
Oregon Agricultural College Extension Service

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Orchard Spray Program For 1919

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ORCHARD SPRAY PROGRAM FOR 1919

There are two objects in spraying. One is to coat all parts of the tree or fruit so thoroughly that no fungus or insect can find any spot that is not protected by a layer of poison. The other is to destroy the pests or parasites present by hitting them with the proper kind of poison at a stage when they are defenseless against it. Spraying is a preventive. It cannot cure damage already done.

Spraying cannot be effective unless adapted to the life-habits of the parasite and the condition of the tree and fruit. Yet many growers apply sprays uselessly at times when the parasite cannot be destroyed or when protection is of no value, while, at the critical periods when they could get results, spraying is omitted. Other growers fail to do the work thoroughly enough to reach all insects, or to coat all susceptible parts of the tree. Still others use wrong materials.

Not all orchard troubles can be controlled by sprays. There are plant diseases and insect pests that must be combated in other ways. There are also orchard troubles for which no definite means of control are yet known.

GENERAL HINTS

Care of the Young Orchard. If free from disease and insect pests when planted, young orchards seldom require any regular schedule of sprays. Thorough inspections should be made, however, at frequent intervals. All kinds of fruits should be watched for the presence of San Jose scale or other scale insects, aphids, borers, bud weevils, fruit caterpillars and Armillaria root rot. In apple orchards look also for mildew, anthracnose, fire blight, and woolly aphis; in pears, for fire blight, slug, and blister mite; in peaches, for leaf curl, mildew, blight, and twig miner; in prunes and plums, for leaf spot, spider mite, bark beetles and borers; in cherries, for bacterial gummosis, leaf spot, slug, and shot-hole borer. When any of these troubles are found, follow out the recommendations outlined for them in the regular spray schedule.

Pruning. Pruning should be conducted in such a way as to let light and air into the interior of the tree. This favors rapid evaporation of moisture from leaf and fruit, and thus tends materially to hinder fungus infections. While pruning, inspect the trees for San Jose scale, woolly aphis, and other pests and diseases. Remove all mummied fruits from the orchard. Where bacterial gummosis is present always sterilize pruning instruments and cuts with some good disinfectant to prevent spreading the disease. In fire-blight districts, orchardists should be careful constantly to sterilize pruning instruments and cuts.

Spray Outfit and Nozzle. An adequate outfit is necessary for best results. In power spraying a pressure of 175 to 225 pounds is advisable. The angle nozzle of the disc type, using a disc with a small opening, gives general satisfaction. This delivers the fine, misty spray desired and affords ease of manipulation in applying the spray from different directions. Two of these nozzles on a Y at the end of a rod, by delivering more solution, increase the speed and thoroughness of application.

In the older orchards satisfactory control of insects and diseases in the upper third of the trees is next to impossible without the use of a tower.

Recently the "Spray Gun" type of nozzle has made its appearance. This is a very compact outfit, easy to manipulate and delivering a large quantity of liquid. Powerful pressure is essential for the proper functioning of a spray gun, a force of 250 to 300 pounds being advisable. With such an outfit in the hands of a careful manipulator, spray may be applied practically as well as with the extension rods and much more rapidly and easily.

Lime-Sulfur Injury. Hot, bright weather should be avoided for applying lime-sulfur in apple orchards, because of the burning that often results under such conditions. Self-boiled lime-sulfur is recommended as a substitute under conditions where ordinary lime-sulfur is liable to injure. Even as dilute as 1 to 45 lime-sulfur may cause injury in warm weather to prune fruit and foliage and it is unsafe to use on peach foliage at any time.

Local Variations. The recommendations appearing in this bulletin are adapted as far as possible to the conditions present in the principal fruit-growing sections of the State, but each grower must study his own orchard, the diseases and pests which are prevalent there, and the influence of the climatic conditions of his locality upon them, in order to arrange a spraying program to meet most perfectly his own particular needs. This will be especially true for the orchardists east of the Cascades. In cases of doubt consult the local fruit inspector, the county agricultural agent, or the Oregon Agricultural College.

