

INSECT PESTS

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Major pests of alfalfa grown for seed are lygus bugs, aphids, alfalfa seed chalcid, twospotted spider mite, alfalfa weevil, armyworms, cutworms, loopers, thrips, and grasshoppers. Some are a yearly problem, others break out sporadically. Populations of the various species peak at different times during the year, depending on temperature and other factors. Cultural practices can help control of certain insects.

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Seeds used as food by lygus bugs soon shrivel, turn dark, and will not germinate.



The fifth instar (stage) of lygus bugs has well-developed wing pads. It is the most damaging stage and also is most resistant to chemical control measures.

LYGUS BUGS

Lygus bugs are the most important pest of alfalfa seed production. There are two major species: *Lygus elisus* and *L. hesperus*. The immature nymphs and the adults both feed on alfalfa. The adult insect is slightly less than ¼ inch long and about half as wide. Color varies from pale green to a light brown to a dark reddish brown. There is a distinct, centrally located, light-colored triangle about one-third of the distance down the back from the head.

The egg is slightly curved, elongated, and has a caplike structure on the exposed end. Eggs are inserted into the plant tissue, usually in the top 3 inches of the plant. First and second instars are frequently mistaken for aphids, but are much more

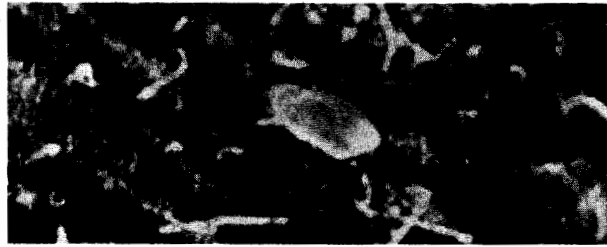
active. Their color is normally a shiny bluish green. As the nymphs grow, the color varies from yellow-green to reddish brown. The first three instars are greenish; the fourth and fifth instars vary from green to brown with darker markings and noticeable wing pads.

Damage. Feeding lygus bugs produce several types of injury. Lygus have sucking mouthparts and physically damage the plant by puncturing the tissue and sucking the plant juices. There is also a toxic reaction caused by the saliva of the insect. Greatest damage is caused when lygus bugs feed on the buds. Injured buds turn tan to white, wither, fail to develop, and fall from the plant within two to five days. High populations may cause severe loss of buds and the field will take on a grayish cast.

Lygus bug adults and large nymphs feed on immature seeds. They pierce the pod and suck the juices from the developing seeds. Seeds at first turn brown and later nearly black. They shrivel and will not germinate. Lygus bug feeding will also cause blossoms to drop. Not all dropped blossoms can be attributed to lygus bugs, however, because an unpollinated alfalfa blossom will wither and drop in about five days. Infestations can also affect growth of the plant. Stem length is reduced and stems become excessively branched with shortened internodes.

Life Cycle. In most areas, lygus bugs overwinter as adults, but in warmer parts of the West, adults can be swept from plants all winter. Eggs and nymphal forms are found in southern Arizona in all months except December. The number of generations per season will vary with temperature; three generations are normal in the cooler seed-producing areas with a partial fourth in warmer areas. During the summer in the intermountain region, each generation requires from five to six weeks.

Eggs are laid shortly after adults become active in the spring. They hatch in about a week, but cool weather may delay hatching up to three weeks. Lygus bugs have five nymphal instars. Total time for development is two to three weeks. Nymphs are common in alfalfa seed fields in mid- to late May, late June to mid-July, and mid- to late August.



A lygus bug egg inserted into plant tissues with just the end protruding. These eggs are difficult to find.

Lygus bugs are general feeders and are found on many herbaceous plants. They damage a number of cultivated crops in the western United States, including alfalfa, cotton, beans, and sugarbeets grown for seed. The more important weed hosts in the alfalfa seed-producing areas include mustards, lambs-quarters, flixweed, Kochia, Russian knapweed, and Russian thistle.

