Legume Insects of Oregon

How to Mix and Apply Insecticides

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If you are raising legumes for hay or seed, it is very likely you will have trouble with insects. Some insects attack foliage, others the blossoms or seeds. Still others damage roots or injure plants in the seedling stage. Information in this bulletin is the result of experimental work done at Oregon State College, other state college experiment stations, and by the U. S. Department of Agriculture.

In the illustrations, actual size of the insect is shown as well as an enlarged drawing to aid in identification. Host plants and distribution of insects in the state, while not complete in all cases, help in recognizing insect pests. As a further aid in identifying injurious insects, the diagram on page 7 shows the point of attack of the most common pests.

Mrs. Patricia R. Hansen, Corvallis, made the insect drawings in this bulletin.
Insecticide Formulations

Pure insecticides are usually coarse or sticky solids or syrupy liquids that cannot be sprayed or dusted. The insecticide is usually diluted with a neutral carrier which may be an inert dust or a liquid. Water will not dissolve most insecticides. They may be suspended, however, as fine particles in water, or may be dissolved in a solvent later emulsified in water. Some insecticides may be dissolved in kerosene or other organic solvents to produce a true solution.

Dusts

Most insecticidal dusts contain an inert carrier such as talc, clay, or diatomaceous earth. Others, such as sulfur dusts, are merely finely ground insecticides. Dusts are not as readily absorbed through the skin as sprays, but may be dangerous if inhaled.

Dusts usually contain from 1 to 10 per cent active ingredients. The percentage of actual insecticide in the dust mixture is stated on the label. This must be taken into consideration in computing the amount of mixed dust to apply per acre. For example, 2 pounds of actual toxaphene per acre is one of the suggested insecticides for control of lygus bugs on alfalfa or Ladino clover.

If a 10 per cent dust is applied, it would require 20 pounds of the dust per acre. The amount of dust needed for any control is easily determined from Table 1 on page 5.

Wettable powders

The wettable powders, used to prepare suspension sprays, contain an insecticide blended with an inert dust. A wetting agent is added to facilitate mixing the powder with water. This forms a suspension rather than a solution, as the fine particles are suspended in water, not dissolved. For this reason, suspensions require constant mechanical agitation to prevent solid particles from settling to the bottom of the spray tank. Suspension sprays are abrasive and cause rapid wear in gear-type pumps.

Suspension sprays are less hazardous to the operator than solutions or emulsions as most suspensions are not readily absorbed through the skin. In handling highly toxic insecticides, such as parathion, extreme caution should be observed not to inhale insecticides when concentrated wettable powder is emptied into the spray tank because the powder has a tendency to billow up from the tank opening. Suspension sprays are also less likely to cause foliage burning than the solution or emulsion sprays. Wettable powders usually contain from 15 to 75 per cent active ingredients. The amount of wettable powder to be used per acre can be determined from Table 1 on page 5. For example, 1 pound of actual DDT per acre is suggested for vetch weevil control. If a 50 per cent wettable powder is used, it would require 2 pounds of wettable powder, diluted with water, for each acre treated.

Emulsifiable concentrates

Emulsifiable or emulsion concentrates are made by dissolving the technical grade insecticide in an organic solvent and adding an emulsifying agent. The concentrated material is diluted with water to form an emulsion. Emulsion sprays are not abrasive and can be used in all types of sprayers.

Emulsion concentrates usually contain from 1 1/2 to 8 pounds of active ingredient or actual insecticide per gallon. The amount is stated on the label. This is helpful in determining
the dosage to use in insect control. For example, in the early season control of alfalfa weevil, heptachlor at the rate of 4 ounces of actual material per acre is one of the suggested materials. The 25% emulsion concentrate contains 2 pounds of heptachlor per gallon. When diluted with sufficient water, 1 gallon, therefore, would treat 8 acres. The amount of concentrate needed per acre can be determined from Table 1 below.

Extreme caution should be used in handling emulsion concentrates of parathion, TEPP, metacide, and demeton (Systox). These are very toxic materials and can be readily absorbed through the skin. Be sure to follow precautions on the label.

**Oil solutions**

Many insecticides are soluble in kerosene, fuel oil, or other organic solvents. When applied as sprays, the solvent evaporates from treated surfaces leaving a deposit of insecticide. Oil solutions are widely used on specialized insect control projects, such as forest insect pest control or grasshopper control on rangeland. Oil solutions lend themselves to low gallonage per acre airplane application. For example, to control grasshoppers on rangeland, only 2 to 3 ounces of aldrin in 1 gallon of fuel oil per acre is required. Oil solutions are not recommended for use on legume crops because of the danger of burning foliage and blossoms with the solvent.

**Table 1. Insecticide Application. Approximate Amounts of Formulation Needed Per Acre to Obtain Specified Amounts of Actual Insecticide Per Acre**

<table>
<thead>
<tr>
<th>Formulation</th>
<th>Desired insecticide per acre</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2 ounces</td>
</tr>
<tr>
<td>Emulsion concentrate containing 1½ lbs. actual insecticide per gallon.</td>
<td>¼ qt.</td>
</tr>
<tr>
<td>Emulsion concentrate containing 2 lbs. actual insecticide per gallon.</td>
<td>½ pt.</td>
</tr>
<tr>
<td>Emulsion concentrate containing 4 lbs. actual insecticide per gallon.</td>
<td>¼ pt.</td>
</tr>
<tr>
<td>Emulsion concentrate containing 8 lbs. actual insecticide per gallon.</td>
<td>½ pt.</td>
</tr>
<tr>
<td>25% wettable powder</td>
<td>8 ozs.</td>
</tr>
<tr>
<td>40% wettable powder</td>
<td>5 ozs.</td>
</tr>
<tr>
<td>50% wettable powder</td>
<td>4 ozs.</td>
</tr>
<tr>
<td>75% wettable powder</td>
<td>3 ozs.</td>
</tr>
<tr>
<td>1% dust</td>
<td>12½ lbs.</td>
</tr>
<tr>
<td>24% dust</td>
<td>10 lbs.</td>
</tr>
<tr>
<td>5% dust</td>
<td>10 lbs.</td>
</tr>
<tr>
<td>10% dust</td>
<td>10 lbs.</td>
</tr>
</tbody>
</table>
Equipment and Application

Most of the legume insects can be controlled with either aerial or ground application of dusts or sprays.

Dusts may be applied by airplane or ground duster. If a ground duster is used, a canvas drag behind the duster will insure better coverage and improve the control. With aircraft, the effective swath width and the evenness of distribution is less with dusts than it is with sprays. To avoid drift, the dust should be applied when there is no wind.

In recent years, sprays have been used more than dusts for insect control on legume seed crops. Aerial spray planes are usually equipped to apply either wettable powders or emulsion concentrates. Airplane sprays are usually applied in 4-6 gallons of water per acre. The airplane pilot frequently requests the grower to furnish flagmen, or mark the effective swath width of each flight run along the edge of the field.

Weed sprayers designed to apply low volumes of spray at low pressures are often used to apply insecticides. Emulsion concentrates of insecticides, rather than wettable powders should be used in most types of low volume sprayers. Wettable powders require constant mechanical agitation to keep them in suspension, cause excessive wear to some pumps, and frequently clog nozzles. When using low volume sprayers, the best coverage is obtained when at least 15 to 20 gallons of spray per acre is applied. Nozzles that deliver a flat, fan-shaped spray pattern are commonly used with low pressure, low volume sprayers. If the sprayer has been previously used to apply hormone-type herbicides such as 2,4-D, 2,4,5-T, it should be thoroughly cleaned and rinsed with sal soda, lye, or other neutralizing agents before being used to apply insecticides.

Orchard-type hydraulic sprayers having plunger or piston type pumps can be used for the control of legume insect pests. Wettable powders as well as emulsion concentrates can be used satisfactorily in these pumps. Nozzles that deliver a cone-shaped spray pattern are frequently used with these sprayers.