POINTERS ON SPRAY MATERIALS

Many varieties of commercial spray materials are on the market, some of them for general use, many of them for special purposes. Most of these materials are very good when properly used; some are of questionable value when price and purpose are considered, and a few are really dangerous. As a rule the commercial preparations of the various spray materials recommended in this bulletin are standardized, are more convenient to use, and often as cheap as the home-made sprays when the labor and equipment necessary for home preparation are considered. It is important that the material, if a commercial product, be pure and fresh. It should be in the original unopened container and should not have been allowed to dry out or to freeze.

Lime-Sulfur. Wherever the word "lime-sulfur" is used in this bulletin it refers to the ordinary commercial concentrated lime-sulfur solution, testing approximately 32 degrees Baume. The expressions "lime-sulfur 1 to 8, 1 to 30," etc., mean one gallon of this commercial lime-sulfur added to 8 gallons or to 30 gallons of water. When the lime-sulfur is made at home it should always be tested with a hydrometer, and dilutions made according to the tables which follow. It should be remembered, however, that thoroughness of application is always more important than minute exactness of dilution.

STANDARD LIME-SULFUR DILUTION TABLE

Showing in columns 1, 2, 3, and 4 the number of gallons of water required for each gallon of concentrated solution to obtain the desired strength.

20 Hydrometer Test of Stock Solution		10	2 ½	2 *	1 ½ **
Baume Scale	Specific Gravity	1 Dormant Spray (1-8)	2 Early Spring Spray (1-30)	3 Mid Spring Spray (1-40)	4 Late Spring Spray (1-50)
°		Gallons	Gallons	Gallons	Gallons
34	1.304	8 ¾	32	43	53 ½
32	1.282	8	30	40	50
30	1.260	7 ¼	28	37	46
28	1.239	6 ½	25 ½	34	42 ½
26	1.218	6	23 ½	31	39
24	1.198	5 ¼	21 ½	28 ½	35 ½
22	1.179	4 ¾	19 ½	26	32
20	1.160	4	17 ½	23	28

SIMPLIFIED LIME-SULFUR DILUTION TABLE

To make 50 gallons of dilute spray use the quantity of concentrated lime-sulfur indicated in columns 1, 2, 3, and 4 for the different strengths, and dilute with water to 50 gallons.

Hydrometer Test of Stock Solution		1	2	3	4
Baume Scale	Specific Gravity	Dormant Spray (1-8)	Early Spring Spray (1-30)	Mid Spring Spray (1-40)	Late Spring Spray (1-50)
°		Gallons	Gallons	Gallons	Gallons
34	1.304	5	1 ½	1	1 **
32	1.282	5 ½	1 ½ *	1 *	1
30	1.260	6	1 ¾	1 ¼	1 *
28	1.239	6 ½	1 ¾ *	1 ¼ *	1 ¼ **
26	1.218	7	2	1 ½	1 ¼
24	1.198	8	2 ¼	1 ¾	1 ½ **
22	1.179	9	1 ½	2 **	1 ½
22	1.179	9	2 ½	2 **	1 ½
20	1.160	10	2 ¾	2 *	1 ¾ **

*Means use a little over measure.

**Means use scant measure.

Dry Lime-Sulfur. Several firms are now putting on the market preparations of lime-sulfur in dry form. These are convenient to use and appear not to be more injurious to foliage or fruit than the ordinary lime-sulfur. Unfortunately the Experiment Station has thus far been unable to make satisfactory comparative tests between these dry forms and the liquid material as far as control of diseases or insect pests is concerned. At present, therefore, no statement as to relative effectiveness can be made except that from analyses by the Department of Chemistry it appears that it will take about four pounds of the dry lime-sulfur to be equal in fungicidal or insecticidal strength to one gallon of the average commercial liquid lime-sulfur.

