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Idaho Recommendations For Insect Control

By

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Department of Entomology

How to Use This Bulletin

THE insects discussed in this bulletin are only those of economic importance which are known to occur in Idaho. The insects are arranged alphabetically according to the accepted common names of the pests. If you know the name of the insect for which you desire further information, it can be readily found alphabetically.

An index has been included beginning on page 59. It is arranged alphabetically according to the host of the insect. If you have insects, for instance, which you do not know, occurring on a crop or animal, you may turn to the index to find the common name of the insects which attack that crop or animal. By reading the brief description of the insect or its injury, you should be able to determine the insect in question and thus find its control. Obviously it has not been possible to include a complete description of either the insect, its damage or its control because of the large number of insects involved. Further information concerning any pest may be obtained by writing to the Entomologist, Idaho Agricultural Experiment Station, Moscow, Idaho.

You may wish to study other literature on any pest herein mentioned. It is then necessary to be certain that you have information concerning the species involved. A list of the accepted common and scientific names is included to make identification more certain. This list will be found on page 56.

Equivalents of Measure

For preparing small amounts of spray mixture
1 pint equals 128 teaspoons
1 fluid ounce equals 1/16 pint or 8 teaspoons
1 ounce equals 28.35 grams
1 to 400 dilution equals 2½ teaspoons to 1 gallon

*USE ONLY THE NEEDED AMOUNT OF
INSECTICIDES — DO NOT WASTE*

Idaho Recommendations for Insect Control

By
W. E. SHULL*

Alfalfa Caterpillar. The adult of this caterpillar is a butterfly with the undersides of the wings colored a solid sulphur yellow. The upper sides of the wings are yellow bordered with black. The larvae, when young, are dark brown and then change to green. A narrow white stripe, through which runs a fine red line, occurs on each side of the body of the caterpillar. The larvae feed upon the foliage of alfalfa.

Control: Spray or dust as recommended for alfalfa weevil, or cut the alfalfa as short as possible and remove the hay.

Alfalfa Looper. The color of the larvae varies from cream to yellowish-green and dark green. Fully grown larvae are about 1 inch long and crawl in a looping fashion. They feed on various weeds and crop plants, including alfalfa, rarely becoming numerous enough to cause serious injury.

Control: Infestations of importance usually develop on the first crop of alfalfa a short time before the date for cutting. The most practicable means of control is to cut the first crop as soon as damage is becoming severe. Cure and remove the hay from the field as soon as possible.

Alfalfa Weevil. The adult is a dark brown beetle $3/16$ inch long, with a moderately long snout which points downward from the underside of the head. Fully grown larvae are about $1/4$ inch long. The color of the larva varies from dingy yellow, when very young, to light green when mature. Larvae are readily recognized by a faint white stripe down the middle of the back and by a black head. They destroy the tips of first crop of alfalfa or, when infestations are heavy, defoliate the plants as well as retard the growth of the second crop.

Control: When injury is severe the first crop should be sprayed or dusted. The spray is prepared by adding 2 pounds of calcium arsenate to 100 gallons of water and is applied at the rate of 100 gallons per acre. A mixture of equal parts of calcium arsenate and dusting sulphur is used as a dust at the rate of 5 pounds of the mixture per acre. Treatment should be made as soon as the tips of the plants have a general ragged appearance. Spraying on the first crop prevents further damage to both the first crop and to the second crop. When the infestation is light cut the first crop for hay when the injury begins to be generally noticeable.

Angoumois Grain Moth. The moth varies in color from buff to grayish- or yellowish-brown. It is about $5/16$ inch long. Eggs are

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Dr. Glenn C. Holm, Veterinarian with the Agricultural Experiment Station, has examined and approved the controls for parasites on animals recommended in this bulletin.

laid on or near grain. Larvae are white with yellowish-brown heads, and are about $1/5$ inch long when mature. Injury in Idaho is confined to grain in storage. Larvae hollow out the interiors of kernels and pupation takes place inside the kernels. Kernels from which moths have emerged are identified by the circular emergence holes.

Control: Follow the recommendations for saw-toothed grain beetle. Fumigation by the use of hydrocyanic acid gas is recommended for eradicating the insects in buildings. Write to the Idaho Agricultural Experiment Station for special instructions.

Ants. Many species of ants are troublesome in houses, lawns, gardens, fruit trees, etc. Before attempting control, it is necessary to locate their nests, if possible. Ants in fruit trees are usually attracted by aphids, upon whose sweet secretions they feed. They also kill or drive off the natural enemies of the aphids.

Control: When nests are located, the ant colonies are often completely eradicated by making from one to three or four holes (depending on the size of the mound) in the mound, about 12 inches deep and pouring into each hole 1 ounce of granular calcium cyanide or 2 ounces of carbon disulphide and then covering the hole with earth. These materials kill vegetation and cannot be used in close proximity to growing plants. When it is desirable to kill colonies among growing plants, concentrated pyrethrum extract, diluted 1 to 1000 parts of soapy water, should be used to wet the interior of the nests. Scrape away the top of the nest saucer-like, and pour the liquid into the center so that it will penetrate to the bottom of the nest. In lawns or in tree rows in orchards where definite colonies cannot be located, ant infestations are gradually wiped out by persistent use of granular calcium cyanide scattered lightly over the soil during the warm part of the day when ants are active. Household ants usually have definite nests outside the house, and when their nests can be located should be treated as already described. When nests are not found, excellent control has resulted by scattering freely in the areas frequented by the ants a mixture composed of 75 parts of sodium fluoride, 15 parts of granulated sugar, and 10 parts of fresh pyrethrum dust. This mixture is relatively non-poisonous to humans and may be kept sprinkled lightly on pantry shelves, beneath bins, etc. A carbon-disulphide naphthalene emulsion is also very effective. The formula for this material may be obtained from the Idaho Agricultural Experiment Station.

Apple Aphid. This green plant louse feeds on the water sprouts and on tender terminal leaves, curling them badly. The black, shiny eggs are laid on the bark of the smaller branches in the autumn and hatch the following spring just before the bud scales separate. There are many generations in a season.

Control: Spray with 1 pint of nicotine sulphate and 1 gallon of dormant-type oil emulsion in 99 gallons of water when the green

tips of the buds are separating, or add 1 pint of 40 percent nicotine sulphate to each 100 gallons of dormant oil emulsion or lime-sulphur spray used for San Jose scale control if the spray is applied at the time above indicated. When control is not obtained in the early spring, it is practicable to add $\frac{3}{4}$ pint of 40 percent nicotine sulphate and 1 gallon of summer-type oil emulsion to each 100 gallons of spray at the time of the first or second cover sprays for codling moth. Poor control is to be expected if nicotine sulphate is used when temperatures drop below 70°F.

Apple Leafhoppers. Severe injury is caused to the foliage of apple trees by the feeding of both the young and the adult forms of two species of leafhoppers. The green-colored species has but one generation each year while the white-colored species has two. Both species occur in the early spring in the nymphal stage and the injury from each is similar. Injured leaves lose their green color, become dry, and are covered with tiny, light-colored flecks. The injury results from the insect sucking the sap out of the leaf tissue.

Control: Control is the same for both species. It is not difficult to obtain good control, but spraying must be done when nymphs of the green leafhopper and nymphs of the first generation of the white species are present on the foliage. This is about the time of the first or second codling moth cover sprays. At that time they are readily controlled by the use of summer-type oil emulsion at the rate of 1 gallon in 100 gallons of spray solution. Attention must be directed to covering the under surfaces of the leaves. After the insects become winged, they are difficult to kill and it is necessary to add pyrethrum extract or 40 percent nicotine sulphate at the rate of 1 pint to 100 gallons of the oil emulsion spray. When oil is used in the first two cover sprays for codling moth control, it usually controls leafhoppers.

Asparagus Beetle. The adult is a slender beetle about $\frac{1}{4}$ inch long, blue-black in general color with red on the thorax and dark blue wings marked with lemon-yellow and reddish borders. The larvae are dark to olive-gray with black head and legs. The eggs are arranged in rows of from 6 to 8 scattered over the foliage. They are brownish in color and measure $\frac{1}{16}$ inch in length. The larvae and adults feed on the leaves of the asparagus plants and the adults feed on the tender young shoots in the spring.

Control: Hand picking is of considerable value in home gardens. The young larvae may be killed by brushing them to the ground in hot weather. Spray late in the season with 2 pounds of arsenate of lead in 50 gallons of water or dust with calcium arsenate 1 pound and hydrated lime 3 pounds. Arsenicals can be applied only when cuttings are not being made. During the cutting season apply rotenone dust.

Bark Beetles. These stout, cylindrical, brownish to blackish beetles are $\frac{1}{8}$ to $\frac{3}{16}$ inch long. The larvae are grub-like, white to cream in color, and are found beneath the bark of coniferous

trees. The adults bore small holes in the bark, and tunnel through the cambium layer. Their presence in the trees is characterized by the boring dust at the bases and pitch tubes on the trunks of the trees. The green foliage of attacked trees turns first to a pale green, then to light yellow, and finally to brown, when the trees are dead. They attack mostly mature coniferous trees.

Control: No control is known which will save trees that have been attacked. Unattacked trees may be protected by felling the infested trees before the insects have reached maturity, removing and burning the bark and slash, and allowing the trunks of the trees to dry.

Bedbugs. Bedbugs are widely distributed in Idaho. Their wingless bodies are ovate and very flat and reddish brown in color. Ordinarily they are found only in dwellings of man but have been known to infest chicken houses.

Control: The only completely satisfactory method of eradicating bedbugs quickly is by fumigation. Special precautions must be followed. Those interested should write to the Idaho Agricultural Experiment Station for special instructions. In cases where it is impracticable or not desirable to fumigate, relief is obtained and sometimes infestations even eradicated by persistent "doping." Spray liberally all cracks and crevices in walls, woodwork, bedstead, etc., with gasoline, or kerosene-pyrethrum (made by mixing 1 part of concentrated pyrethrum-oil extract with 19 parts of kerosene). Remove all loose or torn wallpaper. Wherever possible, fill up cracks in walls, floors, cupboards, etc., with crack filler or putty, and complete the work with a coat of paint or varnish. A mixture of corrosive sublimate 1 ounce, alcohol 1 pint, and turpentine $\frac{1}{4}$ pint painted into cracks in bedsteads, walls, etc., is effective in local applications when used repeatedly.

Beet Leafhopper. This sucking insect is only about $\frac{1}{8}$ inch long when fully grown, and in the spring is pale or yellowish green in color. It feeds on sugar beets and related plants, on tomato, squash, beans, spinach, and many other plants. It winters in the adult stage. The insect breeds on mustards, Russian thistle, and other plants in desert areas, abandoned dry farms, and waste places from whence the adults migrate to beet fields during the spring and early summer. It transmits a disease known as curly-top. The size of the population and the severity of the disease vary from year to year, the variation depending to a large extent on climatic and native host plant conditions.

Control: The only practical method of protecting plants from the disease carried by these leafhoppers is the use of resistant strains where they are available. Tomatoes may be grown under covers until they are large enough to withstand the effects of the disease. For details on making and use of covers see your county extension agent or write to the Idaho Agricultural Experiment Station, Moscow, Idaho.

Beet Webworm. The moth is slightly more than $\frac{1}{2}$ inch in length and when at rest, with the wings folded over the body, is triangular in outline. The moth is delicate gray or brown. When disturbed it takes wing, making jerky, zigzag flights. Eggs are pearly white or yellowish, flat, about the size of a small pinhead and are laid on the under leaf surfaces in rows, often with the eggs overlapping. Larvae vary from light green to dark green and have a characteristic darker line down the middle of the back with a row of dark circles on either side. When fully grown they are about $\frac{3}{4}$ inch long. There are two generations annually. They winter in the pupal stage in the soil and the moths appear in the latter part of May or early June. Larvae are most abundant from the last of June to about the middle of July. When abundant, they completely defoliate sugar beets and other related plants, as well as alfalfa and many other cultivated plants.

Control: Webworms breed on many kinds of weeds, especially lamb's-quarter and Russian thistle. These weeds should not be allowed to grow near or in fields where beets are planted. Beets should be inspected often and sprayed or dusted as soon as eggs or tiny larvae are found on the under surfaces of the leaves in June. Spray infested fields thoroughly with lead arsenate or calcium arsenate in water, at the rate of 8 pounds per acre. To the spray add a spreader at the rate of $\frac{1}{2}$ pound to each 100 gallons of liquid. The spreader greatly increases the adherence of the liquid to the beet foliage. Paris green may be used at the rate of 4 pounds per acre. A practical means of control is to use hand or power dusters and apply calcium arsenate dust, diluted with 3 pounds of hydrated lime or diatomaceous earth to 1 pound of poison, at the rate of from 15 to 20 pounds of the mixture per acre. Dusting has the advantage of using cheap, simple equipment. Calcium arsenate is low in cost and hand dusters can be put into operation very quickly. *It is imperative that control be obtained early before damage to beets occurs.*

Birch-Leaf Skeletonizer. This insect attacks most of the species of birches and alder. The moth is a tiny one with a wing expanse of about $\frac{3}{8}$ inch, bright brown in color and the fore wings crossed with three diagonal silvery bars. The head is white. The larvae are about $\frac{1}{4}$ inch long, slender and green in color. The larvae feed on the lower surface of the leaves.

Control: It is attacked by many species of parasites and therefore control is seldom necessary, but lead arsenate may be applied at the rate of 4 pounds in 100 gallons of water when injury becomes apparent.

Black Cherry Aphid. This large, shiny, black plant louse curls terminal foliage of cherry trees and excretes a sticky honey-dew on leaves and fruit. It winters in the egg stage on the trees. Eggs hatch about the time buds burst in the spring. There are several generations annually on cherry trees.

Control: Spray with 40 percent nicotine sulphate, $\frac{3}{4}$ pint, and dormant-type oil emulsion, 1 gallon to 99 gallons of water, just as the buds are breaking, or add the nicotine sulphate to the dormant oil or lime-sulphur sprays.

Black Flies. Black flies, or punkies as they are often called, are sometimes severe pests of horses and mules. These insects breed in streams and spend the entire larval period in swiftly running water. The adults emerge from the water in large numbers to attack animals.

Control: No control is known.

Black Peach Aphid. This plant louse winters on the roots and migrates to the twigs about the time buds are swelling. Adults are shiny black; young are reddish brown.

Control: Spray with 40 percent nicotine sulphate as for "apple aphid" as soon as the insect is observed on the tips of the twigs or on foliage.

Black Vine Weevil. This snout beetle is about $\frac{5}{16}$ inch long, and brownish black in color. The white legless larvae are about $\frac{3}{8}$ inch long. They live in the soil and feed on the roots of strawberry and many other plants.

Control: The same control measure as recommended for the strawberry root weevil is effective, but the bait should be applied just after the date when berries from annual varieties are all harvested.

Black Widow Spider. The black widow spider is more poisonous than any other spider found in the United States. Painful and serious systemic disturbances may result from its bite but very few cases of death due to the attack of the spider have been recorded. The female black widow spider is entirely black and shining on the upper surface of the body. On her under side she usually has one or more red spots near the posterior tip of the abdomen and an hour-glass-shaped red or orange mark on the lower central part of the abdomen. The immature spiders and adult males usually have yellowish markings on the upper side of the abdomen. The males are smaller than the females.

Control: The black widow spider is widely distributed in nature and, therefore, its eradication is impossible. The removal of materials which harbor the spiders is recommended. Spray the places where the spiders are found with undiluted creosote oil. This material kills the spiders which it strikes and repels others. The spiders and their eggs may be crushed and thus eliminate a mild infestation.

Blister Beetles. Three species are sometimes injurious to cultivated crops, especially near the margins of fields. The spotted blister beetle is the most common. It is from $\frac{1}{2}$ to $\frac{3}{4}$ inch long, of general gray appearance with small black spots. The ash-gray blister beetle, somewhat smaller than the spotted blister beetle,

is uniformly gray in color. Nuttall's blister beetle is green or purplish blue, varying from about $\frac{5}{8}$ inch to $1\frac{1}{8}$ inches long. Larvae live in the ground, some of them feeding on grasshopper egg masses, and infestations usually occur in areas where grasshoppers have been numerous.

Control: Control is not often necessary but occasionally it pays to prevent injury, especially around the edges of sugar beet, alfalfa, and potato fields. Dust the infested plants and the beetles thoroughly with a mixture of equal parts of sodium fluosilicate and hydrated lime. Rotenone dust also is effective.

Boxelder Bug. This insect is about $\frac{1}{2}$ inch in length, black in color with red markings. It sucks the sap from boxelder trees. When this bug is abundant, it frequently becomes a nuisance in dwellings.

Control: When bugs collect in numbers on buildings or on trees, they may be killed by spraying with pyrethrum extract or 40 percent nicotine sulphate, 1 pint to 100 gallons of soapy water.

Bronze Birch Borer. The bronze birch borer is a flatheaded borer which is often a serious pest of birches, especially white or paper birch. The first symptoms of attack is a browning of the tips of the upper branches, followed by the death of the entire tree. The larvae are about $\frac{1}{2}$ inch long, white and very slender with a slight enlargement near the anterior end and with two brownish projections near the posterior end. The adults are greenish-bronze beetles with rather blunt heads and slender pointed bodies. The larvae bore in the inner bark and the sapwood of the host.

Control: Cut out and burn during the winter all infested parts of the tree.

Brown Mite. The brown mite or clover mite is commonly found on prune and sometimes does serious injury. This species is distinguished from the European red mite by its rusty brown color, larger size, and flattened back. The two front legs are much longer than the others and extend straight out in front. The winter is passed in the egg stage and the summer eggs are laid on the leaves. The eggs are bright red, spherical, and smooth, although when highly magnified appear to be lightly dusted with a fine granular substance. They cannot be distinguished from the red mite egg with the naked eye. On hatching in the spring, the mites attack the developing fruit buds and when infestations are heavy, will so injure the buds and blossoms that much fruit fails to set. The foliage may be injured during the spring and early summer but usually not later since the mites decrease rapidly in numbers with the arrival of high temperatures.

Control: They are controlled by using dormant-type oil spray as for the red mite to kill the over-wintering eggs. Summer sprays should not be depended upon for control since they would be applied after the most serious injury had been done.

Bulb Mite. This white, 8-legged creature is about $1/32$ inch long.

It is usually found in colonies on roots or bulbs or in decaying vegetable matter, always away from the light. It injures many kinds of bulbs and breeds continuously in greenhouses or wherever moisture and temperature are high.

Control: Plant bulbs on ground that has been kept well aerated and cultivated and free from decaying vegetable matter. Burn all soft or decayed bulbs. Store bulbs at a temperature of about 35° F. Before planting immerse all infested bulbs for 10 minutes in 40 percent nicotine sulphate, 2½ teaspoonfuls to 1 gallon of water at a temperature of 110° F., or in a 2 percent formalin solution for the same time and at the same temperature.

Cabbage Aphid. These dark green or bluish plant lice, covered with a powdery secretion, sometimes become exceedingly abundant on the under sides of leaves of individual cabbage plants. From these they later spread to other plants in the field.