Residue on Forage

Do not feed or pasture forage treated with insecticides to dairy cattle or animals being finished for slaughter. The length of time a chemical residue remains on the crop varies with the insecticide used and the amount applied per acre. Check the label for the recommended time interval between application and feeding or pasturing of the forage. For example, if aldrin is used for alfalfa weevil larvae control, the label will probably state that the insecticide should not be applied within 15 days of cutting for forage or pasturing.

Precautions in the Use of Insecticides

Chemicals which will kill insects should be regarded as dangerous to man and other animals. Insecticides vary widely in their toxicity. Methoxychlor is relatively safe, malathion somewhat less. DDT and chlordane are safe if used with reasonable precautions. More care is required in the use of
heptachlor, aldrin, and dieldrin. The organic phosphorus insecticides such as parathion, TEPP, and demeton (Sys­tox) are highly toxic and must be handled with extreme caution.

To be safe and to keep your children safe, observe all the following precautions regarding all pesticides.

► Read the label carefully.
► Follow instructions on the label.
► Store out of reach of children.
► Dispose of empty containers.
► If you plan to use one of the dangerous organic phosphorus com­pounds follow directions for their use on the label.

Insects Attacking Legumes

Leaves and Stems
- Alfalfa weevil
- Aphids
- Clover leaf weevil
- Clover root curculio
- Cutworms
- Grasshoppers
- Lesser clover leaf weevil
- Slugs
- Spider mites

Flowers
- Aphids
- Flower (or seed) midge
- Grasshoppers
- Lesser clover leaf weevil
- Lygus
- Nitidulid beetles
- Spider mites
- Thrips

Seeds
- Clover seed chalcid
- Clover seed weevil
- Pea weevil
- Vetch weevil

Roots
- Clover root borer
- Clover root curculio
Injurious Insects

Alfalfa Caterpillar
*Colias philodice eurytheme* Bdvl.

The alfalfa caterpillar is smooth-bodied and green. It feeds on the foliage of alfalfa. The adult is a small yellow butterfly with a black border on its wings. It is commonly found in Oregon but rarely causes damage. Methoxychlor is suggested for the control of larvae on alfalfa grown for hay.

Alfalfa Looper
*Autographa californica* (Speyer)

This insect belongs to the cutworm family. Adult moths are dull gray or brown. Mature larvae are slightly over an inch long, dark olive green in color with darker stripes down the back. They move in a looping fashion from which habit they derive their name. They are found in most parts of Oregon and feed on alfalfa, peas, and other legumes as well as many garden crops, flowers, and weeds. DDT as suggested for lygus bug control is effective in controlling them. *Autographa falcifera* (Kirby) is a closely related species for which there is no common name. They occur at higher elevations in eastern Oregon. Larvae of this species are brown instead of green.

Alfalfa Weevil
*Hypera postica* (Gyll.)

Description
Adults are about 3/16 inch long with a medium-sized beak. Newly emerged adults are grayish in color with a broad brownish stripe down the back. As the fine scales covering the body are rubbed off, the beetles become darker. Overwintering beetles are almost black. The larva is green with a white stripe along the middle of the back. When full grown, larvae are about ¾ inch long.

Host plants
Damage caused by the alfalfa weevil is confined to alfalfa. It is found in Baker, Malheur, Union, Harney, Jackson, Lake, and Klamath Counties.
Life history

Adults overwinter in alfalfa stubble, along ditch banks, and field borders. A few weevils occasionally overwinter in the egg stage. Weevils resume activity with the first warm weather in the spring. The first eggs are laid in dead alfalfa stems on the ground. Later, eggs are laid in the stems of the growing plant. Each female is capable of laying several hundred eggs. Eggs hatch during May and early June. Larvae may be found feeding on the plants until early July. Each larva feeds for approximately 3 weeks before it drops to the ground to pupate in an oval net-like cocoon. In about 10 to 12 days the weevil emerges from the cocoon. These adults are active in the field until cold weather approaches.

Damage

Adults feed on the alfalfa plant, but do not cause serious injury. It is the feeding of larvae that must be prevented. The most serious damage is to the first hay crop. Feeding of larvae gives the leaves a ragged or lace-like appearance. This reduces the yield and quality of hay. Continued feeding of the larvae on stubble after the first cutting is removed delays the second crop. This delay is most serious if the water supply is short or the second crop is grown for seed.

Control

The alfalfa weevil can be controlled by application of insecticides in the early spring. Insecticides applied as sprays or dusts in the spring before the alfalfa is 2 inches high will kill the adult weevils before they have had an opportunity to lay many eggs. Apply the insecticides on a sunny day when beetles are active.

If you are unable to treat the field before plants are 2 inches high, you can control the larvae later in the season. Make this application when you notice the larvae damaging the plants. You can destroy many of the larvae by cutting the hay crop in the bud stage. In some seasons this is all the control needed.

<table>
<thead>
<tr>
<th>Time and control</th>
<th>Amount per acre</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Adult control—Early spring application</strong></td>
<td></td>
</tr>
<tr>
<td>Heptachlor</td>
<td>4 ozs. (actual)</td>
</tr>
<tr>
<td>Dieldrin</td>
<td>4 ozs. (actual)</td>
</tr>
<tr>
<td>Chlordane</td>
<td>1½-2 lbs. (actual)</td>
</tr>
<tr>
<td><strong>Larval control—Early summer application</strong></td>
<td></td>
</tr>
<tr>
<td>Heptachlor</td>
<td>1 oz. (actual)</td>
</tr>
<tr>
<td>Aldrin</td>
<td>2 ozs. (actual)</td>
</tr>
<tr>
<td>Lindane</td>
<td>2 ozs. (actual)</td>
</tr>
<tr>
<td>Parathion</td>
<td>4 ozs. (actual)</td>
</tr>
<tr>
<td>Methoxychlor</td>
<td>1-2 lbs. (actual)</td>
</tr>
</tbody>
</table>
Blister Beetles
*Epicauta* spp.

Blister beetles occasionally cause localized damage to alfalfa and clover. The species most likely to be encountered are slender, soft-bodied, black or gray beetles about ½ inch long. Adults feed on foliage; immature forms are often beneficial since they feed on grasshopper eggs. Control of the adults is seldom necessary; but, if needed, DDT or malathion is effective.

Clover Aphid
*Anuraphis bakeri* (Cowen)

**Description**

Clover aphids are small and light green or pinkish-green in color. They hide in protected places on the plant and may be found in great numbers in the blossoms and beneath the leaf stipules. Probably you will first notice the aphids because heads have become sticky with honeydew.

**Host plants**

Clover aphids prefer red and alsike clover, but may attack white or Ladino clover. The insect is present in all seed producing areas.

**Life history**

Sometimes aphids remain in clover fields all winter. In the fall, they may migrate to fruit trees which serve as an alternate host. Aphids resume activity in legume fields in early spring. Continuous generations are produced all summer depending on weather favorable to their development.

**Damage**

Feeding of aphids on plant juices devitalizes the plant and probably reduces seed yield. The most noticeable damage is caused by the honeydew which makes harvesting difficult. Seed caked with honeydew is difficult to clean without special treatment. Honeydew is soluble in water. Late season rains or overhead irrigation frequently clean the heads of honeydew and simplify harvest.

**Control**

Natural parasites and predators, under favorable conditions, are very helpful in reducing damage by clover aphids. There is no satisfactory chemical control. Since aphids are in protected portions of the plant, it has been difficult to reach them with an insecticide.

Clover Case Bearer
*Coleophora spissicornis* Haw.

This insect attacks Ladino clover in California and has been collected in southern and central Oregon. Larvae make a case from flower parts (florets) which serves as a protective covering. They feed upon the florets and seeds and reduce seed yields. Adults are shiny, black moths about ¼ inch long. The base of the antenna is fuzzy and has a ringed appearance at the tip. There is no suggested control program.
Clover Flower Midge
_Dasyneura leguminicola_ (Lint.)

