
Oregon State Agricultural College Extension Service

Corvallis, Oregon

Oregon Spray Recommendations for Pests and Diseases of Stone Fruits

Prepared by

Representative of the Oregon Agricultural Experiment Station
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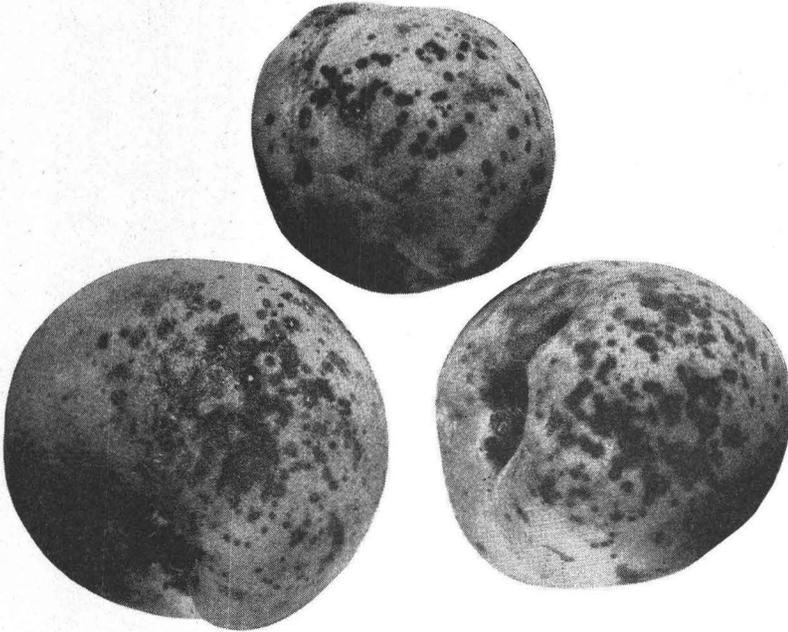


Figure 1. Peach Blight. Spots on fruit caused by spring infection by the peach blight fungus. The best way to control this spot disease is to spray in the autumn to control the twig blight stage. If the twig blight is eradicated there will be no trouble with fruit spot. If this is not done, it is necessary to use the spring sprays to prevent the spotting of the fruit.

Cooperative Extension Work in Agriculture and Home Economics

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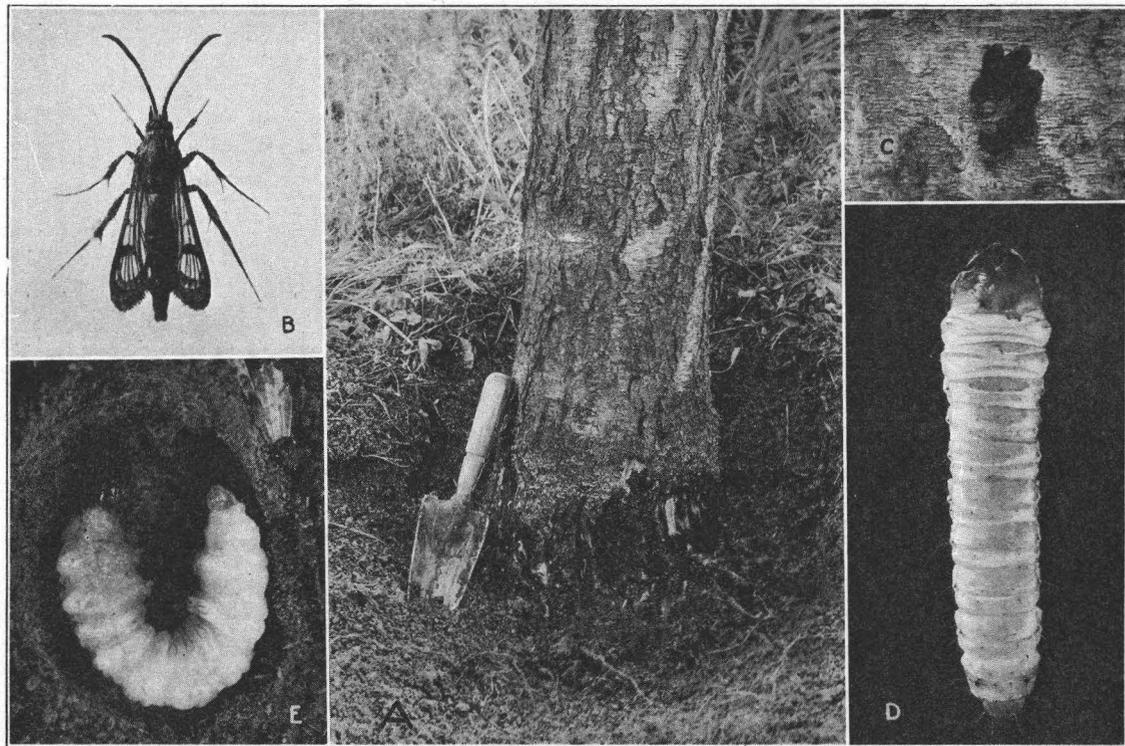