Control: Pull and destroy individual infested plants as soon as they are observed in the spring, or dust or spray them with nicotine sulphate. When fields are generally infested, dust or spray the entire area as soon as the aphids are observed. Use 2 percent nicotine dust or a spray solution composed of ¼ pint of 40 percent nicotine sulphate or ¼ pint of pyrethrum extract and 25 gallons of water to which has first been added 1 pound of laundry soap or 1 quart of summer-type oil emulsion. Plants should be very thoroughly dusted or sprayed and kept free from the aphids until after the heads have well formed. Late season spraying is usually unsatisfactory and is unnecessary if early control is maintained.

Cabbage Maggot. Adults are gray flies resembling the house fly but are smaller. The flies deposit their eggs on the soil near the stems of the plants, and the maggots hatching from them infest the stems of cabbage and cauliflower and the fleshy roots of radish and turnip. Maggots are cream colored.

Control: Dissolve 1 ounce of corrosive sublimate in 10 gallons of hot water and pour ½ cup of the solution on the ground immediately around each plant or along the row in case of radishes. Make the first application 5 days after setting out cabbage plants and repeat two or three times at 10-day intervals.

Cabbage Worm (Imported). The cabbage butterfly is white and is frequently observed flying about cabbage plants. The yellow eggs are placed singly and on end on the under sides of cabbage leaves, nasturtium leaves, etc. The cabbage worm is light green and velvety in appearance, and when mature is about ¾ inch long.

Control: Make a heavy application of rotenone dust when the worms appear. Control should be begun as soon as larvae are first noticed and continued until after heads have begun to form well. Lead arsenate, calcium arsenate or Paris green, 1 part, mixed with flour, 25 parts, may be used as a dust until the heads begin to form.

Carpenter Worm. These pinkish or white larvae with brown heads sometimes completely kill trees. Mature larvae are about 2½

inches long. The large dark gray moths deposit their eggs in the early summer in cracks or crevices of bark or near wounds or the openings of old burrows. The young larvae as soon as they hatch, begin boring into the trees and feed and grow inside the wood for nearly 3 years. Injury is especially severe in the region of the main crotch on the trunks of cork elm trees.

Control: Cutting and burning trees in the winter kills the larvae and prevents the escape of moths to infest other trees. Larvae often may be dug out of the trunk by means of a sharp chisel and the wound then disinfected. Sometimes it is practicable to clean out the burrow as well as possible, force into it a small amount of calcium cyanide-linseed oil mixture, and plug the entrance with mud or putty. The mixture is made by stirring fine granular calcium cyanide into linseed oil until it has the consistency of thick paint. Another method is to inject carbon disulphide into the burrows by means of a small oil can.

Carpet Beetles. Woolen goods, carpets, furs, etc., and occasionally food materials are eaten by larvae of the carpet beetles. These larvae are dark brown and very hairy. They are about $\frac{1}{4}$ inch long when mature and very sluggish in movement. The adults are small, blackish, hard-shelled beetles.

Control: See directions for control of the larder beetle.

Cattle Biting Lice. Cattle biting lice do not feed on the blood but rather on the scales of the skin. They cause the hair to become rough and spots may be entirely removed by rubbing the affected parts. These lice are found on the upper parts of the body in contrast to the position in which the sucking lice are found.

Control: Dust the infested parts thoroughly with rotenone dust or a combination dust of rotenone and pyrethrum. Roughen the hair slightly to allow the dust to penetrate to the lice. Repeat the treatment in 10 to 14 days.

Cattle Grubs. Cattle grubs are the larvae of two different flies, one known as the common cattle grub and the other as the northern cattle grub. They are first noticed in the cattle when bumps as big as the end of the thumb appear on the backs of the animals during late winter or early spring. They are commonly known as cattle grubs in this stage. The bumps contain the larvae of the fly which has passed through the body of the cow to reach the back, and have therefore done their damage before they are noticed. The hairy flies, which are about as large as honeybees, chase the cows in the pasture while the insects deposit their eggs on the hair of the lower extremities. The tiny larvae which hatch from those eggs burrow into the skin of the cow and migrate through the body to the back where the grubs form a cyst.

Control: Cattle grubs can be controlled only after they have cut holes through the skin. Treatment at this time serves to reduce the population of flies which would produce grubs the following year. Rotenone applied as a wash, spray, or dust is the most effec-

tive control. The wash is prepared by making a paste of 12 ounces of either cube or derris powder and 6 ounces of wettable sulphur. Enough water is added to make a gallon of mixture. If wettable sulphur is not available, 2 ounces of soap may be substituted. Apply with a sprinkler jar and brush in thoroughly with a stiff-bristled brush. A spray is prepared by making a paste of 5 pounds of derris or cube powder and 10 pounds of wettable sulphur. Add water to make 100 gallons. The spray should be applied with a power sprayer. Commercial preparations of liquid rotenone containing equivalent rotenone can be used in place of the above materials for both the spray and the wash. A dust is made by thoroughly mixing 1 pound of cube or derris powder and 4 pounds of pyrophyllite or 3 pounds of Tripoli earth. The dust is applied from a shaker can and slightly rubbed in by hand. The treatment should be repeated two or three times at 30-day intervals.

Centipedes. These tiny centipedes feed on the tender roots of greenhouse plants and when numerous eat off the new growth as fast as it is formed. They also eat into the stems near the ground and into the roots, causing small wart-like growths and allowing the entrance of disease organisms.

Control: Control is extremely difficult. Greatest care should be exercised to prevent introduction of the creatures in soil from out of doors or to prevent bringing them in with shipments of plants. The only method yet known of freeing soil of an infestation is by sterilization with steam or heat.

Cherry Fruit Fly. Flies are small, brownish, and are distinguished by having dark bands at intervals across their wings. They emerge from the ground in June or July and fly about in the sun for a few days before beginning to lay eggs. Eggs are inserted through the skin into the flesh of the cherries. Larvae develop to maturity inside the cherries. The maggots are white and when mature are about $\frac{1}{4}$ inch long.

Control: Allowing no cherries to remain on the trees after picking time prevents the escape of any maggots to reinfest the next year's crop, for maggots do not mature until after the date cherries should be harvested. A poisoned bait spray kills the adults which feed on it freely during the time elapsing after emergence from the ground and before they begin to lay eggs. To make the bait, add 2 quarts of molasses or syrup and $\frac{1}{2}$ pound of lead arsenate to 10 gallons of water. The proper time to use the bait first is just before Royal Ann cherries begin to show the first pink coloring. One or two later sprays may be needed at about 7-day intervals. The spray is applied at low pressure and in coarse drops to the outer foliage of the cherry trees and to the foliage of nearby trees or bushes. From 1 to 2 pints of the bait per tree is sufficient.

Chicken Lice. There are several species of lice attacking chickens. All but head lice may be controlled in the same manner.

Control: Use nicotine sulphate, applied on perches either by

painting or by a fine line poured from the can, just before roosting time. Repeat in 2 weeks to kill the newly hatched lice. Head lice may be controlled on chickens and other poultry by applying melted lard or vaseline to the top of the head, under the wings, and around the vent. Sodium fluoride dusted on the fowls will control all species of lice. To apply hold the fowl over a shallow pan and sift the powder through the feathers over all parts of the head and body. An ounce of the material is sufficient to treat 50 to 100 chickens. Do not close the building too tightly during treatment.

Chicken Mites. These mites live in the cracks about the chicken house in the daytime and crawl upon the fowls at night or when nesting. The adults are 1/30 to 1/40 inch long, grayish in color, but when filled with blood are bright red to nearly black.

Control: Thoroughly clean the poultry house, spray it thoroughly with crude oil mixed with one half its volume of kerosene or a mixture of crank case oil and kerosene in about equal parts.

Chorioptic Mange of Horses. Chorioptic mange or symbiotic scabies, commonly known as foot mange, is caused by a mite which closely resembles the psoroptic mange mite. It lives on the surface of the skin and produces lesions similar to those produced by the psoroptic mite. The lesions of this mite are usually confined to the lower parts of the limbs around the foot and fetlock. The infested animals paw and kick and rub the infested foot with another foot or may try to bite the infested parts. Some of the hair comes out and the skin becomes hardened and thickened similar to sarcoptic mange.

Control: The treatments used for sarcoptic mange are effective against this mite.

Chrysanthemum Gall Midge. The adult is a very small fly, resembling a mosquito in appearance except that its body is yellowish or orange. Eggs are laid on tender shoots and new growth. When a maggot emerges from the egg, it crawls over the surface of the leaf for a time, then eats into it, causing a gall formation in which it continues to live and grow. Infestations are detected by the hard, blister-like galls on the leaves or stems.

Control: Pick and destroy infested leaves as soon as they are observed. Spray infested plants at intervals of about 10 days, using 1 teaspoon of 40 percent nicotine sulphate to $\frac{3}{4}$ gallon of water in which has been dissolved a piece of soap the size of a large walnut.

Cicadas. Cicadas sometimes injure apple trees by laying their eggs in the small branches. In depositing the eggs, the female raises the wood beneath the bark until it extrudes in splinter-like pieces and the injury may so weaken the branches that they break off. These insects are commonly known as "locusts" and are readily identified by the shrill singing of the males on hot summer days.

Control: No control method is known.

Clothes Moths (Webbing). The webbing clothes moth is a serious pest on substances made from animal hair, wool, or feathers and annually causes heavy loss in woolen clothing, furs, upholstered furniture, etc. The moth is very light brown and scarcely $\frac{1}{4}$ inch in length. It flits about in an erratic manner and but brief glimpses of it are obtained in the evening or at night for it avoids bright light. Moths deposit their eggs on substances which will later be used as food by the larvae. As soon as the eggs hatch the young larvae seek out protected places in the folds of woolen garments, furs, etc., or in the interior of upholstered furniture, and immediately begin to feed. Fully grown larvae are somewhat less than $\frac{1}{4}$ inch long, with bodies of creamy white color and heads of brown. Damage is caused by the larvae only.

Control: Articles subject to attack should not be left undisturbed for long periods. Clothing should be frequently brushed and aired, preferably in bright sunlight. When clothing is not in use it should be placed in a trunk or box with a tight-fitting lid with about 1 pound of naphthalene or paradichlorobenzene. If clothing is kept in moth-tight paper bags or wrapped securely in paper, it should be enclosed with one of the above chemicals. These chemicals have no value in moth protection unless they are enclosed with the materials to be protected in containers with tight-fitting lids or doors. A splendid means of protection is the construction of a small moth-proof closet in the basement, in which a supply of paradichlorobenzene is kept, where garments which are not in constant use may be hung. Individual pieces of furniture may be fumigated in small rooms or tight compartments. Often entire buildings are infested and must be fumigated. Special precautions must be followed in fumigating. Persons interested should write to the Idaho Agricultural Experiment Station for specific instructions.

Clover Aphid. Clover aphids are small green or pink plant lice that may become very abundant in clover blossoms. They secrete a sticky honey-dew that lowers the quality of the seed and they often greatly reduce the yield.

Control: Probably the best means of avoiding loss is to produce seed from the second crop. Clip the first crop when the infestation becomes heavy, remove the hay as quickly as possible and allow the field to remain without water until the plants are dry—about 10 days in good sandy loam soil. If the sun is hot and the ground dry, good control on second crop clover is attained. The aim should be to clip the first crop as late as possible and yet be assured of maturing seed on the second crop.

Clover Bud Weevil. The adults are deep greenish or blue-green in color with shiny black heads and beaks. Newly emerged adults are brownish in color. The larvae are whitish at first but soon change to brownish white. The larvae feed on the buds and often do considerable damage. The cocoons may be found on the ground or in the clover head.

Control: No practical control has been developed. Clover grown on fertile soil and well watered is not usually attacked when clover on poorer soils which are dry may be severely attacked.

Clover Leaf Weevil. The adult weevil is about $\frac{1}{4}$ inch long, light brown and has a prominent snout projection forward from the front end of the head. Eggs are inserted in punctures in the stems in the autumn. Larvae are green, shading to pink at the rear end, and are marked by a white line lengthwise of the middle of the back. Mature larvae are about $\frac{1}{2}$ inch long. Hibernation takes place in both larval and adult stages. There is one generation annually. Adults and larvae eat notches in the margins of leaves.

Control: Control is rarely necessary. When clover fields are heavily injured they may be clipped, and the field allowed to remain without irrigation water for a few days before the next growth starts.

Clover Root Borer. Tiny brown beetles and small cream-colored grubs bore into the roots of red clover forming tunnels, killing plants, and opening the way for entrance of disease organisms.

Control: The clover root borer is of little importance where stands are maintained for only one seed crop year. It is advisable to rotate land to other crops after one clover seed crop has been produced in areas where this insect is troublesome.

Clover Root Curculio. This beetle somewhat resembles the alfalfa weevil but is smaller, blacker, and has a shorter and broader snout. It is widely distributed in Idaho, but has been of comparatively little importance, probably because of the rotation and irrigation systems followed.

Clover Seed Caterpillar. This caterpillar is about $\frac{5}{16}$ inch long when fully grown, ranges in color from white to pinkish, and has a buff-colored head. It feeds in the florets of alsike clover, destroying the floral parts and the young seed pods. It is a native insect, infesting some of the wild clovers in the higher elevations, and no control is known.

Clover Seed Chalcid. Damage is caused by larvae of a tiny "fly" which eats out the interiors of forming seed. Eggs are deposited inside the seeds before they reach the "dough" stage. Infested seeds have tiny holes in them, and many of them are so light that they are blown out with the chaff at threshing time.

Control: Preventive measures give partial control, and if practiced generally by all growers over a large area would hold populations of the chalcid fly down so that severe damage would rarely occur. Destroy volunteer alfalfa and clover plants near seed fields in the spring, and destroy late-seeding plants in the fall. Prevent infestation from chaff piles by feeding or burning them prior to the first of May. Thoroughly cultivate seed fields in the autumn to destroy shattered seeds by burying them to a depth of at least 2 inches. The practices outlined for the clover aphid also reduce chalcid fly injury.

Clover Seed Midge. This is a very delicate insect resembling a mosquito, which deposits its eggs on the flower heads. Larvae are pink in color and feed inside the individual florets causing them to "blast" before seed is formed. Loss to clover seed producers in some of the warmer areas of Idaho is very heavy during certain seasons.

Control: Pasture or closely clip the spring crop to prevent first brood larvae from becoming adults. Cut the first crop about 2 weeks before the larvae become mature. The procedure outlined for clover aphid offers some measure of prevention.

Cockroaches. Two species are troublesome in Idaho. The German, or common cockroach, is the smaller species, adults being about $\frac{1}{2}$ inch long, light brown, and marked lengthwise on the back with dark stripes. The oriental cockroach is about 1 inch long, very dark brown or nearly black. Both species thrive in unsanitary surroundings or under conditions where they can find protection in dark, undisturbed areas.

Control: Make conditions for their breeding and protection as unfavorable as possible. Fill cracks around baseboards, cupboards, etc., with crack filler and putty. Prevent accumulation of grease, lint, or trash in dark corners and behind cupboards. Eliminate leaking pipes or drains which furnish moisture favorable for breeding. Sodium fluoride is effective if sprinkled freely in places frequented by roaches, especially dark places, under sinks and behind baseboards. Repeat applications frequently and persistently until premises are rid of the pests. Pyrethrum powder, used in the same way as sodium fluoride, also gives good control. It is best applied to cracks and other hiding places by means of an electrically operated dusting machine.

Codling Moth. The full-grown larvae are pinkish white, have brown heads and are about $\frac{3}{4}$ inch long. They overwinter under loose bark on trees; also among prop piles, wood piles, boxes, and trash in or bordering orchards, and in packing and storage sheds. There are from one to three generations annually in Idaho, depending on the location. Eggs are deposited on fruit or foliage.

Control: Control varies with the locality but in all orchards the moth population is greatly reduced by sanitary precautions such as destroying all wormy apples at thinning time; destroying wind-falls and culls before worms in them have an opportunity to escape; eliminating old trees and abandoned orchards; scraping off loose bark and applying chemically treated bands.

The only direct means of control of the codling moth is by spraying. The spray procedure varies so greatly in different localities that no statewide recommendation is possible excepting as to materials. The calyx spray should be applied in all localities, using lead arsenate at the rate of 2 pounds per 100 gallons of water, making the application as soon as 90 percent of the petals have fallen and before the calyx lobes have closed. The first cover spray on the first brood likewise is the same in all localities and

should be completed within 10 to 12 days after the first codling moths are found in the bait traps. The number of cover sprays that should be applied before July 1 depends on locality and severity of infestation. The timing of sprays may be largely regulated by moth activity as indicated by the trap records. Under the most severe conditions it is sometimes necessary to spray at weekly intervals during the spring emergence period of the moths, and from two to four times after July 1. The first spray to be applied in July should be completed within 8 days after the moths show a sudden increase in the traps. Lead arsenate still remains the most important single insecticide for codling moth control. For most conditions existing in Idaho orchards, 3 pounds to 100 gallons of water is recommended. A spreader or sticker should be added. Oil, if used in the first and second cover sprays at the rate of 3 or 4 quarts of summer-type oil emulsion to 100 gallons of spray, increases the degree of control by killing the eggs at the time they are most numerous in the orchard. Oil sprays should not be applied after July 1, because they render residue removal difficult.

Colorado Potato Beetle. Adults are plump, about $\frac{3}{8}$ inch long, and are marked lengthwise on each wing cover by five black and five yellow lines. They hibernate in the soil during the winter. There are two generations annually, but only the first generation appears to be of economic importance in Idaho. Eggs are yellow or orange and are deposited in clusters on the under sides of leaves. Larvae are brick red with black spots on the back and have a "humped-back" appearance. They are about $\frac{1}{2}$ inch long. Larvae and beetles feed on potato and related plants, often completely defoliating vines.

Control: Dust infested vines with a mixture composed of 1 part of calcium arsenate to 3 parts of hydrated lime, or spray them with calcium arsenate or with lead arsenate at the rate of 4 pounds to 100 gallons of water. Liberal applications of dust containing rotenone are also effective. Make applications soon after the larvae hatch and begin to feed in the spring and before they have caused appreciable injury.

Confused Flour Beetle. This insect feeds upon a variety of products, including grains, flour, starchy materials, and many other foods. The adult is an elongate, reddish-brown beetle about $\frac{1}{7}$ inch long. The larvae are brownish white and somewhat flattened. All stages of the insect may be found in infested material at any time of year.

Control: Apply the same control measures as for the sawtoothed grain beetle.

Corn Ear Worm. A large dusky-colored moth deposits eggs on the silks and larvae hatching from them eat into the ears. Larvae vary from yellowish green to dark green, and when mature are about $1\frac{1}{2}$ inches long.

Control: The most satisfactory control is obtained by applying 10 to 15 drops of pyrethrum-oil to each ear about 7 days after the silks begin to wilt. Earlier applications will interfere with pollination. Commercial corn earworm oils are available.

Cottony Maple Scale. This brown, oval, soft scale is found in the winter on the bark of maples and many other kinds of trees and bushes. In June the insects become covered with large masses of a white cotton-like substance beneath which the eggs are found. The heavily infested branches of trees may be killed or the leaves turned yellow.