**Description**

This insect is also called the clover seed midge. It attacks red clover and should not be confused with the Ladino clover seed midge, _Dasyneura gentneri_, which attacks Ladino and alsike clover. The adult is a small, mosquito-like fly. The tiny larva, found in the seed pod, is creamy white when small, gradually changing to salmon-pink as it matures.

**Host plants**

Red clover is the principal host plant of the clover flower midge. It is a pest in the Willamette Valley.

**Life history**

Clover flower midges overwinter in the larval stage. They hibernate in tiny paper-like cocoons which are on or slightly below the surface of the ground. They pupate within this cocoon in early spring. Adults emerge in late April and May and lay eggs in the immature red clover flowers. Larvae feed on the flower parts which would normally develop into seed. They later drop to the soil, pupate in a cocoon, and by mid-July the new generation of adults emerge. There are one or two complete generations produced each season. Maggots of the last generation do not pupate, but remain in their cocoon for hibernation.

**Damage**

Larvae, sucking juices from the developing seed ovaries, prevent the formation of seed. Damaged clover heads have an irregular or lopsided appearance. Petals of infested florets fail to open and contrast sharply to the normal open florets of the uninfested blossoms.

**Control**

You do not need to use chemicals to control the clover flower midge. The insect can be controlled by cutting the hay crop before, or during, the first week in June. This will destroy the maggot before it can complete its development.

It is important to remove the hay from the field as soon as possible after cutting. If rain falls on the hay after it has been cut, larvae are able to continue their development. If the first cutting is for silage, make it after May 15.
Clover Leaf Weevil  
*Hypera punctata* (Fabr.)

**Description**

This is one of the largest weevils you will find in clover and alfalfa fields. The adult is about ½ inch long with a short, but distinct, snout. It has a mottled, grayish-brown appearance and indistinct stripes along the back. The sides and underside of this beetle are yellowish-brown. The full grown larva is about ½ inch long, green to yellowish-green in color, and has a pale white line down the center of the back.

**Host plants**

The clover leaf weevil is reported to attack many plants, but in Oregon it is most common on alfalfa, alsike and Ladino clover. The insect occurs throughout the state, but usually in damaging numbers only in central Oregon.

**Life history**

The winter is most commonly passed in the larval stage. Some eggs laid in late fall do not hatch until the following spring. Larvae may feed during periods of mild weather in the fall, or winter, but most of the damage is in the spring. In late spring, they spin a net-like cocoon and pupate in the soil or among surface debris. Adults emerge in June and July and are active until early fall when they lay eggs on or near plants. There is one generation a year.

**Damage**

In some seasons, serious damage is caused by larvae feeding in early spring just as plant growth begins. They are active in late afternoon and evening. During the day they are concealed around the base of plants. Larvae eat small holes in the leaves and irregular patches from the leaf margin. When infestation is severe, damaged plants may be killed or retarded in growth. Adults feeding on plants in the summer do not do much damage.

**Control**

A fungus disease usually attacks the larvae during cool, moist springs. This results in a natural control of the insect. Growers often notice these black and shriveled larvae curled around the stems of the plant.

Some years chemical control may be necessary. Insecticides should be applied when damage is noted and larvae are actively feeding on the plants. If a field is “trashy” from the previous season’s harvest debris, it is advisable to rake the field before application and expose the plants to insecticides.

For early spring larval control, apply 30 to 40 pounds of 40% calcium arsenate dust per acre; or apply toxaphene—20 pounds of 10% dust, or 2 pounds (actual) per acre as a spray.
**Clover Root Borer**  
*Hylastinus obscurus* (Marsh.)

**Description**
Adults are about 1/10 inch long, dull black or dark brown in color. They will be found in burrows within the clover roots except during a short flight period in spring. Larvae are also found in burrows in the roots. They are about 1/10 inch long, creamy white, with brown heads.

**Host plants**
It is a serious pest of red clover in western Oregon and Malheur County. It has not been found in central Oregon, but may occur in other parts of the state. In the Willamette Valley it attacks peas and vetch, but has not been a serious pest on these crops.

**Life history**
The insect spends the winter protected in clover roots. Most of them overwinter in the adult stage, a few in the larval stage. In April and May, beetles leave the roots and fly to uninfested plants within the field or to new fields. If the spring is wet and cool, the flight may continue into June. Eggs are laid in the crown of the plant. The larvae burrow in the roots and feed about 2 months before pupating in their tunnels. New adults feed within the roots until cool weather in the fall. There is one generation a year.

**Damage**
Injury occurs the spring following seeding. The first cutting, taken for hay or silage, is usually not affected. During the summer there is a conspicuous decline in the plants from which you will get your seed crop. Severity of this damage will vary with the infestation and moisture and weather conditions existing during the summer. Injured plants can produce a seed crop if they are not killed early in the season.

Second-year fields often look good in the early spring, only to succumb
after the growing season starts. Examination of roots will enable a grower to determine whether the field should be kept or plowed.

**Control**

It is possible to control the clover root borer and prolong the life of the stand. Aldrin or heptachlor dusts applied at the rate of 2 pounds of actual insecticide per acre are effective. Apply 40 pounds of 5 per cent, or 80 pounds of 2½ per cent heptachlor or aldrin dust in mid-April before the clover root borers begin their spring flight. This application will protect plants from attack when the female beetles attempt to deposit their eggs.

Fields are treated the spring following seeding. That is, the first seed crop year. Fields seeded in February without a companion crop may be attacked if the clover roots reach \( \frac{3}{4} \) inch in diameter before the spring flight of beetles is completed. Under good growing conditions clover may attain this size by June, in which case an insecticide application in April is justified. There is no benefit in treating old red clover stands. Plants infested from the previous season cannot be saved.

**Clover Root Curculio**

*Sitona hispidula* (Fabr.)

**Description**

General color of the weevil is gray or brown. It is about \( \frac{1}{6} \) inch long and covered with small curved hairs. The beak is short and blunt in contrast to other weevils. Sometimes this insect is called the clover root weevil. Larvae are about the same length as the adult, legless, grayish-white with a brown head.

**Host plants**

The clover root curculio attacks practically all legume plants and is present in all seed-producing areas.

**Life history**

Winter is spent in both the adult and egg stages. Some eggs are laid in the fall and winter during periods of mild weather. Eggs are laid in debris and on the soil surface. Most eggs are laid in the spring. Larvae feed on the roots about 3 weeks before pupating in small, earthen cells. Adults emerge during the summer. There is one generation a year.

**Damage**

Injury caused by adults feeding on the foliage is not important. Leaves
Root injured by the larvae of the Clover Root Curculio.

have small crescent-shaped patches eaten from the margins which will help you recognize the presence of beetles in the field.

Most of the damage is caused by larvae feeding on the small fibrous roots, gnawing cavities and grooves on the main root. This damage is associated with declining crop stands, but it has not been possible to prove that this decline is entirely due to the insect.

Control

A control program is suggested for alsike clover even though it has been difficult to evaluate the benefit to seed production. A surface application of DDT to kill adults before they lay many eggs has been effective in Klamath County. Dusting with 20 pounds of 5 per cent DDT per acre, or an application of spray at the rate of 1 pound of actual DDT per acre is suggested.

In those years when it is cold during the fall and winter months, very few eggs are likely to be laid until spring. Application of insecticides in early spring on warm sunny days will control the adults before they lay many eggs.

If the fall is warm and sunny, beetles are likely to lay a considerable number of eggs. Under these circumstances fall application of insecticides is preferable. In some fields there may be a migration of beetles which will necessitate a second treatment in the spring.

Clover Seed Chalcid

*Bruchophagus gibbus* Boh.

Description

This insect is known both as the clover seed chalcid and alfalfa seed chalcid. Adults are black, wasp-like, and about 1/12 inch long. The shiny, metallic appearance of the body and almost complete absence of wing veins are helpful in distinguishing them from other small wasps in the field. Small, white, plump larvae are found within the infested seeds.

