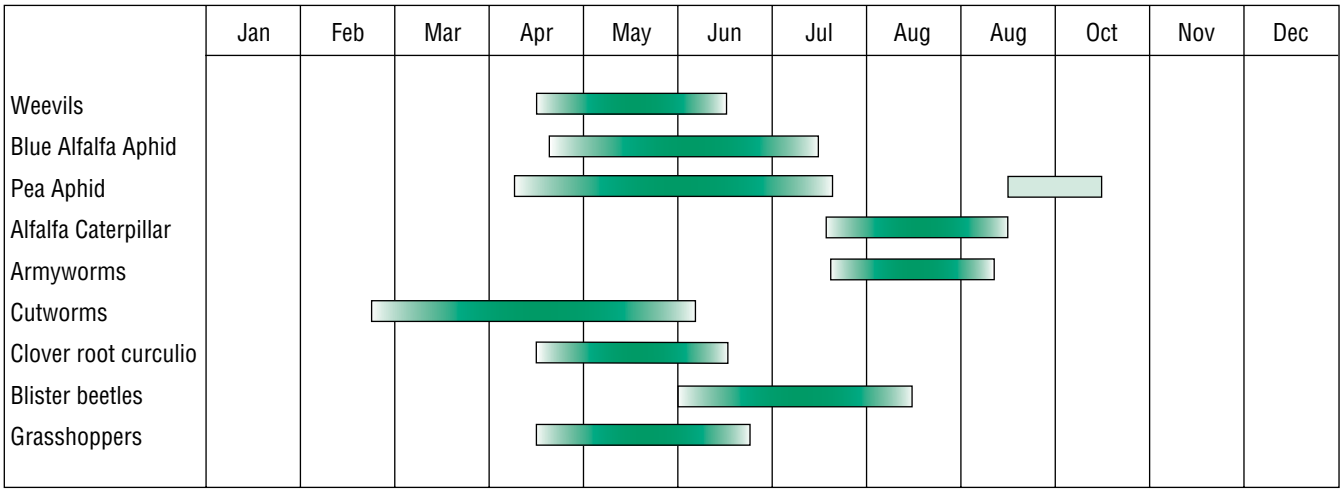


Figure 7.2. Seasonal occurrence of insect pests in the Intermountain Region.

Alfalfa weevils have four instars, or growth stages. Initially, weevils are pale or yellowish. They become an increasingly bright green as they develop. The first two instars feed on the tightly folded young leaves at the end of shoots, where they cause significant damage. These young worms can be difficult to locate, but small pinholes in young leaves signal their presence. The worms can be observed by carefully tearing apart the terminal leaves of shoots, where weevil feeding is apparent. Compared to younger worms, third- and fourth-instar larvae are more voracious feeders and cause significantly more damage. Larvae complete their growth in 3 to 4 weeks. Once mature, larvae spin silken cocoons either on the leaves or, more commonly, in debris on the soil surface (color photo 7.2). They mature into adults 1 to 2 weeks later.

An adult weevil is dark gray to brown, with a dark brown stripe on the back (color photo 7.3). It has a distinctive weevil snout approximately 3⁄16 inch in length. Adults feed for a short time, not causing significant damage, before most leave the field and enter a resting stage. The resting period is usually spent in weedy areas near the field or in field trash. Adults emerge in late winter or early spring, when they mate. Females deposit their eggs in alfalfa stems, completing the life cycle of the alfalfa weevil.

Alfalfa weevil is the most destructive insect pest in intermountain alfalfa fields.

Management guidelines

Alfalfa weevil populations are monitored with a sweep net. (Every grower should own a sweep net so that insects can be monitored on a regular basis. Contact your local Farm Advisor's office for a list of sweep net manufacturers.) A standard insect sweep net is a 15-inch-diameter wire loop fitted with a cone-shaped net bag attached to a 26-inch handle. Once weevil larvae are found, check the field every 2 to 4 days.

A single sweep consists of one 180-degree arc taken as you step forward (Figure 7.3). Hold the net vertically so that the lower rim is 1 or 2 inches ahead of the upper rim and at least 4 inches into the alfalfa (Figure 7.4). This positioning will allow you to catch any insects that fall from the plants. Take single or consecutive sweeps. In each field take several sweeps from all quadrants, and average the total number of larvae per sweep.