Control: Spray with dormant-type oil emulsion at the rate of 4 gallons to 96 gallons water in the winter or just before the buds burst in the spring. A practical means of control on Virginia creeper and other ornamentals is to spray the vines with summer-type oil emulsion, 1 part to 99 parts of water, when the young scale insects are unprotected, shortly after they hatch from the eggs. This is usually the last of June or the early part of July.

Currant Aphid. This plant louse, varying from yellowish to pinkish and dark green, winters in the egg stage on the twigs of the new growth. Eggs are glossy black. They hatch soon after the first leaves unfold. The aphids cluster on the tips, curling the leaves and causing them to turn red and drop.

Control: Spray as soon as aphids are noticed in the spring and before the leaves curl. Use 40 percent nicotine sulphate or pyrethrum extract, 1 teaspoon to $\frac{3}{4}$ gallon of water in which has been dissolved a piece of soap the size of a large walnut.

Currant Worm (Imported). The adult sawflies emerge when the currant leaves first unfold and lay white, elongate eggs end-to-end in rows along the veins on the under sides of the leaves. Larvae are muddy green with black spots excepting in the last stage when they are uniformly light green. There are two generations annually. Larvae of the first generation do most of the injury. They pupate beneath leaves and trash. Leaves may be stripped from an entire plant.

Control: Spray the bushes thoroughly with calcium arsenate 2 pounds to 100 gallons of water when fruit is beginning to set. If control is necessary after fruit is formed, use pyrethrum extract at the rate of 1 part to 400 parts of soapy water or a rotenone dust. A second spray of lead arsenate after the fruit is picked prevents late defoliation and reduces the infestation for the succeeding year.

Cutworms. These smooth, shiny, gray to black worms rest in a curled position in the daytime just below the surface of the ground. They feed mostly at night and cut the plants off at the surface of the ground. Some species, as the western army cutworm, migrate over the surface of the soil at night. Others climb plants at night to feed on foliage, such as on grape and prune. Adults are dusky

brown or gray moths that fly at night and are the ones most commonly observed around lights in the summer time.

Control: Scatter poisoned bran bait (directions for preparation are on page 55) around plants to be protected or sow it broadcast over the field. In the case of crops planted adjacent to weedy areas, the field margins may be protected from cutworm attack by scattering the poison bait over the surface of the ground in the area to be protected. Make applications just after planting time and before the young plants appear above the surface of the ground. Where cutworms are holding back the growth of alfalfa and irrigation water is available, control usually is obtained by flooding the field heavily. Poisoned bran mash is effective in alfalfa fields which cannot be heavily irrigated. Bait should be applied in the evening.

Cyclamen Mite. The adult female cyclamen mite overwinters in the crowns of strawberries. It emerges in the spring at about the time plant growth starts. Newly emerged adults are pale-amber colored but darken as they become older. Infested plants are dwarfed, and the leaves appear to be held close together and near the ground. The general color is light green, almost yellow. Infested flowers and young fruits darken near the bases of the sepals and often turn black and die. The leaves are very small, their surfaces crinkled, rolled, and malformed. Discolored areas may appear before or after the leaves unfold and the spots turn brown and die.

Control: No satisfactory method of control of mites on plants in an established bed has been found. Plants to be set in new beds should be immersed in water heated to 110° F. for 30 minutes. The temperature should not vary more than 1 degree. The water should be agitated to insure uniform temperature throughout the treating tank. Strawberry beds should be rotated every 2 or 3 years.

Diamond-Back Moth. The adult of this insect is a small, light gray moth. The tiny, green, tapering larvae riddle the leaves and spin light webs about themselves on the upper surfaces of the leaves. This species is only occasionally of sufficient importance to necessitate control. It attacks cabbage, turnips, and practically all other cruciferae, and some ornamental and greenhouse plants.

Control: Follow the instructions given under "cabbage worm."

Douglas Fir Aphid. The Douglas fir aphid, or spruce gall aphid, is grayish green, or purplish blue, and is covered with a white powdery substance. It passes the winter in the immature form clustered in crevices of the stems about the bases of the buds. As soon as tree growth starts in the spring, the aphids settle at the bases of the developing branch buds and cause the formation of the "pineapple" galls which stunt the growth of spruce trees and cause an unsightly appearance.

Control: Almost complete protection from gall formation is ob-

tained by spraying the trees with nicotine sulphate 1 pint, hydrated lime or soap 4 pounds, and water 100 gallons. Laundry soap or soap chips 10 pounds in 100 gallons of water may also be used, or lime-sulphur, 1 gallon to 40 gallons of water or with dormant-type oil emulsion, $1\frac{1}{2}$ gallons to $98\frac{1}{2}$ gallons of water. Make applications in late fall or early spring.

Elm Leaf Beetle. The beetles are about $\frac{1}{4}$ inch long, yellow or orange, are marked on the back by a black stripe down the center, a black stripe along each edge, and two elongated black spots. Eggs are orange and are laid in irregular rows on the under sides of the leaves. The larvae are dark with yellow stripes and prominent body tubercles, and are about $\frac{1}{2}$ inch long when fully grown. Beetles eat holes in the leaves and the larvae destroy the leaf tissue on the under sides. Injured leaves turn brown and trees often are completely defoliated. There are from two to three generations annually.

Control: Spray the trees thoroughly with lead arsenate, 4 pounds to 100 gallons of water. Make applications as soon as the first larvae are found and direct the poison upward to cover the lower surfaces of the leaves. Control against the later generations is often unnecessary if it is properly carried on against the first generation.

Elm Leaf-Curl Aphid. The elm leaf-curl aphid is the same insect as described in this bulletin under woolly apple aphid. It attacks both elm and apple. The eggs are laid on the elms in the fall. They hatch in the spring and crawl to the buds.

Control: Spray thoroughly early in the spring before the leaves have curled and when the aphids first hatch with nicotine sulphate or pyrethrum extract, 1 pint in 100 gallons of water to which has been added 4 or 5 pounds of powdered soap. Thorough application is necessary.

European Earwig. The mature earwig is about $\frac{5}{8}$ inch long. The color is dark reddish brown excepting the legs, antennae, and wing-covers which are yellowish brown. The insect is readily distinguished by the presence of a so-called pair of forceps on the rear end of the body. Earwigs feed on many kinds of plants, and even enter houses, where they are obnoxious pests. They are active at night and hide in dark places during daytime.

Control: The insects feed readily on a poisoned bait made by mixing together 12 pounds of bran and 1 pound of sodium fluosilicate and then mixing in thoroughly 1 quart of fish oil. Scatter the bait thinly over the entire yard, but give special attention to baiting along board fences and about trees, telephone poles, wood piles, and other places affording hiding places. Do not sprinkle the lawn until after the bait has been out at least two nights.

European Elm Scale. These reddish-brown, plump-bodied sucking insects are fringed with white and are covered with a "mealy" secretion. They occur most abundantly in crevices of bark and on

the under sides of limbs. Heavy infestations cause the death of elms.

Control: Very satisfactory control is obtained by spraying the trees with dormant-type oil emulsion, at the rate of 8 gallons to 92 gallons of water, just before the buds burst in the spring. Summer oil emulsion at the rate of 2 gallons to 98 gallons of water may also be used.

European Red Mite. The European red mite or fruit mite attacks deciduous fruit trees and is especially injurious to prune in southwestern Idaho. The mites cause injury by removing chlorophyll and sap from the leaves, reducing the vitality of the tree with a consequent reduction in size and quality of fruit and a weakening of buds. The mites are very small, oval in shape, and are a bright red to dark brownish red or orange. The eggs are bright red, spherical or onion shaped with a whitish stripe at the top. The winter is passed in the egg stage on the bark, especially on the spurs and around the smaller crotches which often appear red from the egg masses. In the spring the newly hatched mites migrate to the leaves where they feed and multiply rapidly during the summer, there being about six generations in a season. The eggs of the summer generations are laid on the leaves. This mite spins but very little webbing on the leaves.

Control: Control is obtained by killing the over-wintering eggs with a dormant oil spray, using 4 gallons of dormant oil emulsion in 96 gallons of water. Should the dormant spray be omitted, control in the summer may be obtained with an oil spray, using $1\frac{1}{2}$ gallons summer-type oil emulsion plus $\frac{1}{4}$ pound of colloidal spreader in 99 gallons water. This spray kills both the eggs and the mites and should be applied early in the summer before the mites have done serious damage. To prevent spotting of the fruit, the spray should be applied before the bloom appears on the fruit, or usually before June 20.

Eye-Spotted Bud Moth. The chocolate-brown larvae are about $\frac{1}{3}$ inch long when mature. Larvae hibernate in small cocoons on the bark and in the spring eat the leaf and blossom buds, especially of prune, and frequently tie buds together with silk. Moths appear in mid-summer and deposit their eggs singly or in clusters on the under surfaces of the leaves. There is one generation annually.

Control: Spray with lead arsenate, 3 pounds to 100 gallons of water, just as leaves are showing green in the spring. Pay special attention to the tips of branches.

Fall Webworm. Fall webworms attack many kinds of fruit trees and native shrubs. Their presence is detected by loosely woven, dirty white webs which enclose the foliage on the ends of the branches. Webs enclose many pale yellow, black spotted, very hairy caterpillars which feed upon the surface of the leaves. Webs are very unsightly due to the presence of the black pellets of excrement of the larvae.

Control: Webs are readily removed by clipping off the terminal twigs which are enclosed in them and burning them. They may be burned out of the trees by the use of a kerosene-saturated burlap sack fastened to the end of a long pole. Spraying with lead arsenate or dusting with calcium arsenate controls them where infestations are extensive.

False Chinch Bug. They are small, brown to black, flat-bodied bugs that suck sap from the leaves. When numerous, they cause leaves to wilt, turn brown and become crisp. They usually attack cultivated crops only in weedy areas or after weeds in adjacent fields dry up following drought periods in the summer.

Control: Destroy weeds and do not plant crops susceptible to injury near waste or weedy areas. Plow under weeds the fall before fields are to be planted and destroy weeds in the early spring to prevent breeding of bugs which later migrate to cultivated crops. When hordes are migrating they may be checked by plowing a furrow, keeping the bottom dry and dragging a log in the furrow to kill the bugs and to keep the soil in a dusty, loose condition.

False Wireworms. These are yellow, shiny worms measuring about 1 inch in length at maturity. They destroy planted kernels and sprouts of dry-farmed wheat both in the early spring and the late fall. Adults are large black beetles readily recognized by their habit of "standing on their head" when disturbed. Adults feed on wheat, various grasses, and weeds. Adults emerge in August, winter in protected places, and deposit their eggs in the soil the following spring. Larvae hatch in May and continue to feed and grow in the soil until mid-summer of the following year, when they pupate. It requires 2 years, therefore, to complete the life cycle. A smaller species also occurs in dry-farmed areas and predominates in certain localities. Its life cycle is quite similar and it responds to the same control measures as those for the larger species.

Control: Beetles eat poisoned bran bait freely and are cheaply controlled by its use. (See page 55 for preparation. Paris green is somewhat more effective than white arsenic.) Scatter the bait along fence rows, road sides, among rocks, and in waste places where beetles congregate. Make applications about September 15 on two successive years.

Firebrat. This insect lives in warm, moist places in dwellings and sometimes causes damage by eating paper products, book bindings, etc. Adults attain a length of about $\frac{1}{2}$ inch and are recognized by two very long antennae and three long appendages on the rear of the body. They move very quickly.

Control: Clean out breeding areas, destroy debris, etc., which furnish protection and food. A poisoned bait, composed of 1 pound of finely ground or cut oatmeal, 1 ounce of white arsenic, $\frac{1}{2}$ ounce of granulated sugar, and $\frac{1}{4}$ ounce of salt, is quite effective in

control. Mix together the oatmeal, white arsenic, sugar, and salt. Moisten the mixture with water to bind the substances together thoroughly. Then dry the bait thoroughly to prevent mold, and crush it up into small bits. Scatter the bait lightly behind book-cases, radiators, on shelves, etc., and in other places frequented by the insects. It is effective over long periods of time without renewal. Sodium fluoride or sodium fluosilicate may be used in place of white arsenic.

Fleas. Adult fleas are very spiny, greatly flattened from side to side, wingless insects, with long legs fitted for jumping. They are light to dark brown in color. The slender, white larvae live in the bedding of animals, where they feed upon any available organic matter. While cat and dog fleas usually are found on their respective hosts, they will also attack humans.

Control: The best treatment of pets is the frequent application of dusts containing rotenone to all parts of the body. The animals' sleeping quarters should be cleaned thoroughly, and sprayed or dusted with pyrethrum or rotenone to kill the larval stages.

Follicular Mange Mites. These mites are common on dogs and sometimes attack hogs. They live in the hair follicles. The skin becomes red and inflamed and small hard pimples, ranging in size from that of a pinhead to lumps as big as marbles, form and discharge a yellowish, cheesy pus.

Control: Special medicines, usually containing rotenone in bland oils, are used in the treatment of dogs. The hair should be removed for some distance around the infestation before treatment. The same treatment as recommended for sarcoptic mange mites is effective in hogs.

Forest Tent Caterpillar. These caterpillars collect in dense masses on branches of trees. They are dusky brown with a fine yellowish-brown stripe down the back and on each side. They may attain a length of about 2 inches when mature. They often strip the foliage from native trees and from fruit trees. Their eggs are deposited in a complete ring around the smaller twigs and are closely cemented together. There is one generation annually.

Control: Spray with lead arsenate, 3 pounds to 100 gallons of water, or dust with calcium arsenate.

Four-Spotted Tree Cricket. This cricket closely resembles the snowy tree cricket but is found more generally on plants with pithy stems, such as raspberries or grapes. Eggs are deposited through the bark and into the central pith and are laid in series. The life history is similar to that of the snowy tree cricket.

Control: Prune out, in the spring, canes containing eggs. In severe infestations in berry patches, spray the plants heavily with lead arsenate, 2 pounds to 100 gallons of water, as soon as the berry crop is harvested. This reduces the infestation the following year.

Fruit Tree Leaf Roller. Moths are a little less than $\frac{1}{2}$ inch long, fawn colored or rusty brown, and have a prominent light spot on the outer margins of the wings. They appear in mid-summer and lay their eggs in irregular flat masses on the bark. Eggs are entirely covered with a grayish cement-like substance. Larvae hatch about the time the buds begin to open and are quite active, crawling backward about as well as forward and often may be observed hanging from the tree by a thread. The caterpillars roll the leaves, eating ragged irregular holes in them and in extreme cases completely defoliate the trees.

Control: Spray the trees thoroughly with dormant-type oil emulsion to kill the eggs before they hatch. Spraying should be done before the buds begin to burst. In severe cases use the emulsion at the rate of 8 gallons to 92 gallons of water. One half of that dosage is sufficient in cases of light infestations or where orchards are being regularly sprayed with oil for San Jose scale control.

Garden Slug. These are slimy, shiny, dark green or gray creatures resembling snails. They injure strawberries where the berries come in contact with the ground.

Control: A satisfactory bait for slugs is prepared by thoroughly mixing 2 tablespoons of black strap molasses, 1 ounce of calcium arsenate, $\frac{1}{2}$ ounce of metaldehyde, 1 pound of bran and 1 pint of water. The bait is placed in very small piles about a foot apart and near the plants to be protected or near the hiding places of the slugs. Moisture causes the bait to be less effective, therefore the piles should be protected from the rain or irrigation water.

Gladiolus Thrips. The gladiolus thrips is a very small, slender insect measuring about $\frac{1}{16}$ inch long. It feeds on the corms, leaves, buds, and flowers of the gladiolus. The larva and pupa are lemon yellow and are found mostly in the leaf sheath or the buds. The eggs are deposited within the tissues of the host plant. Only from 11 to 13 days are required in midsummer for development from the egg to the adult. The adult overwinters in Idaho in the corms only.

Control: Reduce corm infestation at harvest by cutting off the tops, but avoid shaking the thrips over the corms during the process. Remove the corms from the field as soon as possible after topping. Place the corms in tight bags and sprinkle naphthalene flakes over them during the winter. Allow this material to remain on the corms for about 4 weeks, after which the excess material should be shaken out. Immersion of corms in hot water at 112° F. for 20 minutes kills all stages of the insect. This method is useful just before planting. The following spray may be used in the field with good results: Tartar emetic 2 ounces, brown sugar 8 ounces, water 3 gallons. Apply with a sprayer with sufficient pressure to produce a very fine spray. Spraying should be done early, when "silvered" spots are first noticed on the foliage. If spraying is delayed until the flower spikes appear, little can be done to save the flowers.

Gooseberry Fruit Worm. The larva is about $\frac{3}{4}$ inch long when mature and has a black head. Larvae eat into gooseberries in the spring. Infested berries usually color prematurely and dry up on the bushes or fall to the ground. Larvae make their way into the ground where they pupate and pass the winter in this stage.

Control: Infestations can be kept low by carefully removing and burning all trash and leaves beneath and around the bushes in the autumn, and thoroughly cultivating around the bushes in the fall and early spring to destroy the overwintering pupae. A high degree of control is attained by spraying the bushes with powdered derris containing 5 percent rotenone at the rate of 4 pounds in 100 gallons of water just as the worms begin to web the berry clusters together.

Granary Weevil. This mahogany-brown beetle is slightly more than $\frac{1}{8}$ inch long, and has a head that is prolonged into a slender snout. The beetles feed upon grain and grain products and the grubs live inside the kernels of grain.

Control: In the household the same precautionary measures recommended for the saw-toothed grain beetle are satisfactory for this insect. Storage bins should be cleaned before new grain is placed in them. Small quantities of infested grain may be fumigated by the use of 1 ounce of carbon disulphide to every 100 pounds of seed closely enclosed in a tight container. Pour the carbon disulphide into a shallow receptacle on top of the grain, close the container and allow it to remain closed for 48 hours. The vapor is very inflammable and must not be handled near a flame of any kind.

Grape Leafhopper. This sucking insect is only about $\frac{1}{8}$ inch long when mature and varies in color from yellowish green to red. Adults fly but nymphs are wingless. Adults hibernate and then make their way to grape leaves about June 1. They deposit their eggs on the under surfaces of the leaves. The young leafhoppers hatching from these eggs feed on the under surfaces of the leaves until they reach the adult stage, sometime in July. A second generation develops in the late summer. Injury is caused by both adults and young. A discolored area develops around each feeding puncture and when leafhoppers are abundant the entire leaf may become discolored and have a scorched appearance.

Control: Overwintering adults are rarely numerous enough in Idaho to cause injury, and they are very difficult to kill. It is best to watch for the appearance of the young on the under surfaces of the leaves in June and when the first of these begin to reach the adult stage to spray the vines thoroughly with 40 percent nicotine sulphate or pyrethrum extract $\frac{3}{4}$ pint, summer-type oil emulsion 1 gallon, and water 99 gallons. Use high pressure and direct the stream upward so that the under surfaces of the leaves are heavily covered.