Host plants

The clover seed chalcid attacks alfalfa, red clover, crimson clover, birds-foot trefoil (lotus), sub clover, and bur clover. It occurs in all seed-producing areas of Oregon.

Clover Seed Chalcid. Adult actual size and enlarged.
Life history

Larvae overwinter within seeds. These seeds may be on the surface of the field, in unharvested fields, or screenings and straw stacks. In the spring, larvae pupate within the seeds. Adults chew a small hole in the seed through which they emerge to attack blossoms of the first seed crop. Eggs are deposited within the developing seeds. Larvae feed for about 2 weeks on the seed contents. There are at least two or three generations each year.

Damage

Oregon seed growers lose heavily from this insect some seasons. Much of this loss is unnoticed because seeds from which adults have emerged, and many of the infested seeds, are blown out at harvest.

Control

There is no chemical control for the clover seed chalcid. It is generally believed that insecticides applied to control other pests are helpful in reducing chalcid infestation.

Growers who plant clean seed and control volunteer host plants with herbicides along ditch banks and along field borders do much to reduce chalcid numbers. In addition to these practices, it would be helpful if they could feed or destroy screenings and chaff stacks before chalcids emerge in the spring.

Clover Seed Weevil

Miccotrogus picirostris (Fab.)

Description

The clover seed weevil is a small gray insect about 1/10 inch long. Its small size and long beak easily separate it from the other weevils commonly found in clover. A full-grown larva is about ¼ inch long, grayish white, plump, wrinkled, with a small, dark head. The larva is found inside the seed pod.

Host plants

The clover seed weevil attacks white clover, alsike clover, and Ladino clover. It is present in all seed-producing areas of the state.

Life history

Adult clover seed weevils overwinter in fence rows and field trash. They become active in the spring and lay eggs on the florets. Eggs are deposited at the time florets begin to brown and turn downward. Overwintering adults live until late summer and continue to lay eggs as successive blooms appear. Larvae develop by feeding on the newly formed seeds. Each larva feeds for approximately 2 weeks before it drops to the ground to pupate in an earthen cell. Approximately 6 weeks elapse between the time eggs are laid and the

Seed damaged by the Clover Seed Chalcid.
new generation of weevils emerges from the soil. When the clover dries in the fall, these weevils hibernate.

Damage

Adults do some damage by feeding on the base of florets in the spring and on the developing seed pods in late summer and fall. Most of the damage is caused by larvae feeding on developing seeds. Each larva damages from two to four seeds in each pod. Damaged seeds may have holes through the seed or be partially consumed depending on the hardness of the seed when attacked. This damage is frequently not noticed by growers since the seeds are light and most of them are blown out at harvest.

Control

DDT as a dust or spray is suggested for control of the clover seed weevil adult. Dust is applied at the rate of 20 pounds of 5 per cent DDT dust per acre, and spray at the rate of 1 pound of actual DDT per acre. In those areas in which a good lygus bug control program is followed, the seed weevil is usually controlled. Timing of application is very important. Treatment must be delayed until the majority of the weevils are out of hibernation, but before many eggs are laid. This is roughly about the time 20% of the first set of blooms have withered and turned brown. The percentage of brown heads can be determined by selecting small areas in the field and counting the brown heads and the heads in full bloom. It may be necessary to apply a second application if the flight from hibernation is delayed or continued over a long period. Since these insects are small and not easily seen, growers will find it necessary to make frequent checks during the early bloom period with an insect net.
**Cutworms**

*Family Phalaenidae (Noctuidae)*

**Description**

Cutworms are the larvae of the dull-colored, night flying moths often referred to as "millers." The larvae vary in appearance according to species. They are smooth, soft-bodied, and when mature about ¾ to 1½ inches in length. They may be brown or dull gray in color. Some are spotted and others striped.

**Host plants**

Cutworms occur in all parts of Oregon. They feed on many plants and are frequently serious pests of vegetables, fruits, and hops as well as the legume seed crops. They have caused serious damage to clover, alfalfa, and peas.

**Life history**

Most cutworms spend the winter as eggs or partly grown larvae in the soil, under debris, or in clumps of grass. Some species overwinter as pupae in the soil. The overwintering larvae resume feeding early in the spring and reach maturity during April, May, and early June. Larvae pupate in earthen cells. Moths emerge from June to September. They mate, and soon after the female moths begin to lay eggs. Each female lays from 200 to 500 or more eggs in fields on or near the food plants of the larvae. These eggs hatch within a few days. In most of the species there is but one generation a year.

**Damage**

Cutworms usually feed in the late evening or at night, cutting off younger plants near the surface or feeding on the foliage of older plants. During the day cutworms often remain hidden beneath the soil surface. Early season injury is sometimes confused with winter damage. Some species of cutworms feed primarily on weeds, such as dandelion and mustard. If you find cutworms in your field, check to see if they are damaging the crop before applying control measures.

**Control**

Several insecticides may be applied as dusts or sprays to control cutworms. These will be effective only when cutworms are feeding above ground. Irrigation will often bring cutworms to the surface, and insecticides should be applied as soon after irrigation as possible.

Cutworms that feed above ground can also be controlled with poisoned baits. Moistened bran baits containing 3 per cent toxaphene or 4 per cent sodium fluosilicate have been recommended for cutworm control. Baits are most effective when applied late in the afternoon or early evening when cutworms begin to feed. Sprays and dusts have been a more dependable means of controlling most species of cutworms and are replacing baits in Oregon.
If cutworms are suspected at seeding time, work DDT or toxaphene into the top inch or two of soil during seedbed preparation. This treatment will reduce seedling damage.

In eastern Oregon the army cutworm, Chorizagrotis auxiliaris, has been effectively controlled with baits. In central Oregon, toxaphene has been effective in controlling the red-backed cutworm, Euxoa ochrogaster. In the Willamette Valley and other areas, both DDT and toxaphene have given good control of several species of cutworms, including the variegated cutworm, Peridroma margaritosa, and the greasy or black cutworm, Agrotis ypsilon. Either of these insecticides may be applied as a spray or a dust. Apply 20 pounds of 10 per cent dust per acre, or 2 pounds of actual DDT or toxaphene per acre as a spray.

Field Crickets
Gryllus assimilus (Fabr.)

The common field cricket can become abundant in late summer and attack legume seed crops. Adults open the seed pods and feed upon the developing seeds. The spray or dust program suggested for grasshoppers will control the field cricket.

Field Cricket. Actual size and enlarged.

Grasshoppers
Family Acrididae

Description
There are many species of grasshoppers in Oregon, but only a few do much damage to legumes. The migratory grasshopper, Melanoplus mexicanus, is the most widespread and may cause serious damage to crops as well as rangeland. The two-striped grasshopper, Melanoplus bivittatus, and the red-legged grasshopper, Melanoplus femur rubrum, are common in legumes. The clear-winged or warrior grasshopper, Camnula pellucida, adapts itself to many conditions, but is most frequently found in improved pastures or well-sodded meadows. One of the slant-faced grasshoppers, Chorthippus longicornis, occasionally causes serious injury to grass seed crops in western Oregon.
Host plants

Many crops can be seriously damaged by grasshoppers. Of the legumes grown in Oregon, clover and alfalfa, particularly alfalfa seed, are susceptible to injury. Damage to range grasses can be serious, and may reduce the carrying capacity of rangeland and expose the soil to erosion. Grasshoppers are common in most parts of the state, but are of the greatest importance in eastern Oregon.

Life history

In Oregon, grasshoppers have a single generation each year. The female grasshopper lays its eggs in the soil during the summer or early fall. These eggs are enclosed in pods. The number of eggs in each pod varies with the species. Clear-winged grasshoppers congregate to lay their eggs in “beds” in sod or meadow land. The migratory and the red-legged grasshoppers do not concentrate to lay their eggs but prefer to lay them throughout legume fields or other uncultivated crops. Migratory grasshoppers often lay eggs throughout rangeland from which the offspring may migrate into crops. The two-striped grasshopper may lay eggs within cropped fields, but prefers sod or weedy ground along ditch banks and fence rows.