Iron Sulfate (*Copperas*). This material, dissolved in water and added to the spray tank at the rate of half a pound of iron sulfate to each gallon of concentrated lime-sulfur used, will bring about the formation of black sulfide of iron in the solution. This serves as a valuable indicator for the man who is spraying, since the color enables him to determine exactly how well he is covering the tree. There are growers and experimenters who claim that this material will also reduce the tendency of lime-sulfur to burn.

Arsenate of Lead. Arsenate of lead is prepared in paste form and as a powder. Both are effective in the control of insects. Recent investigations indicate that unless one is near the place of manufacture, thus insuring that the paste be freshly made, the powdered arsenates are probably advisable. The proportions recommended in this bulletin are figured on the basis of the powdered form. For example, "lead arsenate 2 to 100" means powdered lead arsenate two pounds to 100 gallons of the dilute spray solution. In using the paste arsenate, double the amount here recommended.

Two types of lead arsenate occur, known respectively as the basic lead arsenate (neutral arsenate) or triplumbic, and lead hydrogen arsenate (acid arsenate) or diplumbic. The neutral or triplumbic arsenate of lead is a more stable compound and is safer to use on tender foliage or in combination sprays where there is a tendency to burn. It is recommended for use when combined with lime-sulfur for application on stone fruits after blossoming time. The diplumbic material has much to render it superior for most poison spray work and is considered safe in combination with lime-sulfur on apples and pears. Commercial lead arsenates are generally the acid or diplumbic unless otherwise branded.

Arsenate of Lime. Arsenate of lime or calcium arsenate has recently appeared as a commercial substitute for the lead arsenates. The value of this material lies in the reduced cost and higher poison content pound for pound. Methods for manufacturing the calcium arsenates have not, thus far, been standardized; brands therefore vary greatly in

their chemical and physical properties. The calcium arsenates are less stable than the lead arsenate. This lack of stability increases the possibility of burn and makes necessary the addition of some material as a stabilizer. For this purpose, excess lime is generally added to the spray solutions. Growers contemplating the use of calcium arsenates in the orchard are advised to submit samples to the Oregon Experiment Station for analysis and consequent instructions on the exact procedure in preparing the solution.

Nicotine. Nicotine as recommended in this bulletin refers to the concentrated nicotine sulfate, 40 percent solution. A strength of 1 to 1200, which is equal to one pint in 150 gallons, is sufficiently strong for most troubles; frequently higher dilutions are possible. Soap or lime-sulfur improves the spreading and killing powers of the nicotine solution.

Oil Sprays. The use of oil emulsions for the dormant spray has not been generally recommended or practiced in Oregon. It is apparent that for certain insect troubles they are superior to other sprays, and they are probably of equal value with the standard lime-sulfur as a dormant insecticide for scale, red spider mite, etc. Limited observations indicate that an occasional application of oil spray has a beneficial effect in softening and smoothing the bark and producing a generally stimulating effect on the tree. The action of an oil spray is comparatively slow and where rain follows within six or eight days after the application, the effectiveness is materially decreased. Particular care should be taken, therefore, to apply the oil during settled weather.

Resin-Oil-Soap Spreader. This inexpensive material greatly increases the covering power of Bordeaux and self-boiled lime-sulfur. Send for directions for making. Its use is not advised with ordinary lime-sulfur.

Unsafe Combinations. The combinations recommended in this bulletin are safe under ordinary conditions. Regarding combinations not referred to here, consult the Oregon Agricultural College.

THE DUSTING METHOD

The possibility of applying fungicides and insecticides in a dust form has recently attracted much attention. The advantages of such a method are rapidity of application, the saving in labor, and the very light outfit required. There is also no water supply problem or need of hauling heavy loads of liquid. Aside from the cost of material, the great disadvantage seems to be that effective work is absolutely impossible where even a slight breeze is blowing. Minor difficulties appear in the absence of any dust materials effective for the control of scale, aphids, apple-tree anthracnose, peach-leaf curl, and some other troubles. Unless later developments overcome these disadvantages, therefore, the dusting outfit must be considered only as a supplement to the regular spray outfit.