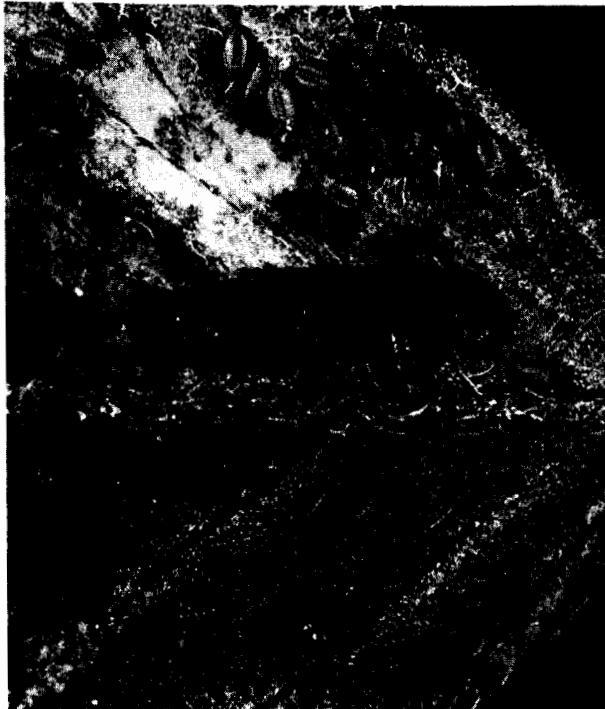
APHIDS

As a group, aphids are easily the second most important pest in the western inland alfalfa seed producing region. Four species are common. The spotted alfalfa aphid, *Therioaphis maculata*, an introduced pest important in the late 1950s and 1960s, has recently become increasingly troublesome in Nevada, southern Idaho, and in southern and central Utah. The blue alfalfa aphid, *Acyrtosiphon kondoi*, a newly introduced aphid, has been found in all of the seed producing areas with severe outbreaks occasionally in most areas. The pea aphid, *A. pisum*, found in all areas, is the most common. *Macrosiphum creelii*, the alfalfa aphid, has a more northern distribution. It is found in Washington, Oregon, Idaho, and Montana. It has not been found in Nevada or Utah.

Spotted Alfalfa Aphid

This aphid is the smallest ($\frac{1}{16}$ inch) of the four species and the most important on alfalfa. It is pale yellow or grayish and has four to six rows of raised dark spots on the back with small spines emerging from the dark spots. Winged forms have smoky areas along the wing veins. Distribution on the alfalfa plant is usually on the underside of the leaves on lower

portions of the plant. This aphid secretes large amounts of honeydew which supports the growth of a black sooty mold. Characteristically, spotted aphids will jump off alfalfa plants when disturbed.



A colony of spotted alfalfa aphids on a leaf.

Damage. When feeding, the spotted alfalfa aphid injects a toxin that kills seedling alfalfa and causes considerable injury to established stands of susceptible varieties. Growth will be severely stunted with considerable yellowing of the leaves. Heavily infested fields appear dried. Populations allowed to remain on plants kill nonresistant varieties and thin the stand. An average of one spotted aphid per plant in seedling stands can cause loss of the entire field. As few as 20-40 aphids per stem on older plants can cause severe injury. To avoid serious losses, begin control before the development of large populations.

Life Cycle. The spotted alfalfa aphid overwinters as adult females or nymphs in the northwestern region, except Washington. Eggs have not been found or are rare in the states involved. Overwintering aphids are found 4-5 inches below the soil sur-

face along the taproot when the ground is cracked. As the temperature begins to warm, overwintered, wingless adults reproduce without mating and give birth to living young. Males have been found, but are rare. Most rapid development is at about 85°F. when the relative humidity is 60-70%. As summertime temperatures rise to near 100°F, aphid development is greatly reduced. Before becoming adults, spotted alfalfa aphids pass through four nymphal stages. During the summer, development from birth to maturity may take place in less than a week. There are many overlapping generations each season.