Control

Grasshoppers are easiest to kill when they are immature and before they have developed wings. It is often possible to kill tremendous numbers of grasshoppers by treating relatively small areas if insecticides are applied before grasshoppers scatter from their egg beds or from ditch banks and fence rows into the fields. Where there is the possibility of extensive grasshopper outbreaks involving rangeland, farmers frequently find it advantageous to cooperate with the U.S.D.A. in their control work. County extension agents can be of great help to farmers and ranchers in planning their control program.

Grasshoppers can be controlled with several insecticides applied as either dusts or sprays. Sprays are usually somewhat more effective and cheaper. Where the foliage being treated is dense, a heavier amount per acre is suggested. Toxaphene is preferred for applications to legume crops in bloom because it is less hazardous to bees than other commonly used insecticides.

<table>
<thead>
<tr>
<th>Insecticide</th>
<th>Spray</th>
<th>Dust</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aldrin</td>
<td>2-3 ozs. (actual)</td>
<td>20-25 lbs. 1%</td>
</tr>
<tr>
<td>Chlordane</td>
<td>½-1 lb. (actual)</td>
<td>20-30 lbs. 5%</td>
</tr>
<tr>
<td>Heptachlor</td>
<td>3-4 ozs. (actual)</td>
<td>10-15 lbs. 24%</td>
</tr>
<tr>
<td>Toxaphene</td>
<td>1-1½ lbs. (actual)</td>
<td>15-20 lbs. 10%</td>
</tr>
</tbody>
</table>
Ladino Clover Seed Midge  
*Dasyneura gentneri* Pritchard

**Description**

This midge, except for food habits, resembles the clover flower midge, *Dasyneura leguminicola*.

**Host plants**

Ladino and alsike clover are the principal host plants for the Ladino clover flower midge. It does not attack red clover. This is a new pest and has been found in central and southern Oregon.

**Life history**

Except for host plants the life history is very similar to that described for the clover flower midge. They overwinter in tiny cocoons, become active with the first blooming of the clover, and produce several generations before cool, fall weather.

**Damage**

There is no visible damage to blossoms as described for clover flower midge. Afflicted florets appear normal except they do not produce seed. The tiny maggots suck juices from the developing seeds and prevent seed formation.

**Control**

There is no suggested control for this midge.

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Leafhoppers  
Family Cicadellidae (several species)

Leafhoppers are slender insects, usually less than ¼ inch long, commonly found in legume seed fields. Most species are green or brown with colored spots or lines on the wings and back. They hop when disturbed. High populations may devitalize plants and reduce seed production. Several species are capable of transmitting virus diseases. The amount of damage leafhoppers do to legumes in Oregon has not been established. Methoxychlor or DDT have been effective in controlling them.

---

Lesser Clover Leaf Weevil  
*Hypera nigrirostris* (Fabr.)

**Description**

Adults are about ¼ inch long, green in color with two dark bands behind the head. The head is brown to black with a long, slender, black beak. Larvae are about ¼ inch long, dirty white to yellowish green in color, with a faint stripe down the back.
Host plants

Although this weevil will attack several clovers, it is principally a pest on red clover and alsike clover. It is found in all seed-producing areas of the state.

Life history

Adults overwinter around the base of clover plants or under grass and debris near clover fields. They become active and lay eggs in the buds of the plant or in slits cut into the stem about the time clover growth starts in the spring. Larvae feed on the folded tender leaves, buds, and stems of the plant. They feed for about 3 weeks, spin a cocoon, and pupate on the plant or on the ground. New adults emerge in late June and early July. There is one generation a year.

Damage

Damage is caused by larvae feeding in early spring on buds and unfolding leaves. They tunnel into the stems and cause the plant above the injury to wilt and die. Plants usually recover from early injury and show very little evidence of damage. When infestations are heavy or occur late in the spring, seed yield may be reduced if plants cannot produce enough new growth to recover from injury. Adults feed on clover leaves but do not cause serious damage to plants.

Control

There is no chemical control. It is difficult to contact larvae protected within the plant parts. If infestations are observed early in the season, it is sometimes practical to clip the crop and destroy larvae and unhatched eggs.

Lygus Bugs

*Lygus* spp. (several species)

Description

Adults are about 3/16 inch long. Lygus bugs vary in color from yellowish-green to reddish or dark brown. The presence of a light yellowish V-shaped mark on the back (see illustration) of the adult is helpful in distinguishing lygus bugs from other insects. Nymphs are wingless and frequently mistaken for aphids in the field. They can be distinguished from aphids by their sturdier bodies and ability to move about rapidly. There are several species of lygus bugs in Oregon.

Host plants

Lygus bugs have an extremely wide range of host plants. They are not considered a pest on all legume seed crops. In Oregon, a control is suggested for alfalfa and Ladino clover seed crops.

A combination lygus bug and clover seed weevil control is suggested for alsike clover. Lygus bugs are present in all areas of the state. They are found in the greatest numbers in irrigated areas.

Life history

Lygus bugs overwinter as adults, in or near the fields, under plants, and field debris. In early spring they resume activity during warm, mild days, laying eggs in plant tissue, usually in the terminal growth. The development period from egg to adult requires about 6 weeks. There are several generations produced each season. When hay fields are cut or seed fields become dry, lygus bugs migrate to fields in which there is attractive, green growth. They are active in the field until cold weather forces them into hibernation.
Damage

Lygus bugs feed by sucking juices from the plant. Nymphs feed more actively than adults and are believed to do the most damage. The injury they cause varies with the crop.

The feeding of lygus bugs on alfalfa kills the buds and prevents the formation of seed. They may attack flowers and cause them to drop, or feed on the developing seed pods and cause shriveled seed. There is no conspicuous damage, such as bud killing or flower drop in Ladino clover. By withdrawing juices from the productive portion of the Ladino plant, these insects are capable of causing shriveled seed or preventing the formation of seed.

It has not been possible to demonstrate that the usual populations of lygus bugs are capable of decreasing seed yields of red clover. The extent to which lygus bugs affect seed production of other legumes has not been established.

Control

An application during the bud stage before pollinators are active is suggested in alfalfa seed fields. This treatment will prevent a large population of lygus bugs in the first bloom. A second application is necessary in the bloom stage of alfalfa if lygus bug counts average one insect (adult or nymph) per sweep of an insect net.

In Ladino clover seed fields, one treatment usually suffices. This application is made during the bloom stage when lygus bugs average one per sweep. If possible, delay treating seed fields until adjacent hay fields have been cut. Lygus bugs will migrate from drying hay fields into seed fields.
Apply insecticides in early morning or late evening to avoid killing pollinating insects. Toxaphene is preferred in some instances because it is less toxic to pollinating insects and is more toxic to grasshoppers than DDT.

**Table 4. Suggested Rates of Insecticide Application for Lygus Bugs**

<table>
<thead>
<tr>
<th></th>
<th>Amount per acre</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Spray</td>
</tr>
<tr>
<td>Alfalfa</td>
<td></td>
</tr>
<tr>
<td>Bud stage control</td>
<td></td>
</tr>
<tr>
<td>DDT</td>
<td>2 lbs. (actual)</td>
</tr>
<tr>
<td>Alfalfa or Ladino clover</td>
<td></td>
</tr>
<tr>
<td>Flower stage application</td>
<td></td>
</tr>
<tr>
<td>DDT</td>
<td>1½ lbs. (actual)</td>
</tr>
<tr>
<td>Toxaphene*</td>
<td>2 lbs. (actual)</td>
</tr>
</tbody>
</table>

* If grasshoppers are present, toxaphene is preferred.

**Meadow Spittlebug**

*Philaeus leucophthalmus* (L.)