SPRAY PROGRAM FO



Delayed Dormant Spray.

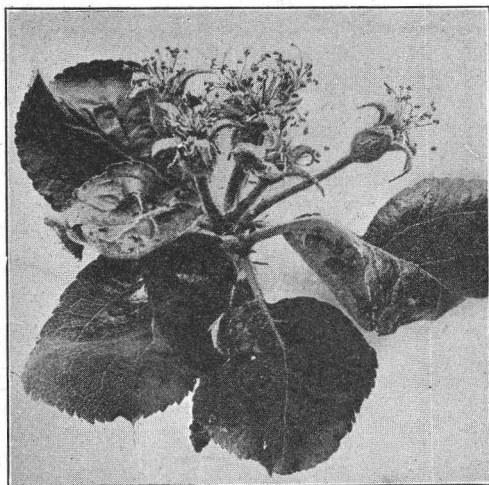


Pink Sp

With very few exceptions, the regular spray program as recommended for the
Frequent orchard inspections should be made, and where other pests and diseases a

Application.	Time Applied.	Pest or disease and materials to use.
1. Dormant Spray.	As the winter buds are swelling and before they open.	For San Jose Scale, Red Spider Mite, and Blister Mite (Pear): Use lime-sulfur, 1-8 or miscible oil, 1-17. For Leaf Roller*: Use miscible oil, 1-17.
2. Delayed Dormant Spray.	Soon after winter buds open. Leaves or green parts on fruit spurs about $\frac{1}{8}$ to $\frac{3}{4}$ inch long.	For Scab and Mildew*: Use lime-sulfur, 1-30. For Aphids: Add nicotine, 1-1200. For Bud Moth: Add arsenate of lead, 2-100.
3. Pink or Pre-blossom Spray.	When the blossom buds are well separated in the cluster, just before opening.	For Scab and Mildew: Lime-sulfur, 1-40. For Bud Moth and Leaf-Roller: Add arsenate of lead, 2-100.
4. Calyx Spray.	Just as last petals are falling and before calyx closes on the main bud of each cluster.	For Scab and Mildew: Lime-sulfur, 1-40. For Codling Moth (apples only): Add arsenate of lead, 2-100.
5. Ten-day Spray.	Ten days or two weeks after the calyx application.	For Scab and Mildew: Use lime-sulfur, 1-40 or 50, (or self-boiled lime-sulfur, 8-8-50, if burning is feared.) For Pear Slug: Add lead arsenate, 2-100.

APPLES AND PEARS



Calyx Spray.

Control of apple scab and codling-moth should be followed in the bearing orchard. And, the proper applications for their control should be given.

Application.	Time Applied.	Pest or disease and materials to use.
6. Thirty-day Spray.	Four or five weeks after the calyx application.	For Scab and Mildew*: Use lime-sulfur, 1-50, (or self-boiled lime-sulfur, 8-8-50, to prevent burning.) For Codling Moth*: Add arsenate of lead, 2-100. For Green and Woolly Aphis: Use Nicotine, 1-1200.
7. July Spray.	July 10 to 25 depending on locality and season.	For Codling Moth* (second generation): Use arsenate of lead, 3-100.
8. August Spray.	August 5 to September 5, depending on season and locality.	For Codling Moth*: Use arsenate of lead, 3-100. For Anthracnose and Late Scab: Add Bordeaux mixture, 4-4-50, or Burgundy mixture, 2-3-100.
9. Fall Spray.	Late October or immediately after fruit is picked.	For Anthracnose: Use Bordeaux, 6-6-50, or lime-sulfur, 1-8. For Pear Leaf Blister Mite* and Scale: Use lime-sulfur, 1-8.

When a pest or disease is marked with an asterisk (), see special discussions regarding it on the pages following.