Parasitic wasps, *Bathyplectes curculionis* and others, have been released by U.S. Department of Agriculture (USDA) and Cooperative Extension researchers to keep weevil populations low. Though these wasps may be present, they often fail to keep weevil populations below the threshold level. Unfortunately, there is little a grower can do to initiate or encourage biological control other than follow sound integrated pest management (IPM) practices and use chemical treatments only when necessary.

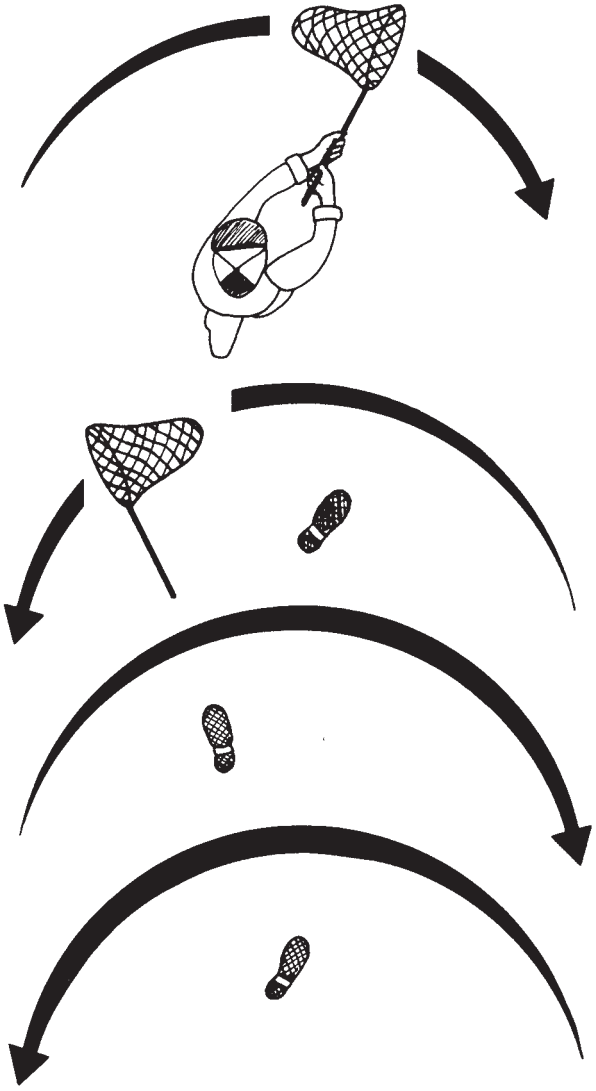


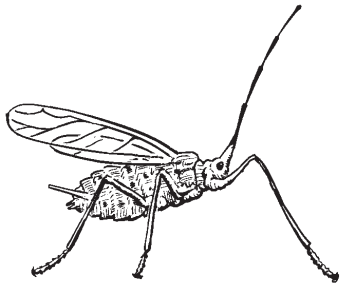
Figure 7.3. A single sweep is one 180-degree arc taken as you step forward. A sweep can be made singly or consecutively. To calculate the average number of insects per sweep, simply divide the total number of insects caught by the number of 180-degree sweeps.

At what point should you apply an insecticide? Implement chemical controls when counts approach 20 larvae per sweep. Sometimes significant populations of weevil larvae are present early in the season, before the alfalfa is tall enough to be swept. Under such conditions, use insecticides when 30 percent of the plant terminals show obvious signs of weevil feeding.

An alternative to insecticide treatment is early cutting of fields that are close to harvest. Weevil larvae are usually killed during harvesting. Occasionally, when weevil populations are extremely high, enough weevils survive in the windrow to prevent alfalfa from regrowing. Therefore, carefully check regrowth for signs of damage to the second cutting.

Figure 7.4. Sweeping alfalfa for alfalfa weevil larvae. Hold the net vertically so that the lower rim is 1–2 inches ahead of the upper rim and at least 4 inches into the alfalfa.