Spittlebugs have become an important pest of legumes in central and eastern United States during the past 10 years. This insect is present in abundance in western Oregon. It may be causing some damage to alfalfa, clover, and birdsfoot trefoil (lotus), but the extent of this damage has not been determined.

The feeding of young spittlebugs stunts the plants and reduces hay yields. In the central and eastern states spring treatment with toxaphene, methoxychlor, benzene hexachloride, heptachlor, or lindane is used to control this insect.

**Nitidulid Beetle**

*Meligethes seminulum* Lee.

**Description**

In Oregon, this insect is called the nitidulid beetle or black pollen beetle. Adults are small, black, oval, shiny beetles about 3/32 inch long. A helpful character in separating them from other small beetles is the presence of a small knob or club at the tip of the antennae. Larvae are yellowish-white with three lines of dark spots running down the back. When full grown, larvae are about 1/2 inch long.

**Host plants**

Nitidulid beetles are found in all flowers from early spring until late summer. In seed crops they are a pest to red clover and irrigated Ladino clover. They are found throughout Oregon, but are a pest only in the Willamette Valley.

**Life history**

These insects overwinter as adults in field borders and plant debris. They
leave hibernation in early spring, March or April, and feed on the pollen of any plants in bloom. They lay eggs in the flowers of vetch, clover, and lotus, the majority being laid in hairy vetch. Larvae feed for approximately 3 weeks on the pollen of their host plant, then drop to the soil to pupate. Around the middle of July the new adults emerge from the soil. These beetles form the large population that attack the seed crop bloom of clovers. Since vetch blooms are dry when adults emerge, they migrate from roadside and cultivated vetch into nearby clover fields. Beetles remain in the fields until mid-August.

**Damage**

Larvae feed in the florets on pollen of vetch and clover but do not affect seed production. Adults, because of their large numbers and activities in seeking pollen, damage the developing florets of clover in July and August. Buds are attacked as soon as the florets show color, and these damaged flowers fail to produce seed. Damaged buds and flowers are brown and unattractive to pollinating insects. Since red clover requires insect pollination, these browned or damaged fields fail to produce profitable seed crops.

**Control**

A chemical or cultural control has been difficult because of the prolonged emergence and migration period from vetch to clover. If there are only six to eight beetles per blossom, one application of toxaphene has given adequate control. When beetles are more abundant and the migration period prolonged, two or three applications of toxaphene have reduced beetles sufficiently to permit blossoms to develop normal color and attract pollinating insects. The time between applications depends on the extent to which beetles migrate back into the field following treatment. Apply 25 pounds of 10 per cent toxaphene dust per acre or 2 to 2½ pounds of actual toxaphene per acre as a spray.

**Omnivorous Leaf Tier**

*Omnivorous Leaf Tier*

*Cnephasia longana* (Haw.)

Larvae of this moth attack many agricultural crops. They are called “tie worms” when they attack common vetch. Larvae web the terminal leaves and feed upon the terminal growth. It is doubtful if this insect reduces seed yields. Attempts to control it have not been successful.
Pea Aphid  
*Macrosiphum pisi* (Kalt.)

**Description**

The pea aphid is a small, light green, soft-bodied insect about 3/16 of an inch long. Except for size, adults and young are similar in appearance. Adults may be either winged or wingless.

![WINGLESS NYMPH](image)

**Host plants**

The pea is the preferred food plant. Alfalfa and vetch are other favored food plants and occasionally are seriously damaged. Although several kinds of clover, including red, alsike, crimson, and sweet clover are fed upon by the pea aphid, they are seldom damaged to any serious degree. The pea aphid is found throughout Oregon, but is a serious pest only where peas are grown extensively.

**Life history**

In eastern Oregon, the pea aphid overwinters in the egg stage on alfalfa and clover. The overwintering eggs hatch into wingless young or nymphs. When mature, these are called stem mothers. These stem mothers produce living young. When mature, some of these may fly to other legume crops where they can produce as many as 10 to 15 generations a year. In the late summer or fall aphids migrate to alfalfa and clover fields where the overwintering eggs are laid.

In western Oregon, pea aphids overwinter as adults and probably to some extent in the egg stage. Overwintering adults may be found on alfalfa, clover, and Scotch broom, but those which overwinter on fall sown legumes contribute the most to aphid outbreaks. Winter weather conditions greatly influence aphid abundance in western Oregon. Data gathered by federal entomologists show aphid outbreaks do not occur on fall sown legumes when the minimum temperature falls below 15° F. or when the mean temperature for any 7- to 8-day period is 31° F. or less.

**Damage**

The pea aphid damages peas by sucking plant juices from leaves, stems, blossoms, and pods, and causes the plant to have a wilted and stunted appearance. Because of its ability to reproduce rapidly under favorable weather conditions, tremendous numbers may build up in a relatively short time. The pea aphids are capable of transmitting virus diseases to legumes. Loss due to virus disease may be very severe even though aphids are not abundant.
Control

The damage aphids might do is difficult to predict. Frequently parasites, predators, and adverse weather keep aphid populations below damaging numbers. When aphids are abundant and damage is noted, it is desirable to control them.

Sprays have been more effective than dusts. Airplane dusting has been less effective than ground dusting, but airplane spraying is effective if 4 to 5 gallons of liquid per acre are applied.

<table>
<thead>
<tr>
<th>Insecticide</th>
<th>Amount per acre</th>
<th>Spray</th>
<th>Dust</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parathion</td>
<td></td>
<td>6 to 8 ozs. (actual)</td>
<td>35 lbs. 1%</td>
</tr>
<tr>
<td>Malathion</td>
<td></td>
<td>1 lb. (actual)</td>
<td></td>
</tr>
<tr>
<td>TEPP</td>
<td></td>
<td>6 ozs. (actual)</td>
<td></td>
</tr>
</tbody>
</table>

Pea Leaf Weevil

Sitona lineata L.

This insect was first found in Oregon in 1951. This weevil is similar in appearance to the clover root curculio. It has been observed to feed on pea and red clover foliage. This insect has not been abundant in Oregon long enough to determine if it will be a serious pest. If control is needed, DDT at the rate of 1 pound actual material per acre is reported as being effective against adult weevils.

Pea Weevil

Bruchus pisorum (L.)

Description

The adult pea weevil is a small, grayish-brown beetle about 1/5 inch long and marked with dark and light spots. The full grown larva is about ¾ inch long. It is crescent shaped and white or cream colored.

Host plants

Cultivated peas are the only plants attacked. The pea weevil is found in all areas of the state.
Life history

Pea weevils spend the winter in the adult stage in protected places. Beetles begin leaving their winter quarters about the time the first peas begin to blossom. They feed on pea flowers, mate, and by the time pods form, or shortly after, females begin laying orange-colored eggs on the pods.

Upon hatching, young larvae bore through the pods and enter the seeds. Larvae feed and develop inside seeds. The period of larval development is from 4 to 8 weeks. Mature larvae transform into the pupal stage and then change to the adult stage within the seeds. If the seed is stored in a cool, dry place, adult weevils may remain inside the seeds until the following spring. Usually, however, they leave the seeds and seek suitable hibernation places. There is one generation a year.

Damage

The pea weevil is the most important insect pest of peas in Oregon and should be controlled in most areas where peas are raised. Larvae feeding within the seed destroy or greatly impair its viability.

Control

Proper timing of insecticide application is important. It should be remembered that insecticides are applied to kill adult weevils before they lay eggs. Once eggs are laid on pods, it is too late to prevent weevily peas. Sprays or dusts should be applied soon after the first pods appear and before eggs are laid. Apply 20 pounds of 5% DDT dust per acre, or 1 pound of actual DDT per acre in a spray. Both pea weevils and pea aphids may be controlled with parathion or malathion. However, DDT is more effective if weevils are the only problem. This combined control is suggested only if aphid control can be delayed until pods appear.