SPRAY PROGRAM FOR PRUNES AND PLUMS

Application.	Time Applied.	Pest or disease and materials to use.
1. Dormant Spray.	Just as the winter buds are opening.	For San Jose Scale, Red Spider Mites and Twig Miner: Use lime-sulfur, 1-8.
2. Pre-blossom Spray.	When the blossom buds are showing white just before opening.	For Brown Rot* Blossom Blight: Use Bordeaux, 4-4-50 or lime-sulfur, 1-30. For Bud Moth: Add lead arsenate, 2-100. For Aphids: Add nicotine, 1-1200.
3. First Fruit Spray.	As soon as the "shucks" or calyx parts are off the fruit.	For Brown Rot and Leaf Spot*: Use Bordeaux, 4-4-50 or self-boiled lime-sulfur, 8-8-50, with resin-soap spreader. For Syneta: Add neutral or triplumbic lead arsenate paste, 7-100.
4. June Spray.	About June first.	For Leaf Spot (Beneficial for brown rot also): Use Bordeaux 4-4-50 or self-boiled lime-sulfur, 8-8-50 with spreader.
5. July Spray.	About July first.	For Leaf Spot (Beneficial for brown rot also): Use same materials as in preceding.
6. August Spray.	About one month before picking time.	For Brown Rot*: Use Bordeaux, 4-4-50 or self-boiled lime-sulfur, 8-8-50. Add resin-soap spreader.

*See special discussion on this particular pest or disease.

SPRAY PROGRAM FOR PEACHES

Application.	Time Applied.	Pest or disease and materials to use.
1. Dormant Spray.	At least two weeks before buds begin to open.	For Peach Leaf Curl*: Use Bordeaux, 6-6-50 or lime-sulfur, 1-8. For San Jose Scale: Use lime-sulfur, 1-8.
2. Late Dormant Spray.	Just as first buds are ready to open.	For Peach Twig Miner, Red Spider Mite: Use lime-sulfur, 1-12. For Aphids: Add nicotine, 1-1200. For Bud Moth: Add lead arsenate, 2-100.
3. First Fruit Spray.	Just after the "shucks" or calyx parts fall off.	For Peach Blight* on fruit and leaves: Use self-boiled lime-sulfur, 8-8-50. (Many growers use Bordeaux, 4-4-50 with excellent results.)

*See special discussion on this particular pest or disease.

SPRAY PROGRAM FOR PEACHES—Continued

Application.	Time Applied	Pest or disease and materials to use.
4. Second Fruit Spray.	About two or three weeks after the preceding.	For Peach Blight on fruit and leaves: Use self-boiled lime-sulfur, 8-8-50.
5. Last Fruit Spray.	About one month before picking.	For Brown Rot: Use self-boiled lime-sulfur, 8-8-50. For Bud Moth and Peach Twig Miner: Add lead arsenate, 2-100.
6. Early Fall Spray.	As soon as the fruit is picked.	For Peach Blight, twig and bud infections: Use Bordeaux, 4-4-50.
7. Late Fall Spray.	About the first of November.	For Peach Blight, twig and bud infections: Use Bordeaux, 6-6-50.

SPRAY PROGRAM FOR CHERRIES

Application.	Time Applied.	Pest or disease and materials to use.
1. Dormant Spray.	Just as the winter buds are beginning to open.	For San Jose Scale and Red Spider Mite: Use lime-sulfur, 1-8. For Aphids: Add nicotine, 1-1200, and apply Tanglefoot in band around trunk to prevent ants carrying aphids up the tree.
2. Pre-blossom Spray.	When blossom buds show white just before they open.	For Brown Rot Blossom Blight*: Use Bordeaux, 4-4-50, or lime-sulfur, 1-30. For Bud Moth and Syneta: Add neutral or triplumbic lead arsenate paste, 7-100.
3. First Fruit Spray.	As soon as most of the "shucks" or calyx parts have fallen.	For Leaf Spot* and Brown Rot: Use Bordeaux, 4-4-50, or lime-sulfur, 1-50, or self-boiled lime-sulfur, 8-8-50. For Syneta: Add neutral or triplumbic lead arsenate paste, 7-100.
4. Second Fruit Spray.	Apply a month before picking time.	For Brown Rot and Leaf Spot: Use Bordeaux, 4-4-50, or self-boiled lime-sulfur, 8-8-50, or Burgundy mixture, 2-3-100. For Slug: Add neutral or triplumbic lead arsenate paste, 7-100.
5. July Spray.	After the fruit is picked or about first of July.	For Leaf Spot: Use Bordeaux, 4-4-50, or self-boiled lime-sulfur, 8-8-50.
6. August Spray.	About the first week in August.	For Cherry Slug and Bud Moth: Use lead arsenate, 2-100.