APHIDS



Both the pea aphid (*Acyrthosiphon pisum*) and the blue alfalfa aphid (*Acyrthosiphon kondoi*) damage alfalfa. They may be present in the field at the same time as the alfalfa weevil but are usually found slightly later (Figure 7.2). The pea aphid can survive warmer temperatures than can the blue alfalfa aphid and can therefore be found later in the spring and may even occur in late summer or early fall. These two aphids reproduce asexually and can multiply rapidly. Both are green, and they are similar in appearance. The easiest way to distinguish the two is to examine their antennae with a hand lens. Pea aphid antennae are green with a narrow dark band at the tip of each segment; those of the blue alfalfa aphid are uniformly brown (see color photo 7.4). Also, the blue alfalfa aphid is generally found on young tender shoots and developing leaves, whereas the pea aphid can be found over most of the plant. Ability to distinguish between these two species is important because the blue alfalfa aphid is more damaging.

Both aphids can stunt alfalfa and reduce yield by sucking plant juices with their piercing mouthparts. They secrete a sticky substance referred to as honey-

dew. Honeydew can hinder the baling process, and it promotes the growth of a black fungus that can reduce the palatability of the hay. In addition, the blue alfalfa aphid injects a growth-reducing toxin into the plant.

Management guidelines

Fortunately, aphid populations in the Intermountain Region seldom necessitate treatment. Predators, parasites, and fungi keep aphid populations in check most years, but population explosions can occur. Consider beneficial insect populations before applying an insecticide treatment. Common predators include convergent lady beetles (ladybugs), green lacewings, bigeyed bugs, minute pirate bugs, and damsel bugs (Figure 7.1). Aphid populations may increase when insecticides applied for control of the alfalfa weevil kill beneficial insects.

Resistant varieties of alfalfa have successfully minimized aphid damage. Alfalfa varieties resistant to pea aphid are readily available in the Intermountain Region. Nondormant varieties resistant to blue alfalfa aphid are available, but resistance has not been incorporated into most dormant varieties.

Stem samples are used to signal the need for aphid control. Cut the stem close to the ground, and hit it sharply against a stiff piece of white paper or into a white pan. This dislodges the aphids so they can be counted. Take several stems from different areas of the field. Short alfalfa is more severely damaged than tall alfalfa; therefore, the treatment threshold varies according to the height of the alfalfa (Table 7.1). Treatment thresholds are high; the mere presence of aphids in a field does not necessitate treatment. As mentioned, aphid populations rarely reach these levels in the Intermountain Region.

Sweep nets are used in some states to sample aphid populations. Although commonly used, this method is not precise or efficient. Collection of 100 pea aphids per sweep (a golf ball-sized ball of aphids) indicates the treatment threshold; for the blue alfalfa aphid, the total is lower.

Table 7.1. Treatment thresholds for pea aphid and blue alfalfa aphid.[1]

PLANT HEIGHT	PEA APHID/ STEM	BLUE ALFALFA APHID/STEM
Under 10 in.	40–50	
Over 10 in.	70–80	40–50
Over 20 in.	100	

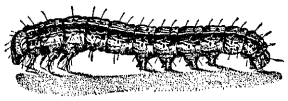
1. Data apply to the stem-shaking method of sampling, not to sweeping. This chapter describes the shaking method in the section on aphids.

CATERPILLARS

Alfalfa caterpillar (*Colias eurytheme*), beet armyworm (*Spodoptera exigua*), western yellowstriped armyworm (*Spodoptera praefica*), and alfalfa looper (*Autographa californica*) all feed on alfalfa during the summer. Temperatures are seldom warm enough for these pests to be a serious problem in the Intermountain Region, however.

Alfalfa caterpillar

Also referred to as alfalfa butterfly, this insect has a velvety green appearance. The larger larvae have a white stripe down both sides of their body. An invasion of alfalfa caterpillars is preceded by a large influx of the adult form, a yellow or white butterfly. The life cycle of the alfalfa caterpillar is closely synchronized with the cutting schedule of alfalfa. Infrequent cutting and a short growing season usually prevent it from reaching economically damaging levels in intermountain alfalfa fields. Furthermore, a parasitic wasp (*Apanteles medicaginis*) is very effective in controlling this pest; if alfalfa caterpillars are a suspected problem determine whether this wasp is present. Simply pull the worm apart—if a white larva pops out, the alfalfa caterpillar has been parasitized.