Blue Alfalfa Aphid

The blue alfalfa aphid was first recognized in California in 1974. First thought to be a possible biotype of the pea aphid, it proved to be a newly introduced species. The aphid is now recorded throughout the seed producing area.

Damage. Blue alfalfa aphids feed chiefly on the buds of alfalfa, where they form tight colonies on the elongating stems, usually covering the growing tips. Damage is severe and second only to that produced by the spotted alfalfa aphid. Large amounts of honeydew are produced and the alfalfa stems become very sticky, but sooty mold is usually absent. Leaves show a noticeable yellowing. The aphid apparently injects a toxin which retards growth, producing a marked stunting. Recovery from stunting is slow and plant regrowth may be retarded for up to two weeks after the aphids are no longer present.

Description. Color is useful in field identification in the southern range. The blue aphid is bluish green and the pea aphid is yellowish green to light green. This color difference is not reliable in northern areas. When viewed with a hand lens, the color of the third antennal segment of nymphs and adults and the color of the thoracic area of winged forms is diagnostic. The third antennal segment of the pea aphid has a narrow dark band at the tip, while antennae of the blue aphid are uniformly brown. The thoracic area of the winged blue alfalfa aphid is dark blackish brown. The pea aphid is light brown between the wings. Final identification should be made in the lab.

Populations of the blue alfalfa aphid vary from field to field. High populations may occur in early spring, acting as a set-back to the field without causing severe loss to seed crops. Infestations of this aphid in the fall are very spotty.

Pea Aphid

The pea aphid was first reported in Illinois in 1879, and is believed to have been introduced from Europe. It has spread throughout the United States, infesting a number of crops and various weeds of the legume family. Peas are the favored host and alfalfa is considered second in preference.

Damage. Heavy infestations on alfalfa cause the plants to wilt and turn yellowish green. Severe stunting and even dying of plants has been observed but is not common. Heavy infestations of 1,000 or more per sweep can cause the alfalfa blooms to drop. Production of honeydew is not common and sooty mold growth is less than with the spotted alfalfa aphid. Pea aphids congregate in rather dense colonies along the stems, terminal shoots, and leaves. The damage produced by 40 pea aphids per sweep has been calculated to approximate that of one lygus bug per sweep.

Description and Life Cycle. Adult pea aphids are about $\frac{1}{8}$ inch long and green, yellow-green, or pink. They may be winged or wingless. At times large numbers of winged forms are produced. Overwintering females give birth to 100-150 living young at the rate of 5-7 per day. During the summer, young may be produced at the rate of 10-14 per day. The number of offspring and their rate of development varies with temperature, but usually there is some decrease in midsummer. There are, however, occasions when populations will increase rapidly in midsummer. This phenomenon is not fully understood. Nymphs will molt four times, mature, and begin to reproduce in 8-12 days and continue for 18-20 days. Pea aphids normally overwinter as eggs. In warmer areas or in protected places, the pea aphid is able to overwinter as nymphs or adults. In colder regions, male pea aphids begin to appear in the population in the fall. Females born at this time will be egg-producing females. After mating, small, shiny, green eggs which later turn black

are attached to alfalfa stems and leaves and remain through the winter. The eggs hatch in late March or early April when temperatures are cool (35-40°F.) and become stem mothers that produce the winged females. Later, these winged forms migrate and move long distances when assisted by winds.

Alfalfa Aphid

Damage. Alfalfa aphids cause the same type of damage as pea aphids. Stunted growth, yellowed and wilted foliage, damaged buds, and limited production of honeydew with sooty mold formation are common symptoms of damage.

Description. Alfalfa aphids are the same size as pea aphids and cannot be distinguished from them in the field. Alfalfa aphids may be green or pink, varying from yellow-orange and light pink to lavender. Color may vary with the time of year. Pink aphids collected in the late fall, winter, or early spring are always pea aphids. Pink aphids found during the late spring or summer are usually alfalfa aphids.