*See special discussion on this particular pest or disease.

IMPORTANT POINTS ABOUT PARTICULAR PESTS AND DISEASES

Note. Do not waste time and money by spraying for pests or diseases not present in your orchard.

DISEASES OF APPLES AND PEARS

Apple Scab. Dormant sprays are of no value against scab. In Oregon with the more susceptible varieties the delayed dormant spray (No. 2) must be given as the first scab spray to prevent early infections. If foliage, blossom buds, and fruit are thoroughly covered by two applications before and two after blooming, such a complete elimination of scab will often result, even with the worst varieties, that the recommended fifth scab spray will not be necessary. This spray should not be omitted, however, unless careful inspection at that time shows that leaves and fruit are practically free from scab.

Lime-sulfur will burn through scab spots which are already present on the leaves, and not infrequently also will cause a slight edging and tip burn of healthy leaves; but this is unavoidable. Periods of hot weather, however, are conducive to fruit burn and to more severe foliage injury. At such times the use of self-boiled lime-sulfur is suggested.

Pear Scab. This disease, which is similar to apple scab, is controlled in the same way. At least two thorough sprays before blossoming must be given to catch early infections. Some varieties, however, are extremely susceptible to lime-sulfur injury and weaker dilutions of this material are suggested. In fact, on the sorts most liable to spray injury, the use of self-boiled lime-sulfur beginning with the calyx spray would be advisable. The addition of resin-oil-soap spreader to this material will greatly increase its covering power.

Fire Blight. While scab may destroy an entire crop, fire blight may destroy the entire orchard. It is the most dangerous of all known diseases of the apple and pear, and must be watched for unceasingly.

In cases of suspected fire blight, send specimens at once to the Agricultural Experiment Station at Corvallis for microscopic examination, and get in touch with your county fruit inspector or agricultural agent. Do not attempt to cut out blight until you have received careful directions from a reliable source. It is highly contagious and may easily be spread by persons who do not understand the disinfecting process.

Do not be duped into using so-called **Blight cures**. Many orchards have been ruined because owners have unwisely put their trust in some reputed "expert" or in some "remedy" backed up by fine testimonials. Send for our circular on Fire Blight.

Apple Tree Anthracnose. Infections on fruit and branches start in the fall during the rainy spells. To clean up a badly attacked orchard an application of Burgundy mixture should be given in August or early September, followed by Bordeaux immediately after picking time. When well under control, a single thorough spraying just after picking season will often be sufficient to keep the disease within bounds.

Powdery Mildew of Apples. Prune out all affected tips before spring. The ordinary sprays for the control of scab when given according to schedule will keep the mildew down to a practically negligible amount. The special iron sulfide mixture formerly advised is probably not of great advantage under Oregon conditions.

Moss. Moss is rarely troublesome where a regular spray schedule is maintained in the orchard. To clean up an old moss-covered orchard add common soda lye to the dormant spray or spray straight lye dissolved in water at the rate of one pound to five or six gallons. Such strong caustic, however, should be used with caution. Bordeaux mixture is also of value.

Drouth Spot, Cork and Bitter Pit or Baldwin Spot of Apples. These are physiological troubles not caused by parasitic organisms and hence not controllable by spraying.