Figure 2. *A*: Peach tree practically girdled by continual attacks of root borers. *B*: Adult moth, at rest. *C*: Eggs on prune bark (magnified). *D*: Larva (magnified). *E*: Larva in winter cell (magnified).

Oregon Spray Recommendations for Pests and Diseases of Stone Fruits

INSECT PESTS OF STONE FRUITS

San Jose scale manifests itself as small, ash-gray or blackish pimple-like scales clustered on the bark. The bark usually shows a purple stain for a short distance around each scale especially on young trees and new growth. The trees become bark-bound and devitalized. Infested fruit shows bright red spots. The pest seldom becomes serious in well-sprayed commercial orchards. Where present, the dormant spray of lime sulfur or oil is advisable.

Brown peach and apricot scale occurs as a rather large, dark brown, strongly humped scale on the limbs and twigs of prune trees especially in Southern Oregon. The standard method of control is to apply an oil emulsion spray (5 per cent actual oil) in the early spring as the winter buds are ready to open.

Red spider-mites. Three species of these mites, the European red spider-mite, brown orchard mite, and the common red spider-mite, attack Oregon orchards. Mites are more frequently serious on prune and cherry where no spray program is regularly applied. The first two species overwinter in the egg stage on the tree. Lime sulfur 10 to 100, applied just before the buds open, is recommended for the control of these forms. A dormant spray of mineral oil emulsion has given partial control of these two species. The common red spider-mite, however, cannot be controlled by a dormant or delayed dormant spray since it migrates to the orchard from adjacent weeds and other plants later in the season. Summer sprays of oil emulsion or lime sulfur are recommended for the common red spider-mite. Lime sulfur, 1 to 2 gallons plus 5 pounds wettable sulfur mixed with 100 gallons of water, is the standard summer lime sulfur spray for mites. A "summer" oil emulsion, 1 to 2 gallons to 100 gallons of water, is of value when used as a summer spray for red spider control. See page 12 for discussion of oil sprays. Dusting with sulfur is sometimes effective.

Prune thrips. These tiny insects about 1/20 inch long come from the ground in the early spring, about March 15 to 20, as the buds are swelling and opening. These insects work into the buds before they open and in parts of Western Oregon have caused serious bud injury. Later the adults lay eggs in the fruit and leaf stems and also in the fruit. Both young and adults may feed upon the young prune, rasping the tender surface causing a rough russet-like corky condition of the skin. A carefully timed spray of oil emulsion, 2 gallons, plus nicotine sulfate, 1 pint to 100 gallons, has proved effective on prunes. Two sprays are given, the time of application depending upon the emergence of the thrips; (1) usually when winter buds are swelling and a few green tips are showing, and (2) when most of the buds are green at the tip. In some seasons, due to the late emergence of the thrips, the first spray is applied in the green-tip stage followed by a second spray applied as a

preblossom spray. Possibly similar applications might be of value in the control of thrips on cherries. At least 250 pounds pressure and thoroughness in application are essential in thrips control.