The alfalfa aphid is closely related to the potato aphid and probably overwinters as eggs on roses or other plants in the rose family. Their production and development rate is similar to the pea aphid and varies with temperature.

ALFALFA SEED CHALCID

Until recently, this small wasp was referred to as the clover seed chalcid, however the complex has been separated into several species. *Bruchophagus roddi* is the species now recognized as attacking alfalfa seed. The clover seed chalcid, *B. platypterus*, will not infest alfalfa.

Damage. Consumption of the seed contents is the only damage produced by the alfalfa seed chalcid. Seed losses as high as 85% have been recorded in southern Nevada. Damage usually varies from less than 2% to as much as 15%. Damage from the alfalfa seed chalcid is often not recognized. Seed chalcid damage is not reported because many seeds are crushed and blown out with the chaff during harvest.

Damage varies greatly from year to year and from field to field. As a general rule, later-developing seed sustains more damage than the early seed set. This is due to chalcid populations building up first on volunteer alfalfa and still more as the first and second generations develop.

Description. This pest is a small, shiny, jet black wasp about $\frac{1}{12}$ inch long. The female has a slender ovipositor at the end of the abdomen which she uses to insert her eggs into the young, developing seed. Seed nearing maturity is not attacked. Only one chalcid larva can develop within an alfalfa seed. Infested seeds are plump and light brown, while uninjured seeds have a healthy green appearance before they are mature.



Left to right: a healthy alfalfa seed, a seed infested with a seed chalcid grub, the grub removed, and a seed from which the adult wasp has emerged.



The alfalfa seed chalcid is a tiny, shiny black wasp.

Life Cycle. Alfalfa seed chalcids spend the winter as fully grown larvae within individual seeds. Overwintering can take place wherever seed is found—in seeds remaining on the plants surrounding a seed field, unharvested plants grown for hay, seed remaining in screenings, and seed that has been stored through the winter for spring planting. Larvae pupate

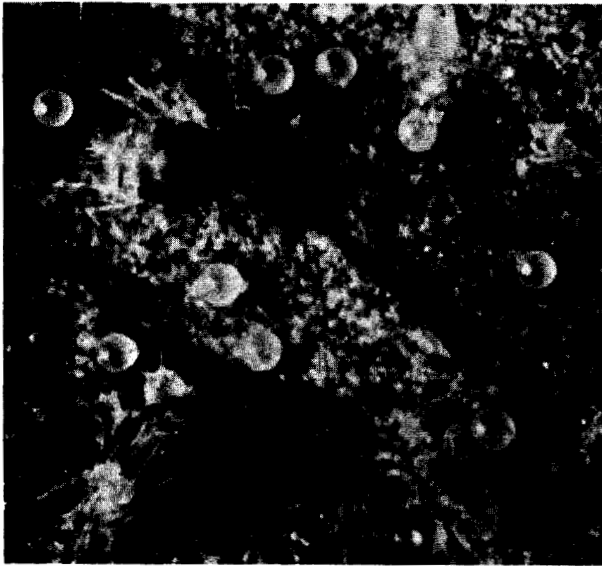
within the seed during late spring. After a two-week pupation, adults emerge by chewing their way out of the seed. Mating takes place almost immediately. The female lays only one egg per seed. Eggs hatch in about 10 days and the larva requires about two weeks to develop. There are two or three generations per season. Mature larvae can remain in a seed for two years before pupating. Serious infestations can develop when there is a large supply of infested seed left in the field at harvest, on the plants around the field margin, or on volunteer plants in fence rows and roadways.