DISEASES OF STONE FRUITS

Brown Rot of Stone Fruits. This is the worst disease of prunes in Oregon, frequently destructive to cherries, and sometimes bad on peaches. It varies tremendously in severity from year to year. It often causes considerable damage in prunes and cherries by blossom blight. Attacks of fruit rot are likely to develop at any time during the season when there is continued moisture, particularly when accompanied by warm temperatures. A rigid spray schedule, therefore, cannot be adhered to. The worst attacks occur almost always during the ripening and picking period. Hence it is usually very desirable to give a thorough spraying about a month before picking. Other sprays should be given when conditions seem to justify them. Send for our mimeographed circular on brown rot.

Leaf Spot or Yellow-Leaf Disease of Prunes and Cherries. Caused by a fungus known in its summer stage as *Cylindrosporium*. Results in dropping of leaves; this, if severe, brings about poor fruit development, retarded growth, and reduced or weakened fruit buds. Spraying will materially lessen the disease. Attacks vary greatly in severity from year to year. Hence growers are advised to watch and spray when first signs of the disease are evident. Send for circular.

Internal Browning and Gum Spot of Prune Fruit. These are physiological troubles and not controlled by sprays. Often mistaken for brown rot and insect attack.

Peach Blight. Infections take place abundantly during fall rains and cause the death of buds and the girdling of twigs during the winter. Then in the spring new infections attack fruit and foliage, causing fruit spot and leaf shot-hole. The first fall spray should be given before rains begin.

Peach Leaf Curl. Infections take place just as the leaves are emerging. The one spray needed must be applied before any of the leaf tips are out. Every bud and twig must be thoroughly covered. Leaf curl

may be controlled by a winter application even as early as the first of December. Bordeaux gives more uniform success than lime-sulfur in controlling the disease.

Powdery Mildew of Peaches. The first control applications should be given soon after the winter buds have come out and while the leaves are still very small; repeat at intervals of three or four weeks until mildew is eliminated and give another spray if it begins to show again. Use self-boiled lime-sulfur 8-8-50 with resin-oil-soap spreader added. In warm weather dusting with very finely powdered sulfur should be effective.

Bacterial Gummosis. This disease is common and destructive on young sweet cherries, and sometimes troublesome on other stone fruits in Western Oregon, but is apparently unknown east of the Cascades. It cannot be controlled by spraying. Send for circular.

INSECT PESTS

San Jose Scale. This manifests itself as small, ash-gray or blackish, pimple-like scales clustered on the bark. Removing scale discloses a flattened, oily, lemon-yellow insect beneath. The bark is thin, and stained with purple, the trees becoming bark-bound and devitalized. Infested fruit shows bright red spots.

Use Spray No. 1. While this spray may be applied practically any time during the dormant season, it would appear that the maximum efficiency is obtained when the treatment is delayed until the buds are swelling well. Application for control is advisable only when one is reasonably sure of presence of pest. Thoroughness is essential; drive the spray under the buds. Oil emulsions are effective, and are probably occasionally advisable as a substitute for lime-sulfur because of their beneficial effect on the tree. Send for circular.

Red Spider Mites. Use Spray No. 1. Application is advisable only when one is reasonably sure of presence of pest. Send for circular.

Codling Moth. Use Sprays No. 4, 6, 7, and 8. The exact date for the application of Sprays No. 6, 7, and 8 will vary with the season, and with the locality. In the case of No. 6 the date of application should correspond with the first deposition of eggs. Procure a standard thermometer and take daily readings at 8:00 p. m. during the season immediately following the calyx application. When the evening temperature registers 60 degrees or above, it is time to apply this spray. As a general rule, this date will follow the calyx spray by about three and one-half to four and one-half weeks in Eastern and Southern Oregon; four to five weeks in the Hood River Valley; and five to six weeks in the Willamette Valley. In a bearing orchard, it is never advisable to omit this spray.