Only those portions of the field actually infested need to be treated. Extent of the infestation within a field may be determined by sweeping with an insect net. In the case of smaller fields of 10 acres or less, it will usually be necessary to dust the entire field.

Austrian winter field peas should be fumigated promptly after harvest to kill any larvae in the seed before they impair germination.

Slugs

Description

Slugs are not insects. They are closely related to snails, clams, oysters, and similar animals. There are several species of slugs in Oregon, but the most common pest in legume fields is the gray garden slug, *Derocerus reticulatum* (Müller). They vary in color from black to gray and are usually flecked or mottled with brown spots. Newly hatched slugs are only about ¼ inch long, and when full grown are several inches long.

Host plants

Slugs will attack almost all crops. In western Oregon they frequently damage legume seedlings and may injure older plants in hay and seed fields and pastures.

Life history

Slugs overwinter in all stages of development in protected places or cracks in the soil. They are active during mild moist weather and are inactive during warm, dry, or freezing weather.
Slugs feed and are active at night or on dark cloudy days. Slugs are bisexual, that is each individual slug is capable of laying eggs. Eggs are pearly white and about the same size and shape as a BB shot. They are laid in small masses under field debris or in cracks in the soil. The period of development from egg to adult depends on the weather, but is less than 3 months under favorable conditions. Slugs are extremely well adapted to withstand prolonged periods of starvation or adverse temperature conditions.

**Damage**

In newly seeded legume fields, seedling plants are often destroyed completely. It is advisable for growers to examine for slug damage as seedlings are emerging. A stand may be seriously damaged or destroyed in a few days. During periods of mild weather they may kill or retard the growth of legume plants in established seed fields or permanent pastures. Slug damage is distinctive and may be identified by the irregular-shaped feeding holes in the leaves or the dried mucus trails where the slugs have traveled.

**Control**

Slugs are difficult to control. A bait containing metaldehyde as an attractant and calcium arsenate as a poison is the most practical method of control. However, unless conditions are favorable, it is not always possible to obtain satisfactory control. Commercially prepared baits in a pellet form containing at least 3% metaldehyde are recommended for field applications.

Apply bait in late afternoon during cloudy, cool weather. Since rain breaks down the bait, avoid treatment during periods of heavy rainfall. It is possible only a portion of a field will be infested. Infested areas may be determined by test-baiting the field and making application in the areas slugs are found. To test-bait, place a dozen or so pellets at several locations throughout the field. Mark these locations. Examine the baits after 24 hours and if two or more dead slugs are found at a bait station, you would be justified in baiting that portion of the field.

**Table 6. Suggested Rates of Bait Application for Slugs**

<table>
<thead>
<tr>
<th>Newly seeded legume fields</th>
<th>Amount per acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Test-bait before seeds sprout to determine if slugs are in field or fence rows.</td>
<td>4-5 pounds</td>
</tr>
<tr>
<td>2. Bait if slugs are present or damaging seedlings.</td>
<td></td>
</tr>
<tr>
<td>3. A second application may be necessary if damage continues in seedlings.</td>
<td>4-5 pounds</td>
</tr>
</tbody>
</table>

| Established fields or pastures | Test-bait for areas of infestation or bait when damage is noted. A second application is usually necessary. Eggs laid before baiting will hatch and slugs will reinfest the fields. Under some conditions, applications have been necessary in the fall and again in the spring. | 10 pounds or more per acre per application. |
Description

Spider mites are not insects. They are tiny eight-legged animals less than 3/100 inch long, closely related to spiders and ticks. Because of their extremely small size they are usually recognized in the field by their damage rather than by their appearance. There are several species of spider mites in legume crops in Oregon. One of the most common is the Atlantic spider mite, *Tetranychus atlanticus*. Others found on legumes are the two-spotted mite, *Tetranychus bimaculatus* and the clover spider mite, *Bryobia pratiosa*.

Host plants

Spider mites attack many plants. In central and eastern Oregon they are most abundant on alfalfa, red clover, and Ladino clover.

Life history

The life history of spider mites varies with different species. They may overwinter as adults in protected places, or as eggs on either the host plant or an alternate host plant. The clover spider mite frequently overwinters in and around homes and may become a household pest. Eggs, nymphs, and adults may be found on the underside of the same leaf. Some species spin fine webbing on the leaf or may web several leaves, or leaves and blossoms, together. They remain on the plants until the crop is harvested or cold weather forces them into hibernation.

Damage

Spider mites damage a plant by sucking juices from the leaves. Early in the season infested leaves have a mottled appearance. In late summer leaves appear dry and browned. In severe infestations leaves and blossoms may be webbed, the plants withered or
burned in appearance. Poor stands appear to suffer more than vigorously growing stands. Frequently parts of a field, such as borders or dry areas, appear more severely damaged.

The extent to which these spider mites are capable of affecting seed production has not been established. Early season infestations, which dry the plants before the seed is set, undoubtedly decrease yields. Observations indicate late season infestations may not seriously affect seed production.

Control

Further information is needed on the effectiveness of the various miticides, the timing and method of application, and benefit to seed production before a control program can be suggested.

Some western states recommend dusts and sprays of the miticide, aramite. Ground application is reported to be more effective than airplane application, and dusts more effective than sprays. These states suggest applying 20 pounds of 3% or 4% aramite dust per acre, or 3 to 4 quarts of emulsifiable concentrate in 25 gallons of water per acre. It is possible to combine aramite with DDT or toxaphene for lygus bug and spider mite control.

A number of miticides have been tested on red clover. The most effective of these has been Systox (demeton) applied by ground sprayer at the rates of 2, 4, or 6 ounces of actual material in 20 gallons of water per acre. In the experimental work however, it has not been possible to demonstrate that spider mite control has increased seed yields.

Sweetclover Weevil

*Sitona cylindricollis* Fahr.

This insect was first found in eastern Oregon in 1954. In other areas of the United States it is a pest to sweetclover and alfalfa seedlings. It has been found in Oregon on Ladino clover and alfalfa. The adult is similar in appearance to the clover root curculio. Heptachlor or dieldrin applied at the rate of ½ lb. actual material per acre are reported to be effective in controlling adult weevils. Applications may be made in the spring when overwintering adults migrate into new plantings, or in midsummer when new weevil adults emerge from old stands.
Thrips
Frankliniella spp.

Description
Thrips are small insects rarely more than 1/10 inch long. They are slender, quick moving, and scarcely visible to the unaided eye. Nymphs resemble adults but are smaller and wingless.

Host plants
Thrips are found in the flowers of all legumes. They are present in all seed-producing areas of Oregon.

Life history
Thrips overwinter in the adult stage in grass and field trash near the soil surface. They usually appear in spring when legume plants begin their growth and migrate to new fields about blooming time. Eggs are laid in the floral parts and on leaves. There are several generations produced each season until cold weather or drying fields force them into inactivity. Under favorable weather conditions there is probably a new generation every 2 weeks.

Damage
Thrips cause damage to many agricultural crops. It is quite possible they are responsible for some of the discolored or withered flowers in legume plants. They have sucking mouth parts and suck juices from the plant cells. These damaged cells, when dry, give the plant a discolored appearance.

Control
Almost all control programs for injurious insects on legume crops also control thrips to some extent. These applications are most frequently made in late spring or summer after thrips are established in the fields. The control may reduce them for a short period until another generation hatches from the eggs. Predators frequently reduce the number of thrips in the seed fields.

Vetch Weevil
Bruchus brachialis Fabr.

Description
The vetch weevil is a small, dark-colored beetle about ¼ inch long. This insect is also known as the vetch bruchid. It resembles the pea weevil, but is only about half as large. The full-grown larva is light, or cream-colored, and slightly less than ¼ inch long.

Host plants
The vetch weevil infests seeds of woolypod vetch, purple vetch, hairy vetch, and smooth vetch. It does not attack the seed of Willamette or common vetch. It is found in all hairy vetch seed-producing areas.
VETCH WEEVIL. Adult actual size and enlarged.