Peach and prune twig miner. This small, pinkish worm works havoc by tunneling into the terminal growth of both bearing and nonbearing peach, prune, and apricot trees.

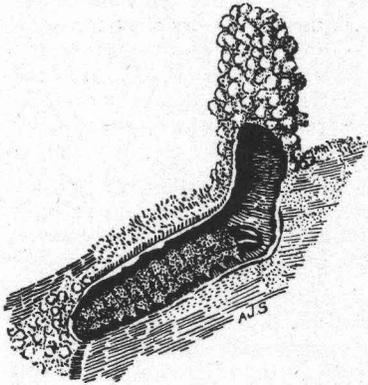


Figure 3. Peach twig miner larvae at rest in the hibernating burrow.

In recent years a later brood of worms has attacked the fruit also. Mature peaches and apricots have shown an alarming degree of infestation, and a heavy prune drop has sometimes resulted from the attack of the worms. The pest is almost invariably present in destructive numbers in both young and bearing orchards. Lime sulfur, 12 to 100, or even 10 to 100, applied any time from late February until early pink, will give excellent control if thoroughly applied, and is probably advisable in the majority of the orchards. Oil sprays are not recommended.

Bud moth. This is a chocolate-brown worm $\frac{1}{8}$ inch long found inside a mass of webbed leaves at the tip of the twig. It attacks all fruit trees, but owing to arsenate sprays for other pests on apple and pear, bud moth is rarely serious there. Cherries are often seriously attacked and other stone fruits to a varying degree. Lead arsenate in the preblossom spray will control. See remarks on lead arsenate on stone fruits, page 9.

Aphids or plant lice occur as small green or black, soft-bodied insects on the developing buds and leaves. They have piercing mouthparts and suck the juices from the leaves, sometimes causing dwarfing, cupping, and curling. The standard aphid spray is a nicotine-sulfate solution applied as recommended in the Spray Program.

Syneta leaf beetle. This insect occurs in April and May on foliage, fruit clusters, and in open blossoms as a creamy-white beetle about $\frac{1}{4}$ inch long. It eats holes in the leaves and blossom petals and gnaws out small cavities in fruit and fruit stems. The syneta beetle is especially injurious to cherry. A satisfactory spray on cherries has not as yet been developed, but in tests conducted by the Oregon Agricultural Experiment Station, 4 pounds of lead arsenate plus 4 pounds of lime to 100 gallons of water applied both as a preblossom spray and also when most of the petals have fallen, has given a fair degree of control. From chemical considerations probably two pounds of lime would be sufficient to protect against arsenical burn. Help in brown-rot blossom blight prevention may be obtained in addition to syneta control if the

lead arsenate is added to 4-4-50 bordeaux (without extra lime). Applications of lead arsenate-lime dust (30-70) instead of the spray applications have given favorable results.

Shot hole borers are small, dark brown beetles, 1/8 inch long. Their presence is made known by the small "shot hole" tunnels through the bark. Shot hole borers never attack perfectly healthy trees, but only those that have a "sour sap" condition. The larva of this beetle feeds on a certain fungus which grows only when the sour sap condition is present. Poor drainage, lack of cultivation, winter injury, etc., may cause the sour sap condition. The first step in control is to get the trees back into a healthy condition. Seriously infested trees or limbs should be cut out and burned.

For slightly infested trees the following wash is effective: Water 3 gallons, soft soap 1 gallon, crude carbolic acid $\frac{1}{2}$ pint. This is mixed and painted over the infested portions during April or May. About three applications are advised at weekly intervals.

Flat-headed borers are slender, white grubs with broad flattened heads. They are found generally just beneath the bark where they tunnel out broad, flattened channels. The bark of the tunnels is usually discolored and shrunken. Young trees are most noticeably injured.