Grasshoppers. Grasshoppers eat the foliage, blossoms, seeds, and

fruits of many crops. Several species are of economic importance in the state, all having similar life habits and responding to the same control methods. Eggs are laid in the ground in pods containing from about 15 to 100 eggs each. The pods are inserted in the soil at depths varying from very shallow to about 3 inches. Eggs are laid most abundantly in firm ground or sod along ditches, roadsides, fence rows, and waste places. Eggs are surrounded by a protective secretion and in their position in the ground are not greatly influenced by climatic conditions. Young 'hoppers hatch in the spring as soon as the soil surface becomes warm.

Control: The most dependable and economical method of control is to scatter poisoned bran bait. It should be scattered at the rate of 10 pounds per acre in the morning as early as the 'hoppers become active. The greatest returns from the bait are obtained when hoppers are small and before they have begun to migrate, but it may be used successfully to protect crops at any time during the growing season. In alfalfa and clover seed fields and in grain crops, gardens, etc., it is necessary to scatter it generally throughout the field. When grasshoppers attack alfalfa hay crops it is usually just before the first crop is cut. In such cases a strip of alfalfa should be left uncut in the center of the land and heavily treated with bait to kill the 'hoppers concentrated there to prevent them from attacking the tender plants of the second crop.

Spring-toothing of infested fields late in the fall destroys many eggs by exposure. Thorough and frequent discing where practicable, or plowing late in the fall, destroys many eggs.

In gardens and around ornamentals, bush fruits, etc., the poisoned bait is quite effective, but at times 'hoppers will stay on the plants destroying flower buds and foliage. In such cases they are repelled and prevented from doing damage by thoroughly spraying the plants with lead arsenate at the rate of 4 pounds to 100 gallons of water.

Greenhouse Leaf Tyer. This insect is named from its habit of spinning light webs inclosing leaves in the web. It causes injury by destroying the under surfaces of the leaves. The larva is light green marked by lengthwise light stripes. It is very active, moving either backward or forward and often lowers itself on a silken thread.

Control: Suspend shallow pans 5 or 6 inches beneath clear glass incandescent lamps above the greenhouse benches. In the pans keep a supply of water and kerosene. Moths are attracted to the lights and captured in the traps beneath. Lamps should be turned on within an hour after sundown and allowed to burn for 2 or 3 hours. For control of the larvae, infested plants should be sprayed with lead arsenate at the rate of 1 pound to 25 gallons of water, or dusted with a mixture of fine dusting sulphur 6 parts, and lead arsenate 1 part.

Greenhouse Thrips. These small, narrow-bodied insects vary in color from yellow to brown or almost black. They injure both leaves

and blossoms of many greenhouse plants. They have mouth parts fitted for piercing and scraping the leaf surface and for sucking the exuding sap. Injured leaves or petals become covered with whitish or silvery blotches which later run together causing dead areas. There are many generations annually, and infestations breed up so rapidly that injury develops suddenly.

Control: Spray with $\frac{1}{2}$ pound of tartar emetic and 1 quart of molasses in 25 gallons of water. Several applications will usually be necessary.

Greenhouse Whitefly. The tiny, four-winged, white, powdery adults are about $\frac{1}{16}$ inch long. They are readily observed while resting on the under sides of the leaves. If numerous they rise in small white clouds when disturbed. The young are less than $\frac{1}{25}$ inch long. They are oval, flat, scale-like, and pale green in color. Fine waxy threads of various lengths radiate from the body. Adults and young both feed on the leaves, sucking the juices. Injured plants turn yellow, wilt, and may die.

Control: Whiteflies are probably best controlled by repeated fumigations with calcium cyanide used at the rate of $\frac{1}{2}$ ounce per 1000 cubic feet of space. Fumigations should be spaced about 2 weeks apart until the infestation is eradicated. In using calcium cyanide follow the directions of the manufacturers.

Green Peach Aphid. This green plant louse injures new growth and curls terminal foliage. It winters in the egg stage. Eggs are black and shiny and are deposited in crevices in the bark and around the bases of buds. Eggs hatch just before the buds open in the spring.

Control: Dormant-type oil emulsion applied just before the buds open is fairly effective in control. If the dormant spray is lime-sulphur it should be delayed until just before the buds open and $\frac{3}{4}$ pint of 40 percent nicotine sulphate added to each 100 gallons of dilute spray. For foliage sprays use $\frac{3}{4}$ pint of 40 percent nicotine sulphate or pyrethrum extract and $\frac{1}{2}$ gallon summer-type oil emulsion to 100 gallons of water.

Green Plant Bug. This plant bug, or stink bug, is about $\frac{1}{2}$ inch long and is colored bright green. It sometimes seriously injures the heads of standing wheat by destroying the developing kernels.

Control: No practical method of control is known. Spring burning of weeds and trash in infested fields and weedy roadsides will reduce somewhat the numbers of the bugs.

Hog Louse. The hog louse is a sucking louse. It is a large, bluish-gray louse nearly $\frac{1}{4}$ inch long when mature. The lice torment the hogs by piercing the skin and thus cause the animal to rub. The skin becomes thick, cracked, tender and sore, and the animals become restless and unprofitable.

Control: A method of control on swine is the application of a thin coat of fuel oil over the animals' bodies with a fine-bristled

brush. Special attention should be given to the inside of the ear, the folds of the skin about the neck and the inner surfaces of the thighs, to be sure that all eggs are covered with the oil. Oils should not be used on pregnant sows.

Hog Mange. Hog mange is caused by the sarcoptic mange mite. The mites are white or yellowish parasites about 1/50 inch long. They are not readily visible to the naked eye unless placed on a black background. The general form of the body is more nearly round than oval and the bluntly rounded head is as broad as long. The mites excavate egg burrows in the outer skin. The young mites feed in the burrows and when mature make new burrows. Lesions are usually first visible on the neck and shoulders or around the head but they may start on other places. If unchecked they may spread until they cover the entire animal. The skin becomes thickened, wrinkled and scurfy. The animals lose weight.

Control: Mange mites are controlled on hogs the same way as are hog lice.

(Hollyhock) Aphid. These dark red plant lice cluster on buds and leaves causing them to wilt and wither and often preventing blossoming.

Control: Spray with 40 per cent nicotine sulphate or pyrethrum extract, 1 teaspoon to $\frac{3}{4}$ gallon of water in which is dissolved a piece of soap the size of a large walnut. Make applications as soon as the first aphids are observed and repeat if necessary.

Hollyhock Beetle. This oval-shaped beetle is about $\frac{3}{8}$ inch long. The head and thorax are black, wing covers are yellow to orange with irregularly shaped black lines extending lengthwise. Beetles severely eat the leaves of hollyhocks, especially those near the soil. They may be found underneath leaves or trash beneath injured plants.

Control: Dust with rotenone or spray the leaves with lead arsenate or calcium arsenate at the rate of 1 pound to 25 gallons of water.

Hop Looper. The grayish-brown moth is between $\frac{1}{2}$ and $\frac{3}{4}$ inch long. The mouth parts project forward from the head resembling a snout. Caterpillars are pale green, about $\frac{5}{8}$ inch long when mature. They feed on the leaves of ornamental hops, causing a ragged, unsightly appearance.

Control: Dust the vines with pure calcium arsenate or lead arsenate, or spray with lead arsenate, 3 pounds to 100 gallons of water. Apply when the first holes are observed in the leaves and repeat 2 or 3 weeks later if necessary.

Horn Fly. The horn fly is a close relative of the stable fly, and its harmful effect on cattle is very similar. It pierces the skin to suck the blood, causing pain and annoyance, and interferes with the feeding and resting of the cattle so that they lose weight and drop in milk production. They are small flies, about half as big as

the house fly or the stable fly, and hover over the backs of cattle all summer long. They crawl down between the hairs on the withers, back, or belly and suck blood.

Control: No satisfactory control has yet been devised for these flies. Darkened stables, with curtains or brush arranged over the entrance to brush the flies off as the cattle go in, give a measure of relief. Repellant sprays applied at the time of milking give temporary relief. The destruction of their breeding places by daily removal of all manure from feed lots to the field during fly seasons greatly reduces populations of the fly.

Horse Biting Lice. Horse biting lice are not often severe pests of horses, but they occasionally become sufficiently numerous on horses to cause severe irritation and itching. Horses will often rub, bite, stamp, kick, and otherwise manifest extreme uneasiness, in an effort to relieve themselves of the irritation. The coat becomes roughened, and frequent rubbing destroys the hair in patches, often causing bruises or wounds in the skin. The lice usually are found on the sides of the neck, around the flank, and on the jaw. They are found on all parts of the body in severe infestations. The eggs are attached to the individual hairs on the body and require about 8 or 10 days to hatch.

Control: Hand applications of rotenone dust applied from a shaker-top can with enough grooming to insure that the powder will sift into the hair, will control horse lice. Two applications are usually necessary about 10 days apart.

Horse Botflies. Three species of botflies attack horses. The horse botfly, while depositing its eggs, does not annoy the horse as much as the other two species. The body of the female is covered with bands of black and yellow hair. Each of its wings bears a dark band. The abdomen is curved under in characteristic shape. The fly hovers about the horse while attempting to deposit eggs. The eggs are glued to hairs on the inner sides of the knees, and on the outsides of the forelegs, on the shoulders, belly, neck, and flank. The throat botfly moves more rapidly than the horse botfly and usually poises in midair between the forelegs and then darts at the chin or throat to lay its eggs then rapidly flies away. The nose botfly is even more rapid in its movements than the throat fly. The female darts at the lip, deposits an egg and then flies away only to return in a few seconds to deposit more eggs.

Control: Several things can be done to protect horses from the attack of the egg-laying botflies. No known repellants are entirely effective. A mixture of equal parts of pine tar and lard applied to the areas where the flies lay the eggs is effective for about 4 days in keeping the flies from laying their eggs. The use of blankets or nets tends to aid the animals in fighting away the botflies. The best treatment for ridding the animals of this pest is the administration of carbon disulphide. The carbon disulphide is prepared in capsule form. It should be administered only by a

veterinarian, for if the capsules are not properly administered or are broken during the process, death of the animal is likely to result. The greatest efficiency in the use of the treatment is obtained during the winter months, preferably in December or January, or after the eggs have all hatched and the larvae have entered the animal. The treatments should be made 30 days after the bots have appeared in the mouth.

Horse Flies. Several flies which may be called horse flies belong to a group known as tabanids. These insects are notorious as tormenters of horses on pasture and in the harness. They are blood suckers, and, in piercing the skin to obtain the blood, they greatly annoy horses. They also attack other livestock and man. Besides being pests, horse flies have been shown to be carriers of certain diseases of animals such as anthrax, anaplasmosis of cattle, and certain trypanosome diseases.

Control: Little is known of how to control these pests on domestic livestock, but the best protective method is to prevent attack of the insects by mechanical protection of the horses.

Horse Sucking Lice. One species of sucking louse is found on horses, and it may be distinguished easily from the horse biting-louse in that it is large and has a long, pointed head, whereas the biting lice have short, rounded, blunt heads. The eggs are attached to the hairs, usually close to the skin, and hatch in from 11 to 20 days. These lice spend their entire lives on the horses and will live only a few days when removed.

Control: They are controlled in the same way as horse biting lice.

House Fly. This loathsome insect breeds in all kinds of filth, garbage, human excrement, manure, etc. It is a filth and disease carrier. Its presence is indicative of filth some place nearby.

Control: Burn, bury, or dispose of garbage immediately. Keep garbage cans covered. Protect foods by screening. Keep stables clean. Haul manure away at least once a week and spread it where it is exposed to sunshine. Fly populations around barns, homes, stores, etc., can be greatly reduced by the use of traps, a number of which are on the market. Proprietary poisons and sticky fly preparations that greatly aid in reducing the numbers of flies are also on the market. A good fly poison may be made cheaply by mixing together 1 tablespoon of 40 percent formalin, $\frac{1}{4}$ pint of sweet milk or buttermilk, and $\frac{1}{4}$ pint of water. Expose this mixture in shallow dishes to the flies. Many proprietary sprays on the market will stupefy flies after which they may be swept up and burned.

Indian-Meal Moth. The adult moth is about $\frac{1}{2}$ inch long. The base of the forewing is grayish white, and the tip half is reddish brown. Larvae are of a general white color and are $\frac{1}{3}$ to $\frac{1}{2}$ inch long when fully grown. The larvae feed upon a great variety of food materials. Infested material is often webbed together and fouled with dirty silken masses.

Control: Control is the same as for the saw-toothed grain beetle.

Lace Bugs. These small, flat, sucking insects feed on the lower surfaces of leaves of many plants. The head and body frequently are completely hidden by the lace-like covering of the thorax and the wings. This lace-like covering is often nearly transparent, showing many veins. Adults are about $\frac{1}{8}$ inch long. The young are darker in color, often covered with spines, and do not resemble the adults. Injured leaves show light flecked areas and quantities of dark pellets of excrement.

Control: Spray with 40 percent nicotine sulphate or with pyrethrum extract at the rate of 2 teaspoons to 1 gallon of soapy water. Direct the spray so that it will hit the insects in flight and so it also will cover the lower surfaces of the leaves.

Larder Beetle. The brown, hairy larva of the larder beetle is occasionally found in woolen fabrics and in food materials. It is very sluggish of movement. The beetle is about $\frac{1}{4}$ inch long, black in color, with a wide, pale yellow band running cross-wise on the wing covers.

Control: Houses severely infested should be fumigated (send to the Idaho Agricultural Experiment Station for special instructions). Moderate infestations should be cleaned out as directed for the saw-toothed grain beetle.

Leaf-Curl Plum Aphid. The first forms of this plant louse which appear in the spring are deep red or brownish red with brown bands cross-wise on the back. The young from these are uniformly pale green. Overwintering eggs on the bark hatch in the spring before the fruit buds of prune show signs of swelling. When leaves appear they are severely curled from the effects of the feeding of this aphid. Several generations develop on peach, prune, or plum trees before leaving for other plants.

Control: Add $\frac{3}{4}$ pint of 40 percent nicotine sulphate or pyrethrum extract to each 100 gallons of dormant lime-sulphur or oil emulsion sprays and make the application just before the blossom buds open in the spring.

Leaf Cutter Bees. These wild bees cut large, circular holes in the margins of the leaves of rose, Virginia creeper, lilac, etc., causing an unsightly, ragged appearance.

Control: Spray the bushes with lime-sulphur 1 part to 40 parts of water, to repel the bees. Make the first application when damage is first observed and repeat if necessary later in the season.

Leatherjackets. These tough, slate colored, tapering larvae may usually be identified by the scalloped "hood" at the rear end of the body. They are the larvae of craneflies, insects that resemble huge mosquitoes. They sometimes feed on strawberries and root crops near the surface of the ground and rest shallowly in the soil in protected places, beneath trash, etc.

Control: Cultivate the soil thoroughly near the plants and elimi-

nate debris. Examine under leaves, hand-pick and destroy larvae. Scatter poisoned bran mash (directions for preparation, page 55) over the surface of the ground and closely around plants.

Legume Bugs. There are several species of insects which are called legume bugs. Three of the species are found most commonly in Idaho. These insects cause puncturing of bean and alfalfa seeds, blossom drop in alfalfa and beans, decreased yield of alfalfa hay and seed as well as injury to many other garden and field crops. The adults are about $\frac{1}{4}$ inch long, of general flat angular shape and are quite active. They have a small blackish or yellowish triangular area on their backs and in front of the wings, on which is usually seen a greenish V-shaped mark.

Control: No entirely satisfactory chemical control is available although dusting with double strength pyrethrum or with a mixture of pyrethrum dust with 10 percent sodium arsenite show some promise of control. Reduction of the weeds on which they spend the winter and on which they breed early in the spring will greatly reduce their numbers. It is possible to reduce the injury to beans by delaying the cutting date of alfalfa for a week or 10 days on the second crop cutting.

Lima Bean Pod Borer. The small gray moths have a broad white band and an ochreous band across the forewings. They are very active and appear in the early spring. The caterpillars vary from white to pale green or red and attain a length of about 1 inch. They commonly infest the green pods of many legumes, in which they eat out large portions of the seeds. Most varieties of beans, peas, and the pods of locust and wild vetch may be attacked. There is only one generation a year. This insect is seldom present in large numbers in Idaho.

Control: There is no satisfactory control for this insect.

Mealybugs. These small, sluggish, white, soft-bodied insects cluster on the under sides of leaves or in leaf axils. They vary in size up to about $\frac{1}{4}$ inch long. They suck the juices from the stems and leaves, discoloring and deforming the foliage.

Control: Control is extremely difficult, for insecticides strong enough to insure kills of the insects often injure tender greenhouse plants. Probably the most practicable control is to spray with nicotine sulphate or pyrethrum extract, at the rate of 1 teaspoon to $\frac{3}{4}$ gallon of water, adding 2 teaspoons of summer-type oil emulsion. Spraying should begin before infestations build up to any extent and applications repeated until control is established.

Mealy Plum Aphid. This bluish-green plant louse covered with a white, powder-like secretion, becomes exceedingly abundant on the under surfaces of the leaves early in the spring. It is accompanied by heavy honey-dew, a sticky secretion that drops on the upper surfaces of the leaves.

Control: Spray thoroughly with 1 gallon of summer-type oil

emulsion in 99 gallons of water and add $\frac{3}{4}$ pint of 40 percent nicotine sulphate or pyrethrum extract. Use pressure and material sufficient to wet through the "mealy" covering and make application as soon as infestations are observed in the spring.

Mediterranean Flour Moth. Larvae of the Mediterranean flour moth are nearly $\frac{3}{4}$ inch long when mature, are whitish, and have dark heads. They spin silken threads and form tunnels in the flour or other cereal products. Adults are dark gray moths that may be found in flour mills or dwellings throughout the year.

Control: Follow the recommendations for saw-toothed grain beetle.

Mineola Moth. Fully grown larvae are slightly more than $\frac{1}{2}$ inch long. They are a red-brown color, being uniformly darker from the middle of the side of the body upward than from the middle of the side downward. Legs are black and the head light brown. Partially grown larvae winter in heavy webs on the bark, become active about the time prune blossoms begin to swell, and enter the blossom buds. Larvae pupate in the soil. Moths deposit their eggs singly on the under surface of the leaves. Part of the insects have but one generation annually. Others pass through a second generation while some of them have three generations annually. Newly hatched larvae enter the fruits. Larvae feed only in flower buds or in the fruit, never on leaves.

Control: There is some evidence that where lime-sulphur is used annually as the dormant San Jose scale spray, infestations of Mineola are light. The best means of direct control yet found is to spray with dormant-type oil emulsion 4 gallons, water 96 gallons, and $2\frac{2}{3}$ pints of pyrethrum extract (oil extract containing 2.15 grams pyrethrins per 100 ml.) Mix oil emulsion and water as for oil spray and then add pyrethrum. In home-made emulsions, or with the tank-mix, first combine the pyrethrum with the oil and then emulsify. Make applications when the prune buds are swelling and show green at the tips and just before beginning to show white.

Monterey Pine Scale. The adult Monterey pine scale is a large semi-globular reddish brown or black, smooth, shiny species which occurs at the bases of the needles on the tips of the twigs of Monterey and other pines. It produces large quantities of honey-dew and often seriously injures young trees. Closely related species occur on spruces and firs.

Control: No control is known.