Control. There is no chemical control for alfalfa seed chalcid. Volunteer plants near seed fields should be eliminated. Cultural practices, such as harrowing or disking to bury chalcid-infested seeds, are particularly effective when followed by an irrigation of at least 1 inch. Any chaff that is not worked into the soil should be destroyed by either burning or composting prior to the emergence of chalcids in the spring. Infested seed should be recleaned and the screenings destroyed. When possible, cutting and removal of hay during May will delay the cycle and reduce populations. Cultural controls will not totally eliminate chalcids, but good cultural practices are important in reducing chalcid numbers.

TWOSPOTTED SPIDER MITE

Damage. Mite damage fluctuates from year to year; it is usually worst in dry years. Mites usually establish themselves in colonies on the lower leaf surface. They spin a web with thin, light strands of silk. Leaves, flowers, flower buds, and stems can become completely enclosed in a fine sheet of webbing which can seriously interfere with pollination.

First indication of a mite infestation is a white, stippled appearance on the upper leaf surface, produced by the mites puncturing the lower leaf surface and feeding. First stippling will usually be located in the central area of the leaf. As more mites are produced, the stippled areas increase in size. When most of the chlorophyll has been removed, the leaf will turn brown and wither, and plants appear to be dry or severely stressed. Heavy mite infestations kill plants.



Twospotted mites and eggs on the underside of a leaf.

Description. Twospotted spider mites, *Tetranychus urticae*, are microscopic, about $\frac{1}{50}$ th of an inch, although males are smaller than females. Mite populations vary from pale yellow to pale or dark green. Brown, and occasionally orange-colored, forms can also be found.

Life Cycle. Mites generally overwinter in a semi-active condition on the plants that remain green, in soil cracks, under debris, or in other protected places. Females lay clear, spherical eggs on the lower surface of the leaf, intermingled with webbing and other members of the mite population. The first instar or larval stage has three pairs of legs and is pale green with two black spots on its back. All other stages have four pairs of legs.

Mite populations develop rapidly in hot weather and a complete generation is produced every 10-21 days. Adults live about two weeks during the summer, but much longer in cooler weather. Mites are mainly a concern in alfalfa seed fields that have been overstressed during July. This usually occurs during drought seasons. Later infestations occurring in August are usually not serious.

ALFALFA WEEVIL

The alfalfa weevil, *Hypera postica*, was introduced into Utah from Europe in 1904 and has spread to all western states where climatic conditions are favorable for its development. This weevil is a pest only on alfalfa, but is able to pass through all of its developmental stages on several species of clover and vetch.



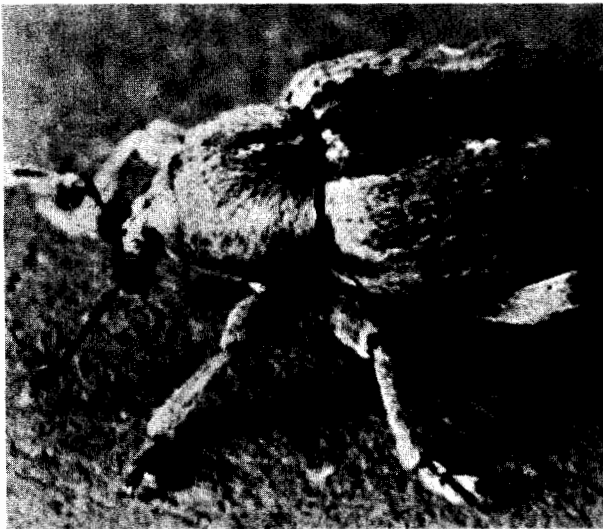
Foliage damaged by alfalfa weevil larvae is skeletonized and gray. Twenty per sweep is the threshold.

Damage. Adults and larvae of the alfalfa weevil feed on alfalfa leaves and buds. When first hatched, the larvae begin to feed within the stem. While still in the first instar, they work their way up to the leaf buds, usually at the tip of the plant, and eat into the buds. The plant may produce new buds below this point, but these are frequently destroyed by other larvae. Older larvae feed mostly on open leaflets, but will also feed on terminal buds. Larval infestations stop plant growth, skeletonize the leaves, and destroy buds. A field with a large adult population at the time of the first cutting will often be held back several weeks by weevils feeding on the epidermis of the stalk, frequently rasping off the entire length. Later, the new adults feed on leaves and cause considerable damage that generally goes unrecognized. Early in

the season, weevils may cause damage by feeding on young developing shoots.