Armyworms

Beet armyworm and western yellowstriped armyworm are the most commonly occurring caterpillar pests. They appear during the hot periods of July and August. A problem often arises when one field is cut and armyworms migrate to adjacent fields. Natural enemies can frequently control these caterpillars. Population levels are cyclic and armyworms only sporadically occur in large numbers. In the Intermountain Region, the western yellowstriped armyworm predominates.

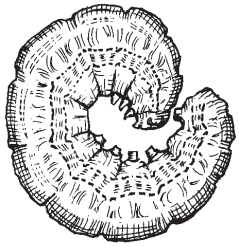
Both beet armyworm and western yellowstriped armyworm are smooth skinned. The beet armyworm is

most often olive green, but it ranges in color from bright green to purplish green. The western yellowstriped armyworm is usually black with orange stripes down the sides. Both armyworms lay their eggs in clusters on the upper side of leaves. The eggs are covered with scales: Those of the beet armyworm are white and cottony, those of the western yellowstriped armyworm gray. Larvae hatch and skeletonize leaves, causing alfalfa terminals to flag. These leaves make detection of armyworms relatively easy even from considerable distances.

Management guidelines

Table 7.2 lists treatment thresholds for summer worms. These thresholds are based on sweep net counts using the same technique described in the alfalfa weevil section. Both alfalfa caterpillars and armyworms are often controlled by parasites and diseases, so the presence of parasitized and diseased worms should be determined before treatment.

CUTWORMS



Although a number of cutworm species attack alfalfa in the Intermountain Region, the variegated cutworm (*Peridroma saucia*) is most common. Cutworms are occasional pests in seedling alfalfa and less frequently a problem in established alfalfa. They can cause serious damage to seedling alfalfa fields by cutting off the seedlings at or just below the soil surface. Cutworms injure established fields by cutting off new growth or feeding on alfalfa foliage.

Cutworms can be extremely frustrating to the grower because they are difficult to detect. They feed primarily at night and hide under debris or in cracks in the soil during the day. Cutworms develop in weedy areas, later moving into an alfalfa field. Fully grown larvae are smooth skinned, are 1½ to 2 inches long, and are brown, gray, or blackish. They often have stripes or spots on their back. When disturbed, cutworms curl up. Adults are dull brown and gray moths that are nocturnal and often attracted to lights.

Management guidelines

Cutworms are most injurious in fields with high plant residue. Historically, cutworms are a problem in early, spring-seeded seedling fields. Tillage prior to seeding is an effective means of preventing cutworm damage. After seedling alfalfa has reached a height of at least 3 inches, flood irrigation can significantly suppress cutworm populations. A thorough harrowing may provide adequate control when cutworms are actively feeding in established fields. Definitive monitoring and treatment guidelines have not been developed because cutworms are a sporadic problem. However, when the number of cutworms exceeds one or two per foot of row or damage is severe, treatment is usually warranted. Spray in the late evening or night, when cutworms are actively feeding.

CLOVER ROOT CURCULIO

The clover root curculio (*Sitona hispidulus*) adult is similar in appearance to the alfalfa weevil adult but is about one-third smaller and has a shorter, blunter snout. It has a mottled brownish coloration on its back rather than the dark brown "stripe" of the adult alfalfa weevil. The adult clover root curculio feeds on alfalfa foliage during the summer and causes irregularly shaped notches in leaf margins. The white grublike larval form causes the most damage by feeding on the roots. Larvae begin feeding on root nodules and fibrous roots and subsequently chew large cavities along the sides of the taproot (color photo 7.5).

The clover root curculio overwinters as an adult under trash and debris on the soil surface. Females lay

Table 7.2. Control action thresholds for summer worms.[1]

PEST	NUMBER OF WORMS/SWEEP
Alfalfa caterpillar	10 nonparasitized and disease-free worms
Beet armyworm	15 nonparasitized worms ½ in. or longer
Western yellowstriped armyworm	15 nonparasitized worms ½ in. or longer

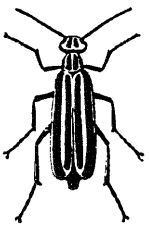
1. Data apply to the sweeping method of sampling, which this chapter describes in the section on alfalfa weevils.

At the very least, sample fields once a week when pests are likely to occur.

their eggs on leaves or on the ground early in the spring. The larval stage lasts about 3 weeks. A larva is about ¼ inch long with a white body and a light chocolate-colored head.