Mormon Cricket. Adults are dark brown to black and from $1\frac{1}{4}$ to $1\frac{1}{2}$ inches long. They are wingless. As the nymphs grow, they begin moving, migrating bands often being of large size and frequently reaching cultivated fields. Mormon crickets are general feeders, but their food preference is distinctly for some of the native plants, and they do not often cause serious damage to cultivated crops.

Control: The best method of control is the application of a sodium fluosilicate-bran-sawdust bait as described for grasshoppers. The bait should be scattered thinly where the crickets are feeding. Large areas of crickets are successfully controlled by spreading the bait from airplanes and from power-driven bait casting machines. Smaller areas are very successfully controlled by scattering the bait by hand. The crickets may be killed when they are crossing a slow moving stream with a thin coating of very light oil over the water.

Mourning Cloak Butterfly. The large, spiny caterpillars are black, marked with white and red dots. They occur in groups and defoliate individual branches on cork elm, poplar trees, etc. They are rarely of much importance.

Control: Clip off and destroy infested branches, or if the infestation is severe, spray with lead arsenate, 3 pounds to 100 gallons of water, when the caterpillars make their appearance.

Narcissus Bulb Fly. The bulbs of narcissus and other plants fail to grow when attacked by the narcissus bulb fly. The bulbs become soft and the outer scales of the bulbs often have brown scars upon them. The large, whitish or yellowish-white maggots feed upon the plant tissues inside the bulb. The adult fly is a shiny, yellow-and-black, hairy fly about the size of a small bumble bee. The eggs are laid in the bases of the leaves or in the necks of the bulbs.

Control: Treat bulbs by submerging them in water held at a temperature of 110° to 111° F. for 2½ hours. Infested bulbs may be sorted out and destroyed at the time of taking them from the field. The bulbs may be treated by fumigation with paradichlorobenzene. The fumigant is placed in the bottom of an airtight box at the rate of 4 ounces per cubic foot of space in the box. The thoroughly dried bulbs may be arranged in trays in the box and left to fumigate about 6 days after which they should be removed and well aired.

Norway Maple Aphid. The Norway maple aphid is a rather large, hairy and yellowish-green aphid with brown markings. The eyes are reddish and the antennae are long and hairy. These aphids cluster in numbers along the veins of the undersides of the leaves. They secrete large quantities of honey-dew. In severe infestations the leaves develop brown blotches, become wrinkled and stunted, and eventually fall off.

Control: Thorough spraying with nicotine sulphate or pyrethrum extract, 1 pint to 100 gallons of water to which has been added 4 or 5 pounds of powdered soap will do much to check the aphids. Care should be taken to spray the undersides of the leaves.

Oblique-Banded Leaf Roller. This insect is common in greenhouses. The tiny green larvae feed for a short time as miners in the leaf but later come to the lower surface. The adult moth

is a little over an inch long, reddish-brown in color, with the front wings crossed by three distinct dark brown bands.

Control: Same as for greenhouse leaf tyer.

Onion Maggot. The small, grayish fly deposits her eggs on the onion plant. Larvae are small, legless maggots, nearly white in color, and when full-grown are about $\frac{3}{8}$ inch long. Maggots eat into the bulbs, causing them to die. Pupation takes place in the soil and winter is normally passed in the pupal stage. Maggots are able to survive the winter in onion bulbs left in the field or in cull piles. There are two generations annually.

Control: All bulbs, cull onions, etc., in the field should be destroyed after harvest. There is no satisfactory control on onions grown from bulbs but maggots may be very successfully controlled on onions grown from seed by treating the seed with calomel. Thoroughly mix the seed with the calomel at the rate of 2 pounds of calomel to 1 pound of seed and plant. The amount of seed should be increased to allow for the extra material in the calomel going through the seeder.

Onion Thrips. Tiny yellow or brown insects that hide in "crotches" of the plants and in the soil in the daytime and feed on the plants at night or in cloudy weather. Injured leaves assume a silvery appearance and become crisp and dry.

Control: Spray with a mixture of 2 pounds of tartar emetic, 1 gallon of sugar beet molasses or 4 pounds of sugar in 100 gallons of water. Apply at the rate of 100 gallons of spray per acre. Two sprays applied at 7-day intervals is the minimum number of sprays required. The first application should be made when the thrips injury to the plants first becomes noticeable and before serious damage has been caused. Usually this will be during the first half of July. A dust made of "Code 2," a proprietary compound, applied at the rate of 40 pounds per acre is also effective. No satisfactory method of applying these materials to seed onions has yet been developed.

Oyster-Shell Scale. These are tiny sucking insects that become fixed on the bark of fruit trees, and as they grow cover themselves with a brown secretion resembling an oyster shell in shape. There is only one generation each year. Eggs are deposited under the shell and hatch shortly after the apple trees bloom. The young insects soon fix themselves on the bark where they suck the sap. They appear as tiny yellow specks on the bark before they are covered with their secretion.

Control: Dormant-type oil emulsions used at the rate of 5 gallons to 95 gallons of water are preferable when infestations are severe. In lighter infestations lime-sulphur at the strength used for San Jose scale gives commercial control when used annually. The young may be killed by the application of summer-type oil emulsion used at the strength of $1\frac{1}{2}$ gallons to $98\frac{1}{2}$ gallons of water shortly after they hatch.

Pacific Mite. The Pacific mite is a pest of the apple in Idaho, but may occur rarely on prunes. This mite has been called the two-spotted mite or common red spider. The two-spotted mites and red spiders attacking other plants are different species. The Pacific mite is a pale lemon-yellow in color, and has irregularly shaped dark spots on the back. It hibernates in the soil and migrates into the tree in the spring. Aside from its color and markings, it is recognized readily by the fact that it spins a dense web, especially on the under sides of the leaves, beneath which it feeds. Eggs and all forms of the mite are protected during the summer by this web. Injured leaves become dry and leathery, turn red or brown and often fall prematurely. The size and quality of the fruit is seriously impaired. The orchardist should carefully examine his trees every few days in the spring after the foliage is out and be prepared to spray as soon as the first mites are found on the leaves and before they have an opportunity to form heavy webbing. Since the mites make their way upward from the soil, the lower leaves are infested first, and the infestation spreads upward as the season advances.

Control: Spray the trees thoroughly with summer-type oil emulsion at the rate of 5 quarts of medium oil or 6 quarts of light oil in 100 gallons of spray. Avoid the use of dormant-type oils since they are likely to cause injury to green leaves or fruit. In spraying pay particular attention to drenching the trunks, lower leaves and under leaf surfaces. Spray before infestation becomes severe, or about the first or second week of June.

Painted Lady. The butterflies have a wing expanse of approximately 2 inches, the wings mottled with brown, orange, and white spots. The spiny caterpillars are dull brown or black with a pale yellow stripe on each side. They commonly feed on thistles and other weeds, but, when numerous, may be found on many cultivated crops.

Control: Spray with lead arsenate, 2 pounds in 50 gallons of water when the caterpillars appear. Control measures are seldom necessary.

Pea Aphid. Green plant lice occasionally become very numerous on first-crop alfalfa, and frequently on sweet peas and garden and field peas. They cause injury by sucking the sap from growing plants causing foliage and blossoms to wilt and shrivel. Severely injured plants turn yellow and dry up.

Control: For sweet peas and peas planted in rows, the best control known is to dust the plants heavily with nicotine dust, made by mixing together first 8 pounds of monohydrated copper sulphate and 38 pounds of hydrated lime, and then adding 4 pounds of 40 percent nicotine sulphate and mixing again. All the mixing must be thoroughly done. Directions for mixing are given on page 55. Dusting must be done on a calm day when the temperature is 70° F. or higher. Spraying with 40 percent nicotine sulphate

at the rate of 1 pint and summer-type oil emulsion 1 gallon to 80 gallons of water, may be used instead of dusting, but it is less effective. First dilute the oil emulsion with the water and then add the nicotine sulphate. Indications are that a dust containing 1 percent of rotenone, applied at the rate of 35 pounds per acre, will give satisfactory control.

When first-crop alfalfa is severely attacked, it should be closely clipped immediately and quickly removed from the field, and the field kept dry until after new growth starts.

Clipping the alfalfa very close late in the fall or grazing it after the last crop is cut prevents heavy infestations from developing.

Pea Weevil. This small gray-brown beetle lays its eggs on the outsides of the pods. Grubs eat into the peas where they mature and pupate. Most of the adults emerge from the peas in the fall, but some of them remain in the seeds until the following spring. Weevily peas are readily recognized by the large, circular emergence holes. Adults fly long distances, some of them hibernating in trash in the field, in old pea vines, in cracks in fence posts, under bark of posts, trees, etc. There is one generation annually.

Control: Garden peas may be almost completely protected from weevils by dusting them with rotenone dust. This dust kills only the adults and has no effect on the eggs. It is not effective for longer than 24 hours after it is applied; and, as adult weevils move to peas from hibernating quarters over a considerable period of time, four or five successive applications must be made at 4- or 5-day intervals on home garden peas.

Weevils may also be controlled on field and seed and canning peas by the use of rotenone dust. Further information on the control of weevils on large acreages may be obtained by writing to the Idaho Agricultural Experiment Station.

Peach Borer. The clear-winged moths deposit their eggs on the trunk of peach and prune trees near the ground. When larvae hatch, they make their way into the trunk just below the soil surface. They feed and grow in the trunk or roots beneath the ground, frequently completely girdling and killing the trees. Masses of semi-transparent gum exude from holes made by the larvae. Larvae are very light yellow, have a light brown head, and when mature are about 1 inch long. There is one generation annually.

Control: Smooth the ground around the base of the tree, lowering the level as little as possible. Spread a narrow ring of paradichlorobenzene entirely around, about 2 inches away from the trunk, cover with 4 inches of soil and pat down. Use $\frac{1}{2}$ ounce of paradichlorobenzene for young trees; $\frac{3}{4}$ ounce to 1 ounce for trees 5 years old or older. The best results are obtained by making the application about September 15, after most of the eggs have been laid. Mounds should be leveled down to the general soil surface the following spring to prevent moths from laying their eggs high on the tree trunks. Applications may be made in the spring if the borers are causing severe injury and it is necessary to

obtain protection, but fall applications make it unnecessary to apply spring control and eliminate the injury caused by overwintering borers.

Treatment should not be made when the soil temperature is likely to fall below 60° F. for the first 2 weeks after application. Infestations in the trunk and crotches may be treated by painting the affected parts with a solution of 1 pound of paradichlorobenzene in 2 quarts of cottonseed oil.

Ethylene dichloride also gives excellent control. Stock emulsion is prepared by adding 9 gallons of ethylene dichloride to 1 gallon of potash fishoil soap, emulsifying, then adding water to make 18 gallons. This stock emulsion is diluted before use with water according to the age of the tree. Use 3 volumes of the stock emulsion to 7 of water, $\frac{1}{4}$ to $\frac{1}{2}$ pint for 2- to 3-year-old trees; 2 volumes of stock to 3 of water, $\frac{1}{2}$ pint for 4- to 5-year-old trees; and $\frac{1}{2}$ pint of a half and half mixture for older trees. Apply by wetting the soil immediately surrounding the tree. The lower part of the trunk should receive some material during treatment.

Peach Lecanium. This brown, hemispherical scale adheres to the smaller branches. The insect under the scale sucks the sap and devitalizes the trees. This insect is of relatively little importance in Idaho.

Control: This insect is readily controlled by the dormant oil emulsion or lime-sulphur sprays used in the control of San Jose scale.

Peach Twig Borer. These are uniformly brown-colored larvae with a black head; the first segment of the body is black. The mature larva is slightly less than $\frac{1}{2}$ inch long and has the appearance of having light and brown stripes alternating cross-wise of the body. There are two generations annually. The overwintering generation hibernates beneath the bark in the crotches of the branches and emerges about the time peaches bloom. These larvae attack the terminal twigs, killing and deforming them. A second generation bores into the fruits and is the principal cause of "wormy" peaches.

Control: Spray with lime-sulphur as for San Jose scale. Oil sprays are not effective unless used in combination with lead arsenate. Lead arsenate, 4 pounds to 100 gallons of water, frequently gives a high degree of control if applied just as the larvae emerge in the spring.

Pear Leaf Blister Mite. These nearly microscopic, pink-colored mites live beneath the bud scales of apple and pear during the winter. They emerge early in the spring and begin feeding inside the leaves before they are fully opened. They cause little blisters which are at first light green or red but which later turn to rusty brown. In late summer severely infested leaves are red and dry in appearance, and whole areas in the leaves are killed. Injured fruits are misshapen, rough, and russeted. Many generations de-

velop in a season all of them within the leaf tissue where they are not successfully reached by sprays.

Control: This mite is readily controlled any time during the dormant season with lime-sulphur spray testing $3\frac{1}{2}^{\circ}$ Baume. A combination of 1 percent dormant oil and 3 percent lime-sulphur will give satisfactory control. Spraying should be done before the leaves begin to unfold.

Pear Psylla. The pear psylla recently has been introduced into the Pacific Northwest, and until this introduction, it was known only east of the Mississippi river. The adults are dark, reddish-brown, four-winged insects about $1/10$ inch long. The nymphs are much smaller, very broad, active, and yellow, and are found on the fruit and leaves during the growing season. The adult psylla overwinter under the bark of trees or in other sheltered places about the orchard. The insect attacks pear and quince. The leaves on heavily infested trees turn brown and often drop; the fruit drops prematurely or is undersized and of poor quality. Both the leaves and fruit of badly infested trees will be covered with honeydew which is generally covered with a black fungus later in the season.

Control: Spray thoroughly with oil emulsion or miscible-oil sprays applied at strengths as for San Jose scale. Spraying should be done when the leaves fall, or just before growth starts in the spring. Trees may be thoroughly sprayed with dormant lime-sulphur, applied just before the blossom buds open.

Pear Slug. Sticky, shiny, olive-green or nearly black larvae move little and destroy the upper leaf surface, causing leaves to turn brown and become crisp. One generation attacks the foliage in the early spring and another in the fall.

Control: Spray with calcium arsenate, 2 pounds to 100 gallons of water, or dust the foliage lightly with calcium arsenate or hydrated lime. One application in the spring, as soon as injury begins to be noticeable, is sufficient. Another application in the fall may be necessary for control of the second brood. Rotenone dust is also effective.

Pine Needle Scale. Needles of pines sometimes are dotted with white specks. These are the scaly coverings of tender-bodied sucking insects. The purplish eggs of the insects may be found beneath the scales in the winter. The young appear some time in May and are red. They may be readily observed crawling about on the needles.

Control: Spray the infested trees with summer-type oil emulsion, 2 gallons to 98 gallons of water, about 10 days after the first crawlers are observed. This will be about the last of May or the first of June. Oil sprays should not be applied to coniferous trees more than 1 year in 4.

Prune Leafhopper. Severe injury is caused to the foliage of prune by the feeding of both the young and adult forms of a white-

colored leafhopper. This species has two generations a year and passes the winter in the egg stage under the bark on the smaller branches and twigs. Injured leaves lose their green color, become dry, and are covered with tiny, light-colored flecks. The injury results from the insect sucking the sap out of the leaf tissue.

Control: It is not difficult to obtain good control but spraying must be done when the nymphs of the first generation are present on the foliage. This is usually about the first week in June. At that time they are readily controlled by the use of summer-type oil emulsion at the rate of 1 gallon in 100 gallons of water. After the nymphs change to the adult or winged stage, they are difficult to kill, and it is necessary to add nicotine sulphate or pyrethrum extract at the rate of 1 pint to 100 gallons of the oil-emulsion spray.

Prune-Thistle Aphid. These red or green plant lice curl the leaves of plums and prunes in the early spring and form sticky honeydew. Heavy infestations are extremely injurious and cause a heavy drop of small prunes.

Control: Infestations are of little economic importance in orchards where a dormant oil spray is applied early in March for San Jose scale. After the foliage is out, spray with nicotine sulphate, 1 pint, and 1 gallon summer-type oil emulsion in 99 gallons of water. Make applications just as the leaves are appearing and before curling of the leaves takes place.

Psoroptic Mange or Scab Mite. The mites which cause psoroptic mange of sheep live on the surface of the skin and do not form burrows. They are slightly larger than sarcoptic mites. Psoroptic mange may start on any part of the body, but the first lesions usually appear on the head. The mites prick the skin and probably introduce a poisonous secretion into the wound causing a slight irritation with severe itching. As the mites multiply, large numbers of small wounds are made in the skin, followed by the formation of papules, increasing the inflammation and itching, and the exudation of serum. Scabs then soon form. The skin becomes thickened and wrinkled as the infection increases; large areas become denuded of wool and covered with thick scabs.

Control: Scab mites are controlled by dipping the sheep in warm lime-sulphur or nicotine dip. Follow the directions for dilution given by the manufacturer. The treatment should be repeated one or two times at 10- to 14-day intervals. Sheds in which the sheep are kept should be sprayed with a 5 percent carbolic acid or lime-sulphur or creosote dip. The animals should be changed to a new pasture.

Raspberry Cane Maggot. Young canes from 1 to 3 feet in length are attacked by this insect. The canes suddenly wilt and have a purple discoloration appearing at the point of attack. The maggot enters the cane, bores downward a few inches and then completely girdles the shoot.

Control: Remove and burn all of the injured canes as soon as observed in the spring to protect next year's young shoots.

Raspberry Fruit Worm. Adult beetles, which are light brown in color and approximately $\frac{1}{8}$ inch long, appear early in the spring and feed on the young leaves and newly opened buds at the tips of the canes. The small brown and white grubs, hatching from these eggs, bore into and feed upon the berries making them unfit for food. When full-grown the grubs are approximately $\frac{1}{4}$ inch long.

Control: Three applications of a rotenone dust at weekly intervals, beginning 10 days after the first blossoms appear, give good control. Two pounds of derris or cube, containing 5 percent rotenone, in 100 gallons of water, may be used as a spray.

Raspberry Root Borer. The adult is a clear-winged moth with a black body crossed by four narrow yellow bands. Eggs are deposited on the under sides of the leaves and larvae hatching from them make their way beneath the bark just below the ground level or under flakes of bark at the bases of stems. The following spring they tunnel beneath the bark of stems and roots, often girdling them and causing wilting stems or dying plants. They continue to grow until the next spring when they are nearly 1 inch long. They pupate in their tunnels. The life cycle is 2 years.

Control: Treat each plant by placing a pound of mixture of equal parts of fine tobacco dust and hydrated lime about the crown and roots of each plant. Make a hollow by mounding the soil up around the edges of the pile of dust and pour over the dust a quart of water. After the water has soaked, draw the earth into a mound around the base of the plant. This mixture kills the young larvae and should be applied after the first of October.

Raspberry Sawfly. The lower leaves are skeletonized in June by spiny green "slugs" which hatch from eggs laid in the late spring in rows in small punctures in the undersides of the leaves. They move from shoot to shoot or plant to plant as defoliation becomes complete. The adult passes the winter in the soil.

Control: Spray with calcium arsenate 2 ounces, hydrated lime 8 ounces, and water 3 gallons just before the blossoms appear, or dust with rotenone just after the blossoms have appeared.