These borers can rapidly deplete and destroy a tree, especially a young tree. Other injuries, such as pruning wounds, sun scald, etc., invite borer infestation. The treating of these wounds with tree paint or whitewash will probably aid in preventing borer infestation.

Cherry fruit maggot occurs as a small white maggot inside the ripe fruit. The standard spray, applied in the form of a poison bait for the adult fly, is lead arsenate $\frac{1}{2}$ pound, sirup or molasses 2 quarts, water 10 gallons. Three applications are usually given—the first when the adult flies appear (about the time the Royal Anns show a good color, or about June 8 to 20); a second application ten days later; and a third application one week after the second. Rains will discount the effect of previous applications and necessitate a repetition of the spray.

The spray should be applied at the rate of one pint to one quart to the tree, applying the solution as fine droplets to the upper surface of the outer leaves where the adult flies will feed upon it. Seedling trees and adjacent foliage should also receive the treatment. Spray information for fruit-fly control is sent out each season from the Oregon Experiment Station. Growers who want this information should consult their county agents. (Write for Circular 35, Oregon Agricultural Experiment Station.)

Cherry slug occurs as a greenish-brown, slimy, slug-like larva, which skeletonizes the foliage of cherry. If the pest is prevalent, dust with a lead arsenate-lime dust (20-80) to avoid spray residue.

Western peach and prune root borer. This serious pest of prune trees is not controlled by spray applications, but special treatment must be given. The paradichlorobenzene treatment appears the most promising and practical treatment for older trees. The most satisfactory time for this is from August 15 to September 15. Apply $\frac{3}{4}$ to one ounce of the chemical in a circular band an inch or two in width and about two

inches from tree trunk. This band is covered with 4 to 6 inches of earth. Tests and observations indicate that it may be used on younger trees without danger to the trees if it is kept at least 2 inches away from the trunk.

Prune "scab." The cause of the so-called prune "scab" is not definitely known. The term "scab" has been used to refer to any rough, russeted, corky or scurfy condition of the skin of the prune. A number of theories have been advanced to account for this condition. Among the suggested causes are: (1) wind-rubbing of young fruits against twigs or leaves, (2) late-frost injury, (3) injury due to the "shucks" clinging to the young developing fruit, and (4) feeding of insects such as thrips, syneta leaf beetle, and the like. None of these may be the true cause of the trouble. Investigation of this trouble is being inaugurated by the U. S. Department of Agriculture in cooperation with the Oregon Experiment Station. It is hoped that more definite information will soon be available. There appears to be some circumstantial evidence that thrips may be the cause of some of this so-called "scab." The injury, if caused by either thrips or syneta leaf beetle, may be controlled by the spray recommendations given in this bulletin.

DISEASES OF STONE FRUITS

Bacterial gummosis of cherry and other stone fruits causes large trunk and limb cankers on young trees and sometimes spur blight. East of the Cascades the disease is unknown, gumming there being due to other causes. Sprays will not control. Surgical methods are advisable. In cherry orchards where the body and frame-work limbs are of resistant seedling stock, the most serious effects are absent. Seedlings are not always resistant. Send for special circular on bacterial gummosis.

Blossom blight of cherry, prune, and apricot causes blossoms to turn brown and die. Certain varieties of pears and plums are also subject to this disease, caused by the common American brown rot or by the European brown rot. The best single control application is a spray of bordeaux, 4-4-50, given just as the first blossoms are beginning to open. Lime sulfur, 3 gallons to 100 gallons, may be used but is usually not quite equal in effectiveness. Where attacks are severe another spray in full bloom and a third as the petals drop may be warranted. Thorough work should be done. Complete control is not likely, but a repetition of this spray over a period of several years should bring gradual reduction of the disease.

Brown rot of fruit causes brown decay followed by gray spore dust on fruit surface. Spread varies so much with the weather and with the locality that no fixed program of sprays will fit all years or all districts. Brown rot is checked rather effectively and safely by non-caustic sulfur-containing sprays or by sulfur dusts when the weather is warm. Ordinary lime sulfur is very likely to cause injury to stone fruits in hot spring or summer weather. Bordeaux mixture is effective in cool, damp weather, but may cause reduction in fruit size. As the weather gets warmer and drier, sulfur fungicides are likely to give better control than bordeaux.