The weevil is most injurious in areas with short growing seasons where the crop is not clipped prior to starting a seed crop.

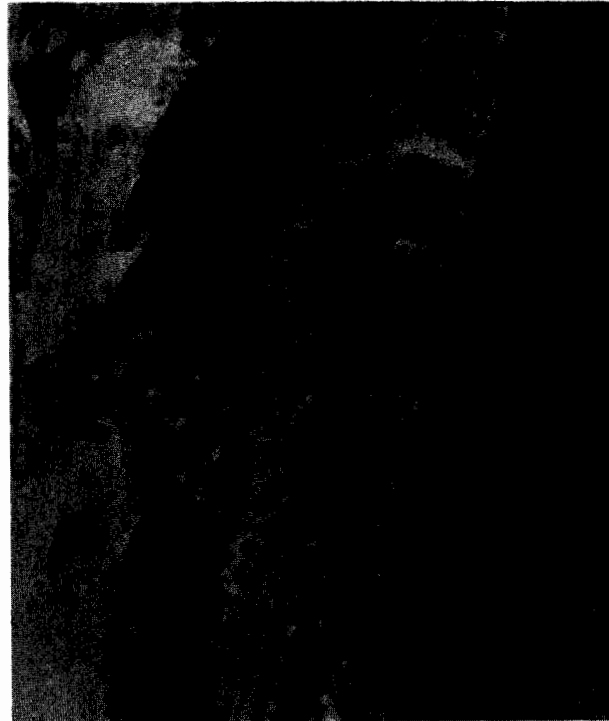
Description. Adult weevils average $\frac{1}{4}$ to $\frac{3}{10}$ inch long. They are light brown with a distinct dark line down the center of the back. Two bands of brownish lines extend down the middle region, separated by a narrow gray area. The color is produced by scales that are rubbed off as the weevil moves about. Overwintered adults often appear dark gray or black because of the loss of scales during late summer and winter months. The eggs are smooth, shiny, yellow, and translucent. Eggs are laid 3-6 inches above the soil in the pithy, central portion of the stem, through a hole eaten by the female. Several punctures may be made before the eggs are laid. First larval instars appear yellowish green; later instars are a darker green with a white stripe extending down the back. Pupation takes place in a round, coarsely woven cocoon, found in debris at the base of the plant. The larva, the greenish pupa, or the new adult may be easily seen within the cocoon.



The alfalfa weevil has a definite, turned-down snout and a dark marking down the middle of the back.

Life Cycle. The alfalfa weevil overwinters as an adult in leaves, trash, weeds along ditch banks, haystacks, and other protected places. Adults become

active early in the spring, often as early as mid-February. Mating takes place and eggs are laid as suitable egg laying sites develop on the plant. Eggs are usually laid in groups of 10-20 though as many as 40 can be found at one site. The female may lay 600-800 eggs during her lifetime. The larvae develop in about three weeks, which is about the time of first cutting in the intermountain region. Larvae then drop to the ground, spin cocoons, and pupate. Pupation lasts about 10 days. Adults feed on the alfalfa throughout the summer and go into hibernation early in the fall. During the summer feeding period, adults can be swept from the plants at night. There is normally only one generation a year.



The female alfalfa weevil chews a hole in the hollow stem and lays her eggs inside.