Red Spider (Common). The common red spider in Idaho includes more than one species and they have not yet been fully described. The one occurring on apple has been found to be the Pacific mite, while one similar in general appearance found infesting red clover in 1939 proved to be a new and undescribed species. The common red spiders vary in color from lemon yellow to a yellowish green and usually have two irregular dark spots on the back so that they are often spoken of as two-spotted mites. During the migration period the mites become red or orange. The common red spider winters in the soil as an adult and migrates to the growing plants in the early spring. It attacks many kinds of fruit trees,

bush fruits, field crops, and ornamentals. It is readily recognized by the dense webbing it spins on the leaves, especially on the undersides. It feeds beneath the web which also protects the eggs and young forms. There are several generations annually. Injured leaves become dry and leathery, turn red or brown in color, and often fall prematurely. Severe damage to the plant or crop may be done in a very short time.

Control: Spray thoroughly with summer-type oil emulsion at the rate of 1 to 1½ gallons in 99 gallons of water. Avoid the use of dormant-type oils since they are likely to cause injury to leaves or young fruits. Probably the best means of controlling red spiders on field crops, such as beans, clover, potatoes, etc., is by dusting the infested plants with dusting sulphur at the rate of 25 pounds per acre.

Rose Aphid. This pink- or green-colored plant louse frequently covers stems, buds, and young leaves, and secretes a sticky honeydew. It frequently severely injures plants by sucking the sap. There are many generations annually.

Control: Spray with 40 percent nicotine sulphate, or pyrethrum extract, 1 teaspoonful to 1 gallon of water, in which is first dissolved a piece of soap the size of a large walnut. It is important to make applications as soon as the first aphids appear. Applications should be repeated as often as necessary.

Rose Curculio. This red, snout-beetle is about ½ inch long. It causes injury by puncturing the flower buds so that the petals, when they unfold, are riddled with holes.

Control: Hand pick the beetles on or beneath the plants. Spray with Bordeaux mixture 6-6-50 to repel the beetles, making the first application when the first flower buds are developing. Keep the new buds covered with spray as they form.

(Rose) Leafhopper. This slender, sucking insect is only about ⅛ inch long. It is greenish-yellow or pale yellow. Injured leaves are identified by the flecking and mottling which occurs around the leaf punctures. Severely infested leaves become crisp and dry. The young are wingless, very delicate creatures, and are found on the under surfaces of the leaves. Injury is caused by both adults and young.

Control: Follow the recommendations for Virginia Creeper leafhopper. Leafhoppers migrate from non-sprayed plants, and it is usually necessary to repeat spray applications frequently to keep rose bushes in good appearance.

Rose Scale. Snow-white, nearly circular scales are found on the canes. This insect is rarely injurious.

Control: Spray with lime-sulphur, 1 gallon to 10 gallons of water, during the dormant season.

Rose Slug. Slimy, green, slug-like worms feed upon the leaves, skeletonizing them. Infested leaves turn brown, as though severely

burned. The adult is a shiny black sawfly, slightly larger in size than the common housefly.

Control: Spray or dust with pyrethrum or rotenone when the slugs are seen, either in early spring or late fall. Calcium arsenate dust or spray is also effective.

Rosy Apple Aphid. Pink or purplish plant lice roll apple leaves severely and cause dwarfed, misshapen fruits. Their attack is not restricted entirely to the new leaves and tender growth. Several generations develop in the spring. The winter is passed in the egg stage on the bark of apple trees. Eggs hatch in the spring about the time that buds begin to swell.

Control: The rosy apple aphid must be controlled early in the spring before the leaves begin to curl. Some degree of control is obtained by the use of the regular dormant spray of oil emulsion or lime-sulphur as for San Jose scale if the application is made just before the buds burst. Better control results if 40 percent nicotine sulphate is used at the rate of 1 pint in 100 gallons of either the oil emulsion or lime-sulphur spray solutions.

Rust Mite. The rust mite is so extremely small that it scarcely can be seen with the naked eye. Where the infestation is heavy, as many as four to five thousand mites have been counted on a single leaf. The injury from the mites causes the leaves to curl lengthwise. After severe injury early in the season and prolonged hot weather in July and August, the foliage becomes dry and crisp and turns brown. Mite-injured trees have the appearance of suffering from drought. This foliage injury causes sunburn, and a reduction of the size and quality of the fruit. The mites feed during the spring and early summer, and disappear soon after the first high temperatures in July. It is usually at about this time that injury becomes evident, and it is then too late to spray for control.

Control: Control measures for the rust mite to be effective should be applied before June first, using a summer-type oil emulsion spray at 1 percent oil strength.

San Jose Scale. These are tiny yellow insects that fix themselves on the bark or fruit of many kinds of fruit trees, shade trees, bush fruits, and ornamentals. They increase rapidly and kill the plants by sucking the sap. As the tiny insects grow, they cover themselves with an ash-gray secretion or scale nearly circular in outline. There are several generations each year.

Control: San Jose scale is controlled by oil-emulsion sprays using dormant-type oil emulsion at the rate of 4 gallons to 96 gallons of water, or by lime-sulphur at the rate of not less than 10 gallons of liquid lime sulphur (testing 32° Baume) for each 100 gallons of spray. One percent oil and 3 percent liquid lime-sulphur concentrate has given satisfactory control of San Jose scale and blister mite. Four pounds of completely dissolved dry lime-sulphur of good quality is equivalent, chemically, to 1 gallon of 32° Baume liquid lime-sulphur. Spray while the plants are completely dormant.

Saw-Toothed Grain Beetle. This beetle is a common household pest. It is reddish brown, about $\frac{1}{8}$ inch long, and derives its name from the notched fringe on each side of the body. The grub is yellowish white and marked on each segment of the body by a darkened area.

Control: The most practical means of protection is to keep all containers free of particles of grain, flour, etc., being sure that each time a new supply is placed in them that they are first cleaned out. Precaution should be taken that flour or other grain products do not collect beneath bins. A practical safeguard is to keep flour in the bag in the bin and keep the top of the bag rolled shut tightly. The insects cannot gain access through tightly woven sacking cloth. An additional safeguard is to keep sodium fluoride sprinkled beneath bins and pantry shelves. When it is necessary to clean up an infestation in the house, infested foods should be destroyed or heated for a period long enough to insure their reaching a temperature of 140° F. This may be done by placing them in the oven. Bins, drawers, etc., may be washed with scalding hot water and then dried, or they may be heated over a stove or in an oven. Clean-up measures are satisfactory also in the case of grain bins, storage elevators, etc. They should be first thoroughly cleaned and scrubbed out and the cracks sprayed with gasoline or kerosene in time so these substances may evaporate before grain is stored in them again. Fumigation is sometimes necessary, but it can be used only in unoccupied buildings that are relatively air tight. Those wishing to fumigate should write the Idaho Agricultural Experiment Station for special instructions.

Scaly Leg Mite. Scaly leg is caused by small mites burrowing into the skin on the legs and feet of poultry.

Control: Dip feet of affected birds in crude petroleum or used crank case oil. Repeat treatment in about a month if necessary.

Sarcoptic Mange Mite. The mites which cause sarcoptic or common mange of horses and swine are small white, or yellowish parasites. The adults will measure about $\frac{1}{50}$ inch in length. They are not readily visible to the naked eye unless placed on a black background. The general form of the body is more nearly round than oval and the bluntly rounded head is as broad as it is long. The mites penetrate the upper layer of the skin and excavate burrows in which eggs are laid. The young mites feed in the burrow and when mature begin new burrows and lay more eggs. In the early stages of this type of mange, lesions are first visible in the neck and shoulders or around the head, but they may start on the breast, flanks, sides or other parts of the trunk. From those parts the mange may spread until it covers the entire body. The presence of the mites causes itching and great irritation and the skin becomes inflamed and swollen so that small nodules are formed around and over the burrows. Later, vesicles are formed which break and discharge serum and as the serum dries small scabs are formed. The hair over the affected part stands erect

or may fall out. As the disease develops the skin becomes more or less bare in irregular-shaped patches, and is generally thickened and thrown into folds.

Control: This mite is extremely difficult to eradicate because of its burrowing habit. The common dips such as lime-sulphur, nicotine, and coal-tar creosote will kill sarcoptic mites if the dip can be brought into direct contact with the parasites, but the method requires thorough, frequent, and persistent application. Dilutions should be made according to the directions given by the manufacturer. Two or more applications, a week apart, of unprocessed crude petroleum usually will eradicate sarcoptic mange if treatment is applied before the disease becomes chronic. Crude oils, however, often cause the hair to come out and may blister the skin. Crank case oil drainings may be substituted for the crude oil but it will also blister and cause the hair to come out. The hair on horses should be clipped for some distance around the infestation.

Seedcorn Maggot. These cream-colored maggots are found in potato seed pieces and seed beans in the soil, particularly during cold, wet springs. They frequently injure planted beans, killing the plants entirely or causing light stands or a condition known as "baldhead."

Control: No direct control method is known. The flies which lay their eggs on the soil are known to be attracted by the presence of freshly decaying organic matter. In fields where potatoes are to be grown, it is best to turn under in the autumn the manure or green cover to be used as fertilizer rather than to do it in the spring before planting. Satisfactory stands and fields are obtained by replanting infested fields as soon as it is determined the first planting will be unproductive. By that time most of the maggots have developed and the second planting usually remains free of injury. Sometimes it is practicable to plant a field to beans a little earlier than the usual planting date, and then in about 10 days, rework the field and plant the main crop.

Sheep Botfly. Sheep shake their heads, stamp their feet, and crowd together, holding their noses to the ground, especially in bare dusty places; or run away with their noses held low, in an effort to escape the fly which deposits its larvae in the nostrils of the sheep. The presence of the larvae in the nostrils causes inflammation, and a copious catarrhal discharge. The excess of mucus together with the dust drawn into the nostrils causes labored breathing. The presence of the maggots in the head may cause thinness and weakness in the animals.

Control: The bedding-out method of range sheep management followed in Idaho leave the larvae behind and is responsible for the practical absence of nose grubs in range sheep in this State. Tall growing pastures should be provided for farm flocks.

Sheep Lice. Three species of lice attack sheep; the bloodsucking louse, the bloodsucking foot louse, and the red-headed or chewing

louse of sheep. The usual symptoms of scratching and biting are caused by the lice running about in the wool and over the skin. The chewing lice eat the wool fibers, the bloodsucking lice rob the sheep of nutrition and stain the wool with small brown fecal spots.

Control: These lice are best controlled by dipping the animals in rotenone dips. The dilutions recommended by the manufacturer should be followed.

Sheep Tick. The sheep tick, louse, fly, or ked, as it is sometimes called, is not a true tick but an insect. It is a degenerate fly which has lost its wings. It feeds by crawling about over the wool and thrusting its sharp mouth-parts into the flesh to suck blood. It causes the sheep to rub, bite, and scratch at the wool, thus spoiling the fleece; and, when abundant, the animals are unthrifty and unprofitable. The sheep tick spends its entire life on the animal. Two stages are readily found on the sheep at all seasons of the year; the adults and the nits. The adult is brown, wingless, about $\frac{1}{4}$ inch long and is covered with short, spiny hairs. Nits are nearly round, chestnut brown, egg-like objects that are glued to the hair especially about the neck, inside the thighs and along the belly. These are the pupal stage of the insect, not eggs.

Control: Same as for sheep lice.

Short-Nosed and Long-Nosed Cattle Lice. These lice are both common pests of cattle and may be considered together since their habits and control are very similar. Both of these lice are bluish gray in color. They may be found on the lower parts of the body of the cow, between the legs, on the belly, and on the escutcheon. They injure cattle by sucking blood. These lice do not migrate much on the body of the animals, but usually stay in one small area after they have found a suitable feeding place. Severe infestations cause cows to lose weight and fall off in milk production. Irritation from the lice causes the animals to attempt to rub and bite the affected parts, resulting in hair removal and, in severe cases, broken skin and scab formation.

Control: Same as for cattle biting lice.

Shot-Hole Borer. The shot-hole borer is sometimes found working in prune, peach, and apricot trees, especially in years following widespread frost injury to trees. During the winter this borer is in the grub or larval stage in the inner bark. The overwintering grub is about $\frac{1}{8}$ inch long, pinkish white in color. They change to pupae in the spring and a little later the adult beetles emerge. The beetles are $\frac{1}{10}$ inch long, half as wide, very blunt at either end, and black in color. On emerging, the beetles seek out trees in an unhealthy condition in which to lay their eggs. The bark of infested trees is perforated with numerous small "shot-hole" openings from which the insect gets its name. Beneath the bark are found many small winding, sawdust-filled galleries that usually girdle the infested part. Death of the branch or tree follows an

infestation, but beetles rarely are the primary cause of the death of a tree. This insect almost invariably confines its attacks to diseased and dying trees, or trees in a poor state of vigor.

Control: No satisfactory method of treating an infestation in a tree is known, but it is advisable to prune out all infested branches, as well as all diseased and dead wood, and burn it. Cultural practices should be resorted to in order to get trees into vigorous growing condition.

Snowball Aphid. These are bluish plant lice that attack the leaves early in the spring, causing curled, deformed leaves, and small, inferior blossoms. Winter is passed in the egg stage. Newly hatched aphids attack the terminal leaves early in the spring. Injury is all caused early for aphids fly away later and do not return to the snowball until autumn.

Control: Spray snowball bushes when the leaves first show green, using 40 percent nicotine sulphate 1 teaspoon, commercial oil emulsion 20 teaspoons, and water 1 gallon; or spray with nicotine sulphate or pyrethrum extract, 1 teaspoon in 1 gallon of water, in which has been dissolved a piece of soap the size of a large walnut.

Snowy Tree Cricket. These green or yellowish "crickets" occur most numerous on prune trees. Eggs are deposited in the bark on the undersides of medium-sized branches in the fall. They hatch about June 1. Feeding is generally confined to the leaves until about July 25 or when the first prunes begin to show color. Crickets then attack the fruit, eating holes of various sizes into it. The first adults develop about the middle of July, after which time males may be heard chirping in unison in infested trees. There is one generation annually.

Control: Dust the trees with undiluted calcium arsenate at the rate of about 0.14 pounds per tree or spray with calcium arsenate, 2 pounds to 100 gallons of water. A spreader should be used with sprays to prevent spotting the fruit. Application should be made between July 15 and August 1. One application completely protects the fruit and so reduces the population that spraying is not necessary again for several years. This dust may cause burning of the leaves during wet seasons.

Sowbugs. These grayish, fat-bodied, fringed, slow-moving creatures attain a length of about $\frac{1}{2}$ inch. They may be found near the ground under trash, leaves, or bits of manure. They cause injury by feeding on tender stems or leaves near the ground.

Control: They are controlled by means of a poisoned bait. The formula suggested on page 55 may be used, but 4 gallons of molasses per hundredweight should be added and the bait made rather sloppy. Another bait is prepared by mixing 1 part of Paris green with 9 parts of granulated sugar. This bait is sprinkled lightly along the edges of benches and walks.

Spinach Leaf Miner. White or yellowish maggots mine within the leaves of spinach, beets, chard, and many weeds, causing blasted spots or blister-like blotches. The grayish two-winged flies of the maggot appear in the field in April or May and may be found throughout the season.

Control: There is no practicable method of control for this insect.

Squash Bug. Adult squash bugs are pale or dark grayish brown on the back, and the protruding margins of the abdomen are orange or alternately striped with orange and brown. The length of the body is about $\frac{5}{8}$ inch. Eggs are whitish yellow to brown and are laid in clusters on the under sides of the leaves. The young are pink to gray and are often covered with a whitish powder. Both adults and young suck the sap and cause plants to wilt or die.

Control: Hand picking of nymphs and eggs is quite effective on a few plants. Practical control can be obtained by 4 applications of a pyrethrum dust or spray. The first application should be made about a week after the first overwintering adults are found on the vines. The remaining applications should be made at 10- or 12-day intervals. The spray or dust should be directed toward the underside of the leaves. The spray mixture should contain 1 part of emulsifying agent, 2 parts of pyrethrum concentrate (containing $2\frac{1}{2}$ percent pyrethrins by weight) in 1000 parts of water. The dust mixture should contain 10 percent "Dry Pyroicide" (containing 2 percent pyrethrins); talc, sulphur or gypsum may be used as a carrier.

Stable Fly. Stable flies, to the casual observer, appear to be very much like the common house fly, but in reality they are quite different in that they feed by piercing the skin of their host to suck blood. They attack many animals, including man. They annoy the animals by their biting. This insect breeds in manure as does the common house fly.

Control: Since the flies breed in manure which is moist the control suggested is the disposal of the manure often during the fly season by distributing it on the fields where it will dry out quickly, thus preventing the adults from depositing eggs. Animals may be protected temporarily by the use of fly sprays applied to the animals themselves. Flies found about the barns may be killed with fly sprays.

Stone Fly. This species is black colored with red and yellow markings and measures between $\frac{1}{2}$ inch and $\frac{3}{4}$ inch long. Larvae live in streams and emerge in the early spring leaving their cast skins on rocks and bushes. Occasionally the flies make their way to apricot and peach trees and cause severe injury by eating holes in the forming fruits and into the fruit buds.

Control: Control probably can be obtained by spraying the trees with lead arsenate as soon as the insects appear on the trees.

Strawberry Crown Moth. Adults are black, clear-winged moths varying in length from about $\frac{1}{2}$ inch to $\frac{3}{4}$ inch. They are marked

across the body by from two to four yellow bands. The caterpillars are whitish or pink with a brown head, and when mature are about $\frac{4}{5}$ inch long. They kill strawberry plants by working in and destroying the crown and so weaken other plants that they reduce the yield.

Control: No satisfactory control is known.

Strawberry Leaf Roller. The small, green caterpillars feed on the upper leaf surfaces, first rolling the leaves together and feeding within. Leaf surfaces are so badly destroyed that leaves turn brown and dry, and in heavy infestations fruits fail to mature. Moths appear in the spring and deposit their eggs on the under surfaces of the leaves. There are probably two generations annually in Idaho, but only the first generation is of economic importance.

Control: Spray the plants heavily with lead arsenate, 3 pounds to 100 gallons of water, before the caterpillars begin to roll the leaves, which is shortly after the moths begin flying, or about the time the plants are blossoming.

Strawberry Root Weevil. These dark brown to black snout beetles are about $\frac{1}{4}$ inch long. They hibernate under leaves or trash, appear in early summer and lay eggs for the succeeding generation. Adults feed at night. Besides attacking strawberries, they kill the terminal buds of raspberry canes and probably injure other plants. The small, white, brown-headed larvae live in the soil and seriously injure or kill strawberry plants by feeding on the roots.

Control: Apply about 1 tablespoon of poisoned bait in the crown of each plant when about 75 percent of the weevils in the soil have changed to the adult stage. This is approximately 3 weeks before the final harvesting of annual-bearing varieties. Grind apple waste or pomace or dried apples through a meat grinder and then mix with it calcium arsenate at the rate of 5 pounds to 95 pounds of ground apple. Adults feed on this bait, and are killed before they deposit eggs, thus insuring protection of the next year's crop. If apple pomace is not available an effective bait may be prepared by mixing 50 pounds bran with 5 gallons water, 10 pounds sugar, and 5 pounds calcium arsenate. Two and one-half gallons of molasses may be substituted for the sugar.