Management guidelines
Clover root curculio has been found in numerous fields in the Intermountain Region. It is a perplexing problem for several reasons. First, to detect a problem, the grower must dig up plants and inspect the roots. Second, the magnitude of damage caused by this pest is not well understood. Some suggest that larval feeding contributes to winter heaving and may enhance the entry of disease organisms such as bacterial wilt and root rots. Some research has attributed significant losses of quality, stand, and yield to the clover root curculio, but only when infestation is severe. Third, control is extremely problematic; no insecticides are registered for the control of clover root curculio and no resistant varieties of alfalfa have been developed. Plant stress from the feeding of clover root curculio larvae is affected by soil moisture content, with greater injury occurring in dry soils. Therefore, maintaining soil moisture at optimum levels is one method of mitigating the effects of clover root curculio.

BLISTER BEETLES

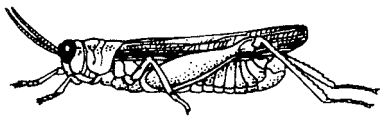


Blister beetles are an occasional, isolated problem in parts of the Intermountain Region. Some species produce the toxin cantharidin, an irritant that can cause blisters on internal and external body tissues. The toxin, not beetle feeding, is extremely significant because it causes sickness in livestock and can even kill them. Even if beetles are killed, the problem may not be solved. Cantharidin remains in the bodies of dead beetles and can still cause injury if baled with the hay. There are very few reported fatalities in cattle and sheep, but contaminated hay can be deadly to horses (cantharidin from only a few dead beetles can kill a horse). Therefore, do not sell blister beetle-infested hay to horse owners.

Blister beetles are rather large (½ to 1 inch long) and can be various colors (black, gray, brown, or striped). They have long, soft cylindrical bodies and a pronounced "neck" area that makes them easy to distinguish from other beetles. Blister beetles overwinter as larvae in the soil and emerge as adults in the spring. Females deposit from 50 to several hundred eggs in soil crevices. After hatching, larvae feed on grasshopper and cricket eggs. Adults fly into alfalfa fields, where they feed on alfalfa foliage. The beetles are usually found in late spring and summer. Blister beetles are often worse in alfalfa fields adjacent to weedy grassy areas that contain an abundance of grasshopper eggs.

Management guidelines
Before treating an alfalfa field, ascertain whether the beetles contain cantharidin by having the beetles identified by a trained entomologist. Treating blister beetle species that do not is probably unnecessary. Managing blister beetles is difficult. Treatment thresholds have not been established, and chemical controls often do not eliminate the problem (because dead beetles can be picked up in the hay and more beetles can migrate into the alfalfa field). Several insecticides are registered for blister beetle control. Strip-spraying field edges may be the best approach when blister beetles are observed in adjacent areas.

GRASSHOPPERS



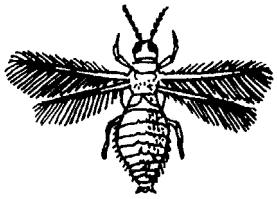
Grasshoppers (*Melanoplus* spp.) are an infrequent problem in alfalfa. However, left uncontrolled, severe outbreaks are capable of destroying crops. Populations are often worst in drought years. Grasshoppers are most often a problem in isolated fields in foothill areas near weedy or grassy areas where they overwinter. Grasshoppers deposit their eggs in soil in the fall and hatch in the spring. A

nymph, the immature form, becomes an adult in 40 to 60 days. Mass migration of grasshoppers to alfalfa fields from overwintering sites can occur in the spring, when the natural vegetation starts to dry.

Management guidelines

In areas with a history of grasshopper infestations, check overwintering sites to detect potential problems while infestations are isolated and insignificant. An effective control measure involves creating a 60-foot vegetation-free buffer strip around the field and applying an insecticide bait to the strip. Insecticide use in a field is advised when grasshopper populations reach 20 per square yard in field margins or 8 per square yard within the field. Spot treatment can be very effective when grasshopper populations are isolated.

THRIPS



Thrips (*Frankliniella* spp.) are tiny insects with rasping mouthparts. These insects are very common in the Intermountain Region, and their feeding causes wrinkled and distorted leaves (color photo 7.6). There are no data to suggest that they cause economic injury. Although leaves can be severely distorted and look unsightly, treatment is not recommended.

ADDITIONAL READING

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