Life history

The adult weevil spends the winter in protected places under loose bark, lichens on trees, or cracks in fence posts and buildings. Adults emerge during the first warm days of spring, usually in April, and continue to emerge on favorable days during May. Weevils begin to lay eggs as soon as the first pods appear. Eggs are glued to the outside of pods. They are elongate oval in shape, whitish in color, and about 1/50 inch long. The larvae hatching from these eggs bore through the pod and into the developing seeds. Larvae develop within the seeds and emerge as adults during August and early September. There is one generation a year.

Damage

Larvae of the vetch weevil feed within the developing seeds, destroying their viability and commercial value. The seed loss in untreated fields is frequently 50 per cent or more.

Control

Insecticides are applied to kill the adult weevils before they have an opportunity to lay eggs. It is important, therefore, that these applications be made when the first pods appear. Dust with 20 pounds of 5% DDT per acre, or apply DDT spray at the rate of 1 pound of actual DDT in 3 to 5 gallons of liquid per acre. It may be possible to combine vetch weevil and pea aphid control in a single application with the addition of a phosphate insecticide in the DDT spray.

Vetch weevils are able to fly a considerable distance. Vetch grown for hay and adjacent to seed fields should be cut before treating the seed field for vetch weevil control. Make application in early morning or late evening to reduce the possibility of killing pollinating insects.

Western Spotted Cucumber Beetle

Diabrotica undecimpunctata Mann.

Description

This beetle is also known as the 11-spotted or 12-spotted cucumber beetle. Adults are about 1/4 inch long and are frequently mistaken for one of the beneficial ladybird beetles. The long, conspicuous, thread-like antennae are a helpful character in separating them from ladybird beetles. The western spotted cucumber beetles are yellowish-green with eleven black spots. The larvae are yellowish-white and are about 1/4 inch long.

Host plants

The western spotted cucumber beetle is a general feeder and has a wide range of agricultural host plants. It frequently damages red clover and other seedling legumes in early spring. It occurs in western Oregon and is not found east of the Cascade Mountains.
and the first generation of adults emerges in late June and July. These adults produce a generation which emerges in early fall and remains active in the field until cold weather forces them into hibernation. Adults, then, are active in the field from the first warm weather of spring until the first cold weather in the fall, and during periods of mild weather during the winter.

**Damage**

Damage occurs in early spring to seedling red clover and other legumes. Adults feed on tender leaflets of these plants and either destroy or retard the growth of seedlings. Since this damage may take place in a very few days, it is important that fields be checked during the warm days of early spring.

Frequently large numbers of adults migrate into blooming fields during the summer and may cause considerable damage. Under such circumstances growers may find it necessary to apply control measures.

**Table 7. Suggested Rates of Insecticide Application for Cucumber Beetle**

<table>
<thead>
<tr>
<th>Adult control</th>
<th>Amount per acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>early spring when beetles present</td>
<td>Spray</td>
</tr>
<tr>
<td>DDT</td>
<td>1 lb. (actual)</td>
</tr>
<tr>
<td>Methoxychlor</td>
<td>1 lb. (actual)</td>
</tr>
<tr>
<td>Toxaphene</td>
<td>1½ lbs. (actual)</td>
</tr>
</tbody>
</table>
Some insects are essential as pollinators of legume seed crops. Bumblebees, wild solitary bees, and honey bees are all recognized as beneficial insects and necessary to seed production. Recognition of pollinating insects and handling of bees comprise a field in itself and will not be discussed in this bulletin. It is important that any control program protect these insects as much as possible.

Another group of insects beneficial to seed producers includes predators and parasites. This group attacks injurious insects and helps keep them in check. Beneficial insects may be confused with injurious insects. It will be of interest and helpful to growers to recognize these insects. Some of the most common predators and parasites found in your fields are included in this section.

Damsel Bugs
Family Nabidae

These predacious insects are called damsel bugs or nabids. They are pale gray in color. Because of the long narrow body they resemble none of the injurious insects found in the field. They feed on aphids, leafhoppers, caterpillars, and other soft-bodied insects.

Geocorus Bugs
Family Lygaeidae

These insects have no common name other than big-eyed bugs. They are similar in shape to lygus bugs and are frequently mistaken for this insect in the field. They are smaller and less distinctly colored than lygus bugs.

Nymphs and adults feed on aphids, thrips, and other soft-bodied insects. Suggested rates of DDT, and to some extent chlordane and toxaphene, do not seriously reduce the numbers of these beneficial predators in the field.
Lacewings
Family Chrysopidae

Lacewings are light green with delicate lace-like wings and golden eyes. When crushed they have a disagreeable odor.

Adults do not feed. Larvae are called aphids-lions because they feed on aphids and other soft-bodied insects. They are grayish or yellowish with red or brown markings, flat, tapered at each end, and have long curved jaws with which they pierce their host and extract the body juices. Lacewings deposit their eggs on silken stalks so the first hatched will not devour the remaining brood.

Ladybird Beetles
Family Coccinellidae

Ladybird beetles or “lady bugs” are common insects and easily recognized. They vary in color and size, but are usually around ¼ inch long and red or yellow with black spots. Larvae are also brightly colored and not easily confused with other larvae in the field. Ladybird beetles in both the adult and larvae stage feed on soft-bodied insects. They are particularly effective in controlling aphids on legume plants.

One species, Stethorus pictipes, a small shiny-black ladybird beetle is an important predator on spider mites. It has been estimated that each larva consumes over 25 aphids per day and each adult over 50 aphids per day. Unfortunately these insects are also killed with almost all the suggested control programs for injurious insects.
Minute Pirate Bug
Family Anthocoridae

This tiny insect has no generally accepted common name. It belongs to a group sometimes called minute pirate bugs and is frequently called orius, a name derived from its scientific name, Orius tristicolor.

These insects are only $\frac{1}{4}$ inch long and the smallest of the common predators. They feed as nymphs and adults on insect eggs, aphids, thrips, and other soft-bodied insects. They can be easily recognized by their small size and characteristic black and white color pattern. Nymphs are amber colored and wingless. These insects are not killed by the suggested rates of DDT.

Parasitic Insects
Some Families of Wasps and Flies

Parasites form a large group of insects which differ in habits from the predators. Each parasite normally develops on one insect or insect egg, whereas predators attack many insects in their development. They lay eggs on or near the intended victim and the parasitic larvae develop by feeding on the host. The host is not killed at first, but will usually live long enough to permit the parasite's development.

Parasites are mostly small wasp-like insects which are rarely seen by growers. Parasitized insects are frequently conspicuous enough to be observed. They are usually swollen, immobile, and if the parasite has matured, the host is completely hollow. Although parasites do not attract as much attention as predators, under favorable conditions they are more effective in controlling insects.
Syrphid Flies
Family Syrphidae

SYRPHID FLY. Adult, actual size and enlarged.

These insects are also called hover flies or drone flies. Adults are brightly colored and mimic bees in their appearance and habit of frequenting flowers. It is possible they are helpful in pollination. They vary in size and color but can be recognized by their bee-like appearance.

The larvae are slug-like maggots and usually are dull green to yellow in color, variable in size, often having a stripe down the back. They feed on aphids and other soft-bodied insects. They are blind and loop around in search of prey. The larvae are killed by most insecticides applied to control injurious insects.

LARVA, feeding on aphid.
Protect Bees

Bees are essential to the production of most legume seeds. To avoid killing them, follow these precautions:

► If possible, avoid applying insecticides when the field is in bloom. If applications are necessary during the blooming period, do not make them during the day when bees are active.

► Toxaphene is probably the least poisonous to bees and is preferred if application is necessary during the bloom period.

► Apply insecticides only at the suggested rates of application.

► If you are renting bees, discuss your insect control plans with the beekeeper. If bees are near your fields, let the beekeeper know when you plan to apply insecticides so he can move the bees if he wishes.