Sugar-Beet Root-Maggot. The adult sugar-beet root-maggot is a fly about $\frac{1}{4}$ inch long, black with transparent white wings except for a black area on the front margin. The maggot is white and about $\frac{1}{4}$ inch long. All of the injury is caused by the maggot which feeds upon the tap root and rootlets beneath the ground surface. Feeding causes the sap to flow, soaking the ground surrounding the beet, and the injured areas turn black. If the maggot cuts off the tip of the taproot, the plant will die.

Control: No control is known. Watering the beets freely during late June and July is thought to keep the maggots feeding so high on the roots that no serious damage will result.

Termites. These so-called white ants occasionally destroy foundation timbers and woodwork in Idaho. They work in the dark, avoiding the light, and often their presence is unsuspected until injured timbers collapse. The species commonly destructive in Idaho maintain a ground connection and the insects travel back and forth from infested timbers in covered runways.

Control: Where timbers are found to be infested, destroy the covered runways and blow sodium fluosilicate into the runways in the wood. To do this, bore $\frac{1}{4}$ -inch holes in the infested timbers at 3- to 6-foot intervals so that the holes cut through the termite galleries and from one-half to three-quarters through the wood. Use a dust gun with a spout that fits tightly into these holes. Treat the ground at the bases of these runways with sodium fluosilicate. The material mentioned is extremely poisonous to humans, and must be handled with care. Immediately after handling the poison the hands should be washed. Wherever possible, replace old wooden foundations with concrete and in the construction of new buildings use concrete foundations, or, if wood must be used, the most permanent known practical method of treating it is to use coal-tar creosote.

Tomato Worm. This large green worm, having a "horn" on the rear end of the body, rarely occurs in numbers, but a few of them may cause heavy defoliation. The adult is known as a hawk moth and is one of the species frequently observed late in the evening feeding in the blossoms of many kinds of plants. It suggests a humming bird in the way it hovers and feeds in flowers.

Control: Hand-pick and destroy the caterpillars, or, in extreme cases, spray with calcium arsenate, 2 pounds to 100 gallons of water.

Tree Hoppers. Tree hoppers cause injury to many kinds of fruit trees and ornamentals. The injury is caused by the wounds and scars made by the female in laying eggs in the bark of trees. The scars may be long longitudinal slits crescent-shaped or roughened and ragged appearing, depending on the species of tree hoppers making them. Egg slits are made in the current season's growth or in year-old wood but old scars persist for several years. Injury is most severe in young orchards having alfalfa or clover cover crops or in orchards which are very weedy. Injury may be especially severe around the edges of orchards where willows or weeds are allowed to grow.

Control: Clean cultivation is the most practicable method of control. It should be followed in old orchards for a season or two to cut down the infestation and should be practiced generally in young orchards until trees are well established. The success of this treatment depends on the fact that tree hoppers feed only on cover crops or weeds and only go to the trees to lay eggs. Many twigs containing eggs may be pruned off during the winter and burned to prevent emergence of young tree hoppers. Many

of the eggs are killed by spraying the trees thoroughly with dormant-type oil emulsion at the rate of 5 gallons to 95 gallons of water before the buds burst in the spring.

Turnip Aphid. Turnip aphids are small, soft-bodied, green or green and black insects. Some of them have wings, others are wingless. They attack turnips, mustard, radish, and related crops causing the leaves to curl or the stems to wilt. Heavily infested plants die.

Control: One percent rotenone dust using equal parts of tobacco dust and sulphur as diluents is effective. The dust is prepared by mixing 20 pounds of ground derris or cube root (5 percent rotenone content), 40 pounds of finely ground tobacco dust and 40 pounds of dusting sulphur. Several applications are sometimes necessary.

(Virginia Creeper) Leafhopper. These sucking insects are extremely abundant and injurious to Virginia creeper in many parts of Idaho. Adults are about $\frac{1}{8}$ inch long, yellowish, and marked by a brown zigzag line lengthwise on each wing. Injured leaves are at first marked by light flecks. As injury progresses, the flecking becomes more general and severely injured leaves assume a white, parched appearance. In the late summer, severely damaged vines are more or less defoliated.

Control: Control measures recommended for the grape leafhopper are effective. Also spraying with concentrated pyrethrum extract, 1 pint to 100 gallons of soapy water, is very effective, killing both nymphs and adults. The chief difficulty in obtaining control is the continuous influx of leafhoppers from non-sprayed vines to those that have been sprayed, and applications must be repeated frequently to assure protection. It is advisable to spray all the infested vines in a neighborhood at the same time to prevent this migration.

Western Black Flea Beetle. This tiny, shiny, black beetle is easily recognized by its habit of hopping when disturbed. It eats holes in leaves of cabbage, radish, and related vegetables or injures plants in hotbeds or shortly after planting.

Control: Dust the plants thoroughly with a mixture of cryolite, barium fluosilicate or calcium fluosilicate 1 part and flour or talc 3 parts. Or, dust them with 2 percent nicotine dust. Begin dusting while plants are in hotbeds or immediately after they are set out, or when they appear above the surface in seeded fields. Repeat applications until danger of injury to young plants is past. Rotenone dusts applied to the infested fields also give excellent control.

Western Potato Flea Beetle. This insect resembles the western black flea beetle. It eats holes in the leaves of young potato and tomato plants, causing leaves to turn brown and become crisp.

Control: Apply the same control measures as for the western black flea beetle.

Wheat Stem Maggot. Wheat attacked by the wheat stem maggot in the fall takes on a dark appearance and is stunted, with thickened stiff leaves. The pale green maggots work on the inside of the lower part of the stem or crown of the plant. In the summer the injured wheat dies out and the heads and the upper parts of the straw become whitened shortly after the heads begin to fill. The lower parts of the plants are green.

Control: No practical method of control is known. Late seeding sometimes reduces the amount of injury.

White Grubs. These are larvae of the June bugs, the 10-lined beetle, and the carrot beetle. They are large, brown-headed grubs that eat the roots of plants below the soil surface. Grubs usually are found in a curled position when dug out of the ground. The adults are large, red beetles measuring from about $\frac{1}{2}$ to $\frac{3}{4}$ inch long. The 10-lined beetle is grayish with 10 black lines running lengthwise on the back. Adults are often attracted to lights in the summertime and make loud buzzing noises when in flight.

Control: Avoid planting crops susceptible to white grub injury on recently broken sod. Pull affected plants and destroy the grubs to prevent them from attacking adjacent sound plants. Injured plants are detected by their wilted appearance.

White-Lined Sphinx. The large moths feed at dusk on the nectar of many kinds of flowers, hovering about the flowers like humming birds. Caterpillars attain a length of 3 inches, and may be either green or nearly black. They have a horn at the rear end of the body. The horn and the head are orange or yellow. They are general feeders, but have been occasionally injurious to alfalfa and wheat in Idaho.

Control: This species is so heavily parasitized that it rarely becomes injurious and probably never in successive seasons in the same locality. Alfalfa fields may be cut as soon as infestations become heavy. The attack soon subsides and later injury is not probable.

Wireworms. These shiny, yellow, hard worms bore into planted seeds, corn, beans, potato seed pieces, and into potato tubers, root crops, and the underground portions of many other plants. The loss caused by them is enormous and is steadily increasing in the irrigated sections of Idaho. The adults are slender brown or black hard-shelled beetles known as click beetles from their habit of springing into the air and making a clicking noise when they are placed on their backs. Wireworms live in the soil several years before transforming to adults. Adults are present for but a short time in the spring during mating and egg-laying. The inaccessibility of the larvae in the soil renders control difficult.

Control: Avoid the use of clovers in crop rotations on land infested with wireworms. Soil dryness is harmful to wireworms and will kill them if the dry period is prolonged. Alfalfa is the key crop in wireworm control rotations. The high populations of wire-

worms usually decrease after each succeeding year of alfalfa. If the stand becomes thin or weedy it may be plowed up after three years but in most cases it will be used for four years in the rotation. The last year in alfalfa the field should not be watered. Alfalfa should be followed with the crop to be used in the rotation which is most susceptible to wireworm damage, such as potatoes. The next year should include less susceptible crops such as sugar beets, beans or corn. These crops should be followed in turn with small grains and then the field should be returned to alfalfa. The alfalfa should not be seeded with the grain but should be sowed alone after the grain harvest. The stubble should be plowed during the first ten days of August to break up the pupa cases, thus destroying many wireworms. Seeding should follow plowing.

Crude naphthalene if thoroughly mixed with the soil, kills wireworms by fumigation action. Five hundred pounds of finely sifted naphthalene flakes per acre should be broadcast and thoroughly disked in. Plow the ground eight to ten inches deep, then disk again, crossing the plow furrows. Applications may be made from April to September and crops may be planted five to seven days after treatment.

Wool Maggots. When the wool of sheep becomes soggy from warm rains, or soiled with urine and feces, or blood from wounds or lambing, certain blowflies are attracted to the animal and deposit their eggs in the dirty wool, most commonly about the rump or near wounds. The maggots feed upon the wet wool and the adjacent skin, causing the latter to fester and the wool to become putrid and loosen, thus exposing the inflamed raw flesh with the whitish maggots tunnelling in it.

Control: Since the flies attack wool chiefly after they have become very abundant by breeding in carcasses, the control measures are to destroy all carrion by properly burning or burying it deeply. When the sheep are infested, the wool should be clipped as closely as possible around the infested area and the wound treated with a preparation made of 3½ ounces of diphenylamine (technical), 3½ ounces of benzol (90 percent), 10 ounces of turkey red oil and 2 ounces of lampblack.

Woolly Apple Aphid. This purplish plant louse clusters in crevices or wounds in the bark or on the roots and is covered by a white, "woolly" secretion.

Control: Spray infested trees thoroughly about the middle of June with a solution composed of 1 pint of 40 percent nicotine sulphate, 1 gallon of summer-type oil emulsion, and 99 gallons of water. The oil and nicotine may be added to one of the first-brood codling moth cover sprays. The spray solution must be applied with sufficient pressure to drive it through the woolly covering and to the aphids beneath.

Zebra Caterpillar. These black-and-yellow striped caterpillars feed

in colonies. They are found first in clusters and defoliate single plants before spreading to others.

Control: Destroy colonies on the leaves or spray as for cabbage worm.

Insecticides

1. Rotenone-bearing dusts. Commercial dusts containing $\frac{1}{2}$ of 1 percent rotenone are used to control many insects. Rotenone dusts lose their effectiveness very rapidly when exposed to sunlight. They leave no poisonous residues and are, therefore, safe to use on vegetables within 2 or 3 days before harvest.

2. Pyrethrum dust. Two kinds of pyrethrum dust are available commercially. One is a mixture of finely ground pyrethrum flowers and an inert carrier. The other consists of an inert carrier coated with pyrethrum extract. This concentrate is mixed with a diluent to make up a dust of the desired strength. For squash bug control the content of active ingredients (pyrethrins) should be 0.2 percent. For less resistant insects it may be less. Pyrethrum, like rotenone, loses its effectiveness rapidly when exposed to sunlight.

3. Pyrethrum spray. Several commercial sprays are available which contain pyrethrum extract. Directions will be found on the containers for making proper dilutions.

4. Nicotine sulphate spray. The standard 40 percent nicotine sulphate solution is usually used at the rate of 1 teaspoonful in 1 gallon of water. One ounce of soap (a heaping tablespoonful) should first be dissolved in each gallon of water for best results. Nicotine sulphate sprays are effective against most soft-bodied insects but should not be used when temperatures are below 70° F.

5. Nicotine dust. To mix a small quantity of dust, put 1 pound of hydrated lime in a gallon can having a tight fitting lid. Place 4 or 5 small, smooth pebbles in the can; then pour in 4 or 5 tablespoonfuls of 40 percent nicotine sulphate. Press the lid tightly on the can and shake vigorously for 10 to 15 minutes. After removing the pebbles the dust will be ready to use. Nicotine dust deteriorates rapidly and should be used immediately after mixing.

6. Lime-sulphur-pyrethrum spray. This spray has given promise in protecting susceptible crops against beet leafhoppers. Small amounts may be prepared from the following formula:

Dry lime -sulphur	1½ ounces
Pyrethrum extract	3 teaspoons
Water	1 gallon

7. Arsenicals. For the control of insects with chewing mouthparts, a dust prepared by mixing 1 part of either calcium arsenate, lead arsenate, or paris green with 3 parts hydrated lime should be used. Calcium arsenate is preferable if available. Mixing should be done as described above for nicotine dust. Any dust not used should be labeled conspicuously and placed out of reach of children and animals.

Calcium or lead arsenate are used at the rate of 1 ounce per

gallon of water for spraying. One-half ounce of soap, casein spreader, or powdered milk is usually added to wet waxy leaves, such as beets. Keep the mixture agitated while spraying. The application of arsenicals to leafy vegetables that are to be eaten is not recommended.

8. Cryolite. A dust for tomato fruitworm control is prepared by mixing equal parts of cryolite and talc. If talc is not available, a bait may be prepared by mixing 1 part cryolite with 10 parts corn meal. Cryolite leaves a poisonous residue and should be washed from tomatoes before they are eaten.

9. Metaldehyde. Garden slugs are effectively controlled with metaldehyde bait. These baits are sold on the market under various trade names. Metaldehyde alone is difficult to obtain.

10. Poisoned bran bait. Grasshoppers and cutworms are controlled with a poisoned bran bait. The following formula will bait $\frac{1}{3}$ to $\frac{1}{2}$ acre.

Bran (free from shorts)	5 pounds
White arsenic, paris green or sodium fluosilicate	4 ounces
Water to moisten	1 to 2 quarts

The bran and sodium fluosilicate are first mixed thoroughly and the water added. Use only enough water so that the bait will be wet, but when pressed in the hands will still fall apart readily. The bait will not spread well if too moist. The bait should be applied early in the morning for grasshoppers and in the evening for cutworms.

11. Earwig bait. A very effective earwig bait is prepared from the following formula:

Bran	12 pounds
Sodium fluosilicate	1 pound
Fish oil	1 quart

Mix together the dry ingredients, then add the fish oil and mix again. This amount will cover 8,000 square feet.

12. Corrosive sublimate (mercuric chloride). Dissolve in a glass, earthenware, or wooden vessel $\frac{1}{2}$ ounce corrosive sublimate in 1 pint hot water. Then dilute to 5 gallons with cold water. This material is extremely poisonous to man—wash vegetables before eating them.

13. Tartar emetic. Commercial preparations containing tartar emetic and sugar are on the market. These should be prepared for spraying according to the directions furnished by the manufacturer. A satisfactory spray can be prepared from the following formula: tartar emetic, 2 ounces; sugar, $\frac{1}{2}$ pound or molasses $\frac{1}{2}$ pint; water, 3 gallons.

14. Barium fluosilicate. A satisfactory substitute for rotenone in the control of flea beetles may be prepared by mixing 1 part of barium fluosilicate with 3 parts of talc, gypsum, or cheap flour.

List of Insects

- Alfalfa caterpillar
Eurymus eurytheme (Bdv.)
 Alfalfa looper
Autographa californica (Speyer)
 Alfalfa weevil
Hypera postica (Gyll.)
 Aneroumois grain moth
Sitotroga cerealella (Oliv.)
 Apple aphid
Aphis pomi Deg.
 Apple leafhoppers
Empoasca maligna (Walsh)
Typhlocyba pomaria McAtee
 Asparagus beetle
Crioceris asparagi (L.)
 Bark beetles
Dendroctonus brevicornis Lec.
Dendroctonus monticolae Hopk.
 Bedbug
Cimex lectularius L.
 Beet leafhopper
Eutettix tenellus (Bak.)
 Beet webworm
Loxostege sticticalis (L.)
 Birch skeletonizer
Bucculatrix canadensisella Chamb.
 Black cherry aphid
Myzus cerasi (F.)
 Black flies
Simulium sp.
 Black peach aphid
Anuraphis persicae-niger (Smith)
 Black vine weevil
Brachyrhinus sulcatus (F.)
 Black widow spider
Latroctes mactans F.
 Blister beetles
Epicauta maculata (Say)
Lytta nuttalli Say
Macrobasis unicolor (Kby.)
 Boxelder bug
Leptocoris trivittatus (Say)
 Bronzed birch borer
Agrilus anxius Gory
 Brown mite
Bryobia praetiosa Koch
 Bulb mite
Rhizoglyphus hyacinthi Bdv.
 Cabbage aphid
Brevicoryne brassicae (L.)
 Cabbage maggot
Hylemyia brassicae (Bouche)
 Cabbage worm (imported)
Ascia rapae (L.)
 Carpenter worm
Prionoxystus robiniae (Peck)
 Carpet beetle
Anthrenus scrophulariae (L.)
 Cattle biting-louse
Bovicola bovis (Nitz.)
 Cherry fruit fly
Rhagoletis cingulata (Loew)
 Chicken louse
Eomenacanthus stramineus (Nitz.)
Lipeurus heterographus Nitz.
 Chicken mite
Dermanyssus gallinae (Deg.)
 Chorioptic mange mite
Choriptes communis (Gerlach)
 Chrysanthemum gall midge
Diathromyia hypogaea Loew
 Clothes moth (webbing)
Tineola biselliella (Hum.)
 Clover aphid
Anuraphis bakeri (Cowan)
 Clover bud weevil
Hypera nigrirostris (F.)
 Clover leaf weevil
Hypera punctata (F.)
 Clover root borer
Hylastinus obscurus (Marsham)
 Clover root curculio
Sitona hispidula (F.)
 Clover seed caterpillar
Grapholita conversana Wlsm.
 Clover seed chalcid
Bruchophagus gibbus (Boh.)
 Clover seed midge
Dasyneura leguminicola (Lint.)
 Cockroaches
Blattella germanica (L.)
Blatta orientalis L.
 Codling moth
Carpocapsa pomonella L.
 Colorado potato beetle
Leptinotarsa decemlineata (Say)
 Common cattle grub
Hypoderma lineatum (DeVill.)
 Confused flour beetle
Tribolium confusum Duv.
 Corn ear worm
Heliothis obsoleta (F.)
 Cottony maple scale
Pulvinaria vitis (L.)
 Currant aphid
Capitophorus ribis (L.)
 Currant worm (imported)
Pteronidea ribesii (Scop.)
 Cutworms
Agrotis c-niarum (L.)
Agrotis ypsilon (Rott.)
Chorizagrotis auxiliaris (Grote)
Lycophotia margaritosa Hbn.
Ufeus hulsti Sm.
 Clyclamen mite
Tarsonemus pallidus Banks
 Diamondback moth
Plutella maculipennis (Curt.)
 Dog mange
Demodectes folliculorum Simon
 Douglas fir aphid
Adelges cooleyi Gill.
 Elm leaf beetle
Galerucella xanthomelaena (Schr.)
 Elm leaf-curl aphid
Eriosoma ulmi (Linn.)
 European earwig
Forficula auricularia L.
 European elm scale
Gossyparia spuria (Mod.)
 European red mite
Paratetranychus pilosus (C. & F.)
 Eye-spotted bud moth
Spilonota ocellana (D. & S.)
 Fall webworm
Hyphantria cunea (Drury)