ARMYWORMS

The main armyworms on alfalfa seed crops in the Pacific Northwest are the bertha armyworm, *Mamestra configurata*, and western yellowstriped armyworm, *Spodoptera praeifica*. In the typical dark form, the bertha has a light yellow stripe down the sides and a solid-colored head capsule. The western

yellowstripe has a dark orange stripe on the sides and a white "V" marking on the head. Both usually have two generations each season, but it is the first generation which sometimes shows up in alfalfa during July. Outbreaks of bertha armyworms have occurred in alfalfa seed fields at three-year intervals during the past ten years, usually in weedy spots. Apparently the moths lay their eggs on plants such as lambsquarters, and the developing larvae move into the alfalfa as they get older. However, in the drought year 1977, bertha armyworms heavily infested and severely damaged lush, non-weedy fields throughout all Washington seed areas.



Dark form of the western yellowstriped armyworm has an orange stripe down the sides and white "V" marking on the head.

CUTWORMS

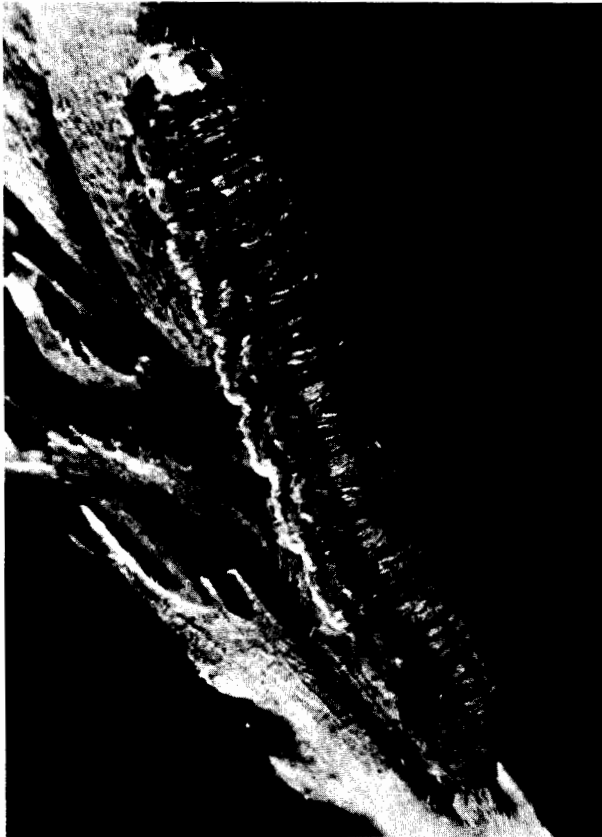
Redbacked cutworms are the most common cutworm to damage alfalfa seed crops, but actually, this is a complex of about a half-dozen very similar species. The redbacked cutworm, *Euxoa ochrogaster*,

is most prevalent on asparagus, but a closely related species, *E. septentrionalis*, is usually involved in outbreaks on alfalfa. The variegated cutworm, *Peridroma saucia*, is the more important species in southern areas. Redbacks winter as first stage larvae inside the egg shells; they start feeding in early spring. Outbreaks are usually noted in April and May. If the larvae are mainly feeding on foliage at night, they do not cause economic damage to the seed crop. They can be found during the day only by digging in the soil around the base of the plant. If they remain in the soil and feed on the crowns and roots, they can thin out the stand, typically in low areas or swales of a field. Control is difficult at best. Weather is often cold at the time damage is occurring and the worms simply don't come up out of the ground and contact the treatment. Irrigation before treatment to drive the worms out of the ground can help. Night applications when the cutworms are up on the foliage are more effective than treatments during the day. Baits have sometimes been effective, but it is difficult to prepare a bait more attractive than the alfalfa.