It is wise to spray or dust as insurance *whenever* brown rot seems to be getting a start in the orchard. An application about three or four weeks before picking will materially reduce harvest attacks, but in some seasons earlier applications should be given.



Figure 4. Effect of bacterial gummosis. *Left*: One-half of cherry tree dead from the effects of bacterial gummosis, a common sight in affected orchards. *Right*: This tree grew through one summer with two cankers at the base but succumbed the following spring.

Clean-up measures are of value against brown rot but cannot be depended upon alone. Plowing early and harrowing every week during the blossoming period will help to reduce early attacks by destroying the spore cups of the fungus on the ground. Mummies hanging in the trees cause infection and should be removed from the trees at pruning time and destroyed. Rotted fruit on the ground in the fall should be cleaned up by hogs if possible.

Pruning trees so as to open them up to light and air helps in brown-rot control and also makes possible more effective spraying.

Cylindrosporium (Coccomyces) leaf spot of cherry and prune causes small spotting or speckling of leaves and fruit stalks. It may cause leaves to

turn yellow and drop early in the season. Fruit may fail to fill out. This trouble is not found in all orchards. It seems to be worse where trees are crowded or the soil thin. Because the old leaves carry the disease over winter they should be plowed under before blossom time. If every old leaf is destroyed there will be no infection except from outside sources and this would be very slight. Where it regularly causes losses it should be sprayed for, following directions in the spray calendar. Leaf spot sprays help control brown rot.

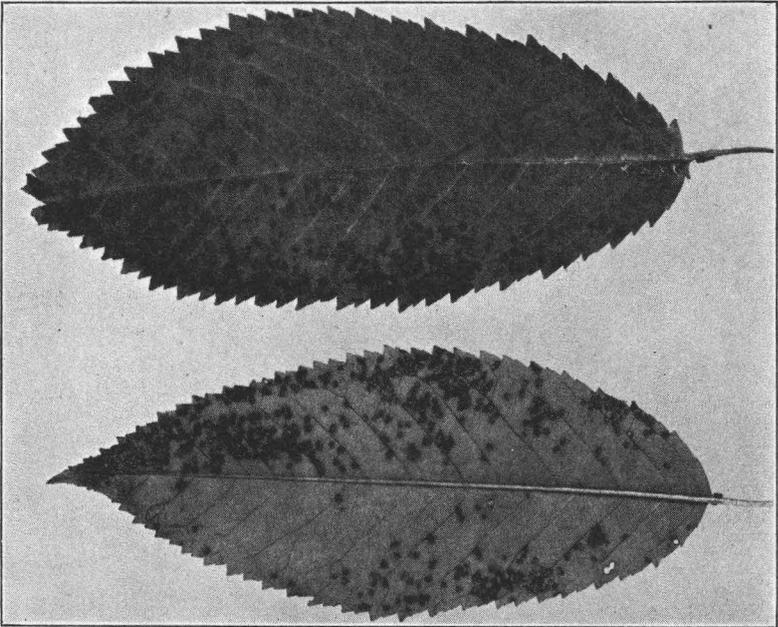


Figure 5. Leaf spot of cherry. *Bottom*: Lower surface of leaf showing white masses of spores coming from each spot. *Top*: Upper surface of leaf showing the dark spots.

Peach blight. This is the most serious disease of peach trees in the state, blighting the buds during fall and winter and spotting the fruit, twigs, and leaves during the growing season. Bordeaux 4-4-50, applied in late summer before the fall rains, is an effective protection against fall and winter attacks. Where the disease is bad it may be necessary to spray again in the spring, beginning when the shucks drop off the fruit and using a non-caustic sulfur spray. *Unless this disease is sprayed for at the right time it will quickly ruin an orchard.*

Peach leaf curl. This destructive disease causes thickening and distortion of the leaves, resulting in their eventual death and depleting the vitality of the trees. It can be controlled easily by applying a bordeaux spray as soon as the leaves are off and *not later than December*. When the curl begins to show on the leaves it is too late to do anything about it.