- False chinch bug
Nysius ericae (Schill.)
- False wireworms
Eleodes extricata (Say)
Eleodes hispidulabris (Say)
- Firebrat
Thermobia domestica Pack.
- Forest tent caterpillar
Malacosoma disstria Hbn.
- Four-spotted tree cricket
Oecanthus nigricornis quadripunctatus Beut.
- Fruit tree leaf roller
Cacoecia argyrospila (Walk.)
- Garden slug
Limax sp.
- Gladiolus thrips
Taeniothrips simplex Morison
- Gooseberry fruit worm
Zophodia grossulariae (Riley)
- Granary weevil
Sitophilus granarius (L.)
- Grape leafhopper
Erythroneura comes (Say)
- Grasshoppers
Camnula pellucida (Scudd.)
Melanoplus bivittatus Say
Melanoplus mexicanus Saussur
Melanoplus femur-rubrum (Deg.)
- Greenhouse leaf tyer
Phyltaenia rubigalis (Guen.)
- Greenhouse thrips
Heliothrips haemorrhoidalis (Bouche)
- Greenhouse whitefly
Trialeurodes vaporariorum (Westw.)
- Green peach aphid
Myzus persicae (Sulz.)
- Green plant bug
Chlorochroa uhleri Stal
- Hog follicle mite
Demodex phylloides Csokor
- Hog louse
Haematopinus suis (L.)
- Hog mange
Sarcoptes scabiei var. *suis* Gerlach
- Hollyhock beetle
Calligrapha sigmoidea (Lec.)
- Hop looper
Hypena humuli (Harr.)
- Horse-biting-louse
Trichodectes equi (L.)
- Horsebotfly
Gastrophilus intestinalis Deg.
- Horse sucking-louse
Haematopinus asini (L.)
- House fly
Musca domestica L.
- Indian-meal moth
Plodia interpunctella (Hbn.)
- Larder beetle
Dermestes lardarius L.
- Leaf-curl plum aphid
Anuraphis helichrysi Kalt.
- Legume bugs
Lygus elisus Van D.
Lygus hesperus Knigt.
- Lima bean pod borer
Etiella zinckenella (Treit.)
- Mealy plum aphid
Hyalopterus pruni (Geoff.)
- Mediterranean flour moth
Ephestia kuehniella Zell.
- Mineola moth
Mineola scitulella Hulst.
- Monterey pine scale
Physokermes insignicola (Craw.)
- Mormon cricket
Anabrus simplex Hald.
- Mourning-cloak butterfly
Hamadryas antiopa (L.)
- Narcissus bulb fly
Merodon equestris (F.)
- Norway maple aphid
Periphyllus lyropictus (Kess.)
- Northern cattle grub
Hypoderma bovis Deg.
- Nose botfly
Gastrophilus haemorrhoidalis (L.)
- Oblique-banded leaf roller
Cacoecia rosaceana (Harr.)
- Onion maggot
Hylemyia antiqua Meig.
- Onion thrips
Thrips tabaci Lind.
- Oyster-shell scale
Lepidosaphes ulmi (L.)
- Pacific mite
Tetranychus pacificus McG.
- Painted lady
Cynthia cardui (L.)
- Pea aphid
Illinoia pisi (Klth.)
- Pea weevil
Bruchus pisorum (L.)
- Peach borer
Cnopia exitiosa (Say)
- Peach lecanium
Lecanium persicae (Fabr.)
- Peach twig borer
Anarsia lineatella Zell.
- Pear leaf blister mite
Eriophyes pyri Pgst.
- Pear psylla
Psyllia pyricola (Foerst.)
- Pear slug
Caliroa cerasi (Linn.)
- Pine needle scale
Chionaspis pinifoliae (Fitch)
- (Prune) leafhopper
Typhlocyba pomaria McA.
- Prune-thistle aphid
Anuraphis cardui (Linn.)
- Psoroptic mange mite
Psoroptes communis ovis (Hering)
- Raspberry fruit worm
Byturus unicolor Say
- Raspberry cane maggot
Pegomyia rubivora (Coq.)
- Raspberry root borer
Bembecia marginata (Harr.)
- Raspberry Sawfly
Monophadnoides rubi (Harr.)
- Red spider (common)
Tetranychus telarius L.
- Rose aphid
Macrosiphum rosae (L.)
- Rose curculio
Rhynchites bicolor (F.)

- Rose leafhopper
Typhlocyba rosae (L.)
- Rose scale
Aulacaspis rosae (Bouche)
- (Rose) slug
Cladius isomerus Nort.
- Rosy apple aphid
Anuraphis roseus (Baker)
- Rust mite
Eriophyes oleivorus (Ashmead)
- San Jose Scale
Aspidiotus perniciosus Comst.
- Saw-toothed grain beetle
Oryzaephilus surinamensis (L.)
- Scab mite
Psoroptes communis bovis Hering
- Sarcoptic mange mite
Sarcoptes scabiei suis Gerlach
- Scaly leg mite
Cnemidocoptes mutans Robin
- Seed-corn maggot
Hylemyia cilicrura Rond.
- Sheep botfly
Oestris ovis L.
- Sheep tick
Melophagus ovinus (L.)
- Short-nosed and long-nosed cattle lice
Haematopinus eurysternus Nitz.
Linognathus vituli Linn.
- Shot-hole borer
Scolytus rugulosus Ratz.
- Snowball aphid
Aphis viburnicola Gill.
- Snowy tree cricket
Oecanthus niveus (Deg.)
- Squash bug
Anasa tristis (Deg.)
- Stablefly
Stomoxys calcitrans (L.)
- Strawberry crown moth
Synanthedon rutilans (Hy. Edw.)
- Strawberry leaf roller
Ancyliis comptana (Froel.)
- Strawberry root weevil
Brachyrhinus ovatus (L.)
- Sugar-beet root maggot
Tetanops aldrichi Hendel
- Termite
Reticulitermes hesperus Banks
- Throat botfly
Gastrophilus nasalis (L.)
- Tomato worm
Phlegethontius quinque maculata Haw.
- Tree hoppers
Ceresa basalis Walk.
Ceresa stimulea (Van D.)
Heliria rubidella (Ball)
Stictocephala wickhami Fab.
- Turnip aphid
Rhopalosiphum pseudobrassicae (Davis)
(Virginia creeper) leafhopper
Erythroneura zizcae Walsh
- Western black flea beetle
Phyllotreta pusilla Horn
- Western potato flea beetle
Epitrix subcrinita Lec.
- Wheat stem maggot
Meromyza americana Fitch
- White apple leafhopper
Typhlocyba pomaria McAtee
- White grubs
Polyphylla decimlineata (Say)
Ligyrrus gibbosus (Deg.)
- White-lined sphinx
Celerio lineata L.
- Wireworms
Ludius inflatus (Say)
Limonius californicus (Mann)
Limonius canus Lec.
- Wool maggots
Lucilia sericata (Meigen.)
Phormia regina Meigen.
- Woolly apple aphid
Eriosoma lanigerum (Hausm.)

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APRICOT		Cutworms	18
European red mite	21	Zebra caterpillar	53
Green peach aphid	27	CHEMICALLY TREATED BANDS	62
Mineola moth	33	CHERRY	
Oyster shell scale	35	Black cherry aphid	7
Peach borer	37	Brown mite	9
Peach twig borer	38	Cherry fruit fly	12
Red spider	41	European red mite	21
San Jose scale	43	Fall webworm	21
Shot-hole borer	46	Green peach aphid	27
Stone flies	48	Mineola moth	33
Tree hoppers	50	Peach borer	37
White lined sphinx	52	Peach twig borer	38
ASPARAGUS		Pear slug	39
Asparagus beetle	5	Red Spider	41
Grasshoppers	25	San Jose scale	43
BAIT TRAPS FOR CODLING MOTH	62	Shot-hole borer	46
BEANS		Tree hoppers	50
Beet leafhopper	6	White grubs	52
Blister beetles	8		
Cutworms	18		
False chinch bug	22		
Grasshoppers	25		
Leaf-cutter bees	31		
Legume bugs	32		

CHRYSANTHEMUM

Chrysanthemum gall midge	13
Grasshoppers	25
Lace bugs	31
Red spider	41

CLOVER

Alfalfa caterpillar	3
Alfalfa looper	3
Alfalfa weevil	3
Beet webworm	7
Blister beetles	8
Brown mite	9
Clover aphid	14
Clover bud weevil	14
Clover leaf weevil	15
Clover root borer	15
Clover root curculio	15
Clover seed caterpillar	15
Clover seed chalcid	15
Clover seed midge	16
Cutworms	18
Grasshoppers	25
Legume bugs	32
Pea aphid	36
Red spider	41
Tree hoppers	50

CONIFEROUS TREES AND SHRUBS

Bark beetles	5
Douglas fir aphid	19
Forest tent caterpillar	23
Monterey pine scale	33
Pine needle scale	39
Red spider	41

CORN

Alfalfa looper	3
Blister beetles	8
Corn ear worm	17
Cutworms	18
False chinch bug	22
Grasshoppers	25
Seedcorn maggot	45
Western black flea beetle	51
White grubs	52
Wireworms	52

COTTONWOOD

Bronzed birch borer	9
Carpenter worm	10

CURRANT

Apple leafhopper	5
Cottony maple scale	18
Currant aphid	18
Gooseberry fruit worm	25
(Imported) currant worm	18
Oyster-shell scale	35
Red spider	41
San Jose scale	43

DELPHINIUM

Black vine weevil	8
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DOG

Dog flea	23
Dog mange	23

ELM

Carpenter worm	10
Elm leaf beetle	20
Elm leaf curl aphid	20
European elm scale	20
Fall webworm	21
Mourning-cloak butterfly	34
Red spider	41
Woolly apple aphid	53

FIELD AND FORAGE CROPS

Cutworms	18
Grasshoppers	25
Mormon cricket	33
White stem maggot	52
White grubs	52
Wireworms	52

GLADIOLUS

Bulb mite	9
Thrips	24

GOOSEBERRY

Apple leafhopper	5
Cottony maple scale	18
Currant aphid	13
Currant worm (imported)	18
Gooseberry fruit worm	25
Red spider	41
San Jose scale	43

GRAPE

Cottony maple scale	18
Four-spotted tree cricket	23
Grape leafhopper	25
Grasshoppers	25
Oyster-shell scale	35
Pacific mite	36
San Jose scale	43
Virginia creeper leafhopper	51

GREENHOUSE PESTS

Ants	4
Centipedes	12
Garden slug	24
Greenhouse leaf tyer	26
Greenhouse thrips	26
Greenhouse whitefly	27
Mealybugs	32
Oblique-banded leaf roller	34
Red spider	41
Sowbugs	47

HOGS

Follicular mange mites	23
Hog louse	27
Hog mange	23

HOLLYHOCK

Hollyhock aphid	28
Hollyhock beetle	28

HOPS

Hop looper	28
Red spider	41

HORSE

Black flies	8
Chorioptic mange	13
Horse biting-lice	29
Horse botfly	29
Horse flies	30
Horse sucking-lice	30
Nose botfly	29
Psoroptic mange mite	40
Sarcoptic mange mite	44
Stable fly	48
Throat botfly	29

HOUSEHOLD AND STORAGE INSECTS

Angoumois grain moth	3
Ants	4
Bedbug	6
Black widow spider	8
Boxelder bug	9
Brown mite	9
Carpet beetles	11
Clothes moths	14
Cockroaches	16
Confused flour beetle	17

European earwig	20	
Firebrat	22	
Fleas	23	
Granary weevil	25	
Greenhouse whitefly	27	
House fly	30	
Indian-meal moth	30	
Larder beetle	31	
Mealybugs	32	
Mediterranean flour moth	33	
Sawtoothed grain beetle	44	
Sowbugs	47	
Termites	50	
LETTUCE		
Alfalfa looper	3	
Cabbage worm	10	
Cutworms	18	
Garden slug	24	
Grasshoppers	25	
Wireworms	52	
LILAC		
Bulb mite	9	
Leaf cutter bees	31	
MAPLE		
Boxelder bug	9	
Carpenter worm	10	
Cottony maple scale	13	
Fall webworm	21	
Norway maple aphid	34	
MOUNTAIN ASH		
Forest tent caterpillar	23	
Oyster-shell scale	35	
Pear leaf blister mite	38	
Rosy apple aphid	43	
Woolly apple aphid	53	
NARCISSUS		
Bulb mite	9	
Narcissus bulb fly	34	
NICOTINE DUST		54
ONION		
Blister beetles	8	
Cutworms	13	
Grasshoppers	25	
Onion maggot	35	
Onion thrips	35	
Webworms	7	
Wireworms	52	
ORNAMENTAL FLOWERS AND SHRUBS		
Beet leafhopper	6	
Blister beetles	8	
Bulb mite	9	
Cabbage worm	10	
Carpenter worm	10	
Cottony maple scale	18	
Cyclamen mite	19	
Diamond-back moth	19	
European earwig	20	
Fall webworm	21	
Forest tent caterpillar	23	
Gladiolus thrips	24	
Grasshoppers	25	
Lacebugs	31	
Leaf cutter bees	31	
Legume bugs	32	
Mormon cricket	33	
Mourning cloak butterfly	34	
Narcissus bulb fly	34	
Norway maple aphid	34	
Oblique-banded leaf roller	34	
Oyster-shell scale	35	
Pacific mite	36	
Painted lady	38	
Pear slug	39	
Red spider	41	
San Jose scale	43	
Shot-hole borer	46	
Tree hoppers	50	
White grubs	52	
PEA		
Blister beetles	8	
Cutworms	18	
Grasshoppers	25	
Lima bean pod borer	32	
Pea aphid	36	
Pea weevil	37	
Red spider	41	
Seedcorn maggot	45	
Wireworms	52	
PEACH		
Black peach aphid	8	
Brown mite	9	
Cottony maple scale	13	
European red mite	21	
Eye-spotted bud moth	21	
Fall webworm	21	
Fruit tree leaf roller	24	
Green peach aphid	27	
Legume bugs	32	
Pacific mite	36	
Peach borer	37	
Peach lecanium	38	
Peach twig borer	38	
Red spider	41	
San Jose scale	43	
Shot-hole borer	46	
Stone flies	48	
Tree hoppers	50	
PEAR		
Apple aphid	4	
Brown mite	9	
Cherry fruit fly	12	
Cicadas	13	
Codling moth	16	
Cottony maple scale	18	
European red mite	21	
Fall webworm	21	
Fruit tree leaf roller	24	
Leaf cutter bees	31	
Legume bugs	32	
Oyster-shell scale	35	
Pacific mite	36	
Pear leaf blister mite	38	
Pear psylla	39	
Pear slug	39	
Red Spider	41	
Rosy apple aphid	43	
San Jose scale	43	
Tree hoppers	50	
Woolly apple aphid	53	
PHLOX		
Red spider	41	
PINE, See coniferous trees		
PLUM, See prune		
POISONED BRAN BAIT		55
POTATO		
Blister beetles	8	
Colorado potato beetle	17	
False chinch bug	22	
Legume bugs	32	
Red spider	41	
Seedcorn maggot	45	
Tomato worm	50	
Western potato flea beetle	51	
White grubs	52	
Wireworms	52	

POULTRY

Bedbugs	6
Chicken lice	12
Chicken mite	13
Scaly leg mite	44

PRUNE

Brown mite	9
Cottony maple scale	18
European red mite	21
Fruit tree leaf roller	24
Green peach aphid	27
Leaf-curl plum aphid	31
Mealy plum aphid	32
Mineola moth	32
Oyster-shell scale	35
Peach borer	37
Peach twig borer	38
Pear slug	39
Prune leafhopper	39
Prune-thistle aphid	40
Red spider	41
San Jose scale	43
Shot-hole borer	46
Snowy tree cricket	47
Tree hoppers	50

RADISH, See cabbage

RASPBERRY

Apple leafhopper	5
Brown mite	9
False chinch bug	22
Four-spotted tree cricket	23
Grasshoppers	25
Legume bugs	32
Raspberry cane maggot	45
Raspberry fruit worm	41
Raspberry root borer	41
Raspberry sawfly	41
Red spider	41
Rose scale	42
San Jose scale	43
Strawberry leaf roller	49
Strawberry root weevil	49

ROSE

Apple leafhoppers	5
Leaf cutter bees	31
Red spider	41
Rose aphid	42
Rose curculio	42
Rose leafhopper	42
Rose scale	42
Rose slugs	42
San Jose scale	43

SHEEP

Black flies	8
Scab mite	40
Sheep botfly	45
Sheep lice	45
Sheep tick	46
Stable fly	48
Wool maggots	53

SNOWBALL

Snowball aphid	47
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SPINACH

Blister beetles	8
Cutworms	13
Spinach leaf miner	49
Wireworms	52

SPRUCE, See coniferous trees

SQUASH

Beet leafhopper	6
Cutworms	18

Squash bug	48
Wireworms	52

STORAGE INSECTS, See household insects

STRAWBERRY

Ants	4
Black vine weevil	8
Cutworms	18
Cyclamen mite	19
False chinch bug	22
Garden slug	24
Grasshoppers	25
Leather jackets	31
Legume bugs	32
Red spider	41
Strawberry crown moth	48
Strawberry leaf roller	49
Strawberry root weevil	49
White grubs	53
Wireworms	52

SWEET PEA

Cutworms	18
Grasshoppers	25
Pea Aphid	36
Red spider	41
Thrips	35

SUGAR BEET

Sugar beet root maggot	49
Western black flea beetle	51
White grubs	53

TOMATO

Beet leafhopper	6
Blister beetles	8
Colorado potato beetle	17
Corn ear worm	17
Cutworms	13
Grasshoppers	25
Tomato worm	50
Western potato flea beetle	51

TURNIP, See cabbage

VEGETABLES

Ants	4
Beet leafhopper	6
Beet webworm	7
Blister beetles	8
Cabbage maggot	9
Cabbage worm	10
Centipedes	12
Corn ear worm	17
Cutworms	18
European earwig	20
False chinch bug	22
Garden slug	24
Grasshoppers	25
Greenhouse leaf tyer	26
Leather jackets	31
Legume bugs	32
Mormon cricket	33
Onion thrips	35
Painted lady	36
Red spider	41
Seed corn maggot	45
Squash bug	48
Webworms	7
Western black flea beetle	51
Western potato flea beetle	51
White grubs	53
Wireworms	52

VIRGINIA CREEPER

Cottony maple scale	18
Leaf cutter bees	31
Red spider	41
Virginia creeper leafhopper	51

WATERMELON

Beet leafhopper	6
Cutworms	18
Grasshoppers	25
Squash bug	48
White grubs	53

WHEAT

Alfalfa looper	3
Cutworms	18
False chinch bug	22
False wireworms	22
Grasshoppers	25

Green plant bug	27
Mormon cricket	33
Wheat stem maggot	52
White lined sphinx	52
Wireworms	52

WILLOW

Bronzed birch borer	9
Carpenter worm	10
Mourning cloak butterfly	34
Oyster-shell scale	35
San Jose scale	43
Tree hoppers	50