Generally speaking, our most serious codling moth injury occurs in late summer resulting in the costly "September sting." To assist in minimizing this injury it seems advisable to increase the poison dosage by one-half in the summer applications, using 3-100 in sprays 7 and 8. The element of time of application is of first importance and will vary

greatly with the season, locality, and local conditions. Where possible, if in doubt, consult the fruit inspector, county agent, or some official who is in a position to know when to apply these summer sprays. In Southern Oregon the rule is, "Keep the fruit covered with spray." Send for circular.

Aphids or Plant Lice. Nicotine sulfate, 40 percent, added to Spray No. 2, at the rate of two-thirds pint to 100 gallons of the dilute spray, is the standard application for control of plant lice. As aphids are nearly always present in the orchard, this application is generally advisable. Reinfestation of apples may take place in June, in which case, add nicotine to Spray No. 6. In the case of cherry trees ants carry aphids up to reinfest the trees. Band the trees with Tanglefoot or other material to prevent this. Send for circular.

Bud Moth. This is a chocolate-brown worm one-third inch long, found in a mass of webbed leaves at tip of twig. On apple and pear add lead arsenate 2-100 to Sprays No. 2 and 3. On stone fruits add neutral lead arsenate 7-100 to Spray No. 2. Application is advisable only where pest has done injury the past season. Send for circular.

Pear and Cherry Slugs. These are greenish-brown, slimy, slug-like larvae, which skeletonize foliage of cherry and pear. On pear use Spray No. 5; adding lead arsenate 2-100. On cherry use Spray No. 4, adding neutral or triplumbic arsenate of lead, 6-100. Road dust, air-slaked lime, sulfur, or any finely divided powder applied as a dust is also very effective. Send for circular.

Blister Mite. This is usually serious only on pears. Use Spray No. 1, and be very thorough in applying it. The sprayed trees should appear as if whitewashed. The ideal control for blister mite is a spray applied in the fall (see Spray No. 9). When thoroughly done, one application in three years is generally sufficient for satisfactory control.

Leaf Rollers. Use miscible oil emulsion recommended in Spray No. 1. For maximum efficiency, apply during period of settled weather. This pest is most common in Northern and Eastern Oregon. Application is advisable only where one is reasonably sure of presence of pest. Write for circular.

Woolly Apple Aphis. This pest occurs as clumps or masses of cotton-like patches about wounds, cracks, and galled areas of bark, or on water sprouts and exposed rootlets. Beneath this cottony mass are wriggling colonies of soft brown aphids. When thoroughly established, this is a very serious pest in apple trees. Mark infested trees for special treatment and obtain circular giving information for control.

Borers. They are not controlled by sprays, but require special treatment. Send for circular.

Fruit Tree Leaf Syneta. This is a small, elongate, active, creamy-white beetle. Feeds on buds, unfolding leaves, blossom petals, and developing fruit, making unsightly holes. Use the neutral or triplumbic arsenate of lead, 7-100, in sprays as indicated.

Cherry Fruit Maggot. This is a small, white, cylindrical maggot found feeding inside the fruit. If lead arsenate sprays are applied for the control of cherry slug, they will also ordinarily control the maggot. If it is desired to apply a special spray, use lead arsenate, 3-50, plus 2 gallons of cheap sirup. This should be applied at the rate of one pint to the tree. Use a hand pump throwing a fine misty spray which will deposit minute droplets on the outer leaves. This is to poison the fly which produces the maggot. Treat the trees just as the fruit begins to color well. Write for circular.

Peach and Prune Twig Miner. This is a chocolate-brown worm $\frac{1}{4}$ inch in length and found in tunnels at the base of a wilted tip or fruit spur. Summer applications are ineffective. Use spray indicated. Applications are generally advisable as the pest is usually present. Send for circular.

NOTICE

More complete information on particular pests and diseases, and also directions for making any particular spray material, may be secured by writing to the Oregon Agricultural College at Corvallis. If information is desired regarding the identity of any insect or disease, send complete description, together with specimens of insect or disease and of the affected plants, if possible. Wrap the material in a container which will not be crushed in the mails. Put your name and address on the package.