LOOPERS

Two species of loopers occasionally cause severe damage to alfalfa seed fields. The alfalfa looper, *Autographa californica*, occurs more commonly in the northwestern seed area. The cabbage looper, *Trichoplusia ni*, is more common in southern areas. All stages of the two species are very similar. The larvae vary from a light, translucent green to an intense dark green, almost black. Young larvae are about $\frac{1}{16}$ inch long, but when mature may exceed $1\frac{1}{4}$ inches. They have a distinct head with faint to distinct white lines down the sides of the body and along the back. The larva tapers from head to rear. There are three pairs of true legs on the forward, smaller portion of the body directly behind the head. Two pairs of prolegs are located toward the rear of the body and one pair on the last segment. All larvae move with a looping motion. Pupae are found inside white cocoons, protected by webbing attached to surrounding vegetation. Pupae within the cocoon may be green to very dark brown. Pale ivory eggs are laid singly on the stems and leaves of the host plant.

Damage. Small larvae, about ¼ inch in length, feed on the leaf surfaces. As the larvae grow to about ½ inch long, they begin to eat ragged holes through the leaves. Larger larvae feed on the leaf margins and may defoliate a large portion of the plant.



Redbacked cutworms often have a reddish stripe down the back. Injury occurs mainly in May.

Life Cycle. Loopers overwinter as pupae in the soil or in plant debris near the base of the host plant. Adults emerge when temperatures are still relatively cool in late March to early April. Moths first begin to lay their eggs on weed hosts such as lambsquarters. Each female may lay up to 1,600 eggs. Egg hatching takes place in 3 to 5 days, followed by five larval stages which pass in about 15 days. Pupation lasts from 7 to 9 days. Adults fly on dull, calm, cloudy days and at dusk or after dark when the temperature is about 50°F. The total number of generations per year will depend on local weather. Alfalfa looper populations peak from May to late June, but cabbage loopers are more abundant in late August or early

September. Chemicals are usually not necessary to control loopers in alfalfa seed production. Pesticides applied on the crop for other pests will hold them in check and, in addition, populations are frequently reduced by a granulosis virus and/or other diseases. Infected larvae usually become white, lumpy, and break to form liquid smears when caught in a sweep net.



Alfalfa loopers are usually green with white stripes and have only three pairs of stump prolegs in addition to the three pairs of typical legs near the head.

THRIPS

Damage. Thrips feed on alfalfa blooms, buds, and leaves. When feeding is severe, leaves become distorted and silvered, and blooms turn a mottled brown. The effect of this damage on an alfalfa seed crop has not been determined and no control methods have been developed.

Description. Thrips found in alfalfa are usually the western flower thrips, *Frankliniella occidentalis*,

although other species may be present. Thrips are small, slender insects. Adults are about $\frac{1}{16}$ inch long, usually dark brown to black, with two pairs of very slender wings of equal length. The wings are nearly veinless and fringed with long hairs around the edge. At rest, the wings are folded flat over the back. Immature forms are wingless and light brown.

GRASSHOPPERS

Grasshoppers may damage alfalfa seed fields. The nymphs or immature grasshoppers appear similar to adults except they are smaller and wingless. Their color may be black, brown, or grey mixed with yellow. They vary from small to over 2 inches long. Grasshoppers in alfalfa are usually winged and are strong flyers.

Damage. Grasshoppers are voracious feeders and can severely damage seed alfalfa. Large populations may devour the entire plant, including leaves, buds, flowers, and young seedpods, but extensive damage is not common. Mid-summer infestations often prune off seedpods by feeding on the soft tissue at the base of the raceme.

Life Cycle. Grasshoppers overwinter in the egg stage. The eggs are laid in protective pods about an inch below the soil surface. Each pod may contain 20 or more eggs and each female may lay up to 20 pods during her reproductive period. Eggs are laid in well-defined egg beds, some within cropped fields, other in weedy areas along ditch banks, fencerows, or on the open range. Eggs usually start to hatch in late May and hatch can continue for one to two months. Grasshoppers will mature in 40-60 days, followed by mating. Feeding continues and females will lay eggs until the first frost.

Alfalfa fields can become infested with grasshoppers hatched within the field or migrating from border areas or open range. Individual growers can usually protect a field from small infestations, but a large outbreak requires control programs covering a large area.