Thorough coverage of every bud is essential. Lime sulfur sometimes produces good results, but bordeaux has proved by far the most reliable material for Oregon.

Mosses and lichens. For fruit trees which are regularly sprayed for diseases no special "moss" spray is required. Whenever a strong winter clean-up spray is used for scale the moss and lichens will also be prevented.

For fruit or nut trees which are not sprayed for fungous diseases or scale, the growth of lichens and mosses may be kept down by a late fall or winter spray of bordeaux mixture 6-6-50. A driving spray under high pressure should be employed and the growth on the branches thoroughly saturated.

IMPORTANT POINTS ABOUT SPRAY MATERIALS

Effective results in spraying depend to a large extent on the use of proper methods in preparing, diluting, and combining sprays. Send for Oregon Agricultural Experiment Station Bulletin on *Sprays, their Preparation and Use* and Oregon Agricultural Experiment Station Circular 68 for information on safe and unsafe ways of combining sprays.

The proportions of lime sulfur recommended for sprays in this bulletin are based on the use of the standard concentrated liquid lime sulfur testing about 32° by Baumé hydrometer test. Thus, for example, where the recommendation "lime sulfur 12 to 100" appears in the calendar, use 12 gallons of the standard concentrated liquid lime sulfur and add water to make 100 gallons of dilute spray. Where the stock lime sulfur is different from standard strength, dilute according to the accompanying Liquid Lime-Sulfur Dilution Table (See page 10.)

Where the powdered or "dry lime sulfur" is used it will take, according to chemical analysis, 5 pounds of the dry powder to equal one gallon of the standard concentrated liquid lime sulfur in active ingredients. For example, where this bulletin recommends "lime sulfur 12 to 100" the grower employing the dry form should use 60 pounds of the dry lime sulfur with every 100 gallons of water to get the same strength of spray.

The powdered form of lead arsenate is the basis of the formulas for this poison recommended in this bulletin. Where arsenate in paste form is used the grower should employ double the number of pounds indicated in the bulletin.

Lead arsenate on stone fruits. There is a reasonable element of danger of burn in applying ordinary commercial lead arsenate to stone fruit. Another manufactured form, known as the basic or triplumbic lead, is preferable, if available, to the ordinary lead arsenate. Use of the ordinary lead in combination with lime sulfur increases the opportunity for injury and is possibly inadvisable on stone fruits. The addition of some hydrated lime reduces the chances of burn to a minimum. Serious burn on stone fruits from lead arsenate spray alone is extremely rare, and even an appreciable burn is uncommon. It is advisable, however, to add two pounds of hydrated

lime to each 100 gallons of spray. Probably in the majority of cases the defoliation by the pest against which arsenate might be applied would prove much more extensive and deleterious if unchecked than the defoliation or leaf burn resulting from the spray application.

LIQUID LIME-SULFUR DILUTION TABLE

For use when stock solution is different from standard commercial strength (32°) when tested by hydrometer

Strength of stock solution		To make 100 gallons of dilute spray use the number of gallons of concentrated stock lime sulfur indicated in the columns below and add water to make 100 gallons				
Degrees Baumé	Specific gravity	1 Dormant strength for scale clean-up (12-100)	2 Dormant strength for blister mite and twig miner (8-100)	3 Early spring spray (3½-100)	4 Mid-spring spray (2½-100)	5 Late spring spray (2-100)
		<i>Gal.</i>	<i>Gal.</i>	<i>Gal.</i>	<i>Gal.</i>	<i>Gal.</i>
34°	1.304	11+	7½	3+	2½+	1½+
32°	1.282	12	8	3½	2½	2
30°	1.260	12½+	8½	3½	2½+	2+
28°	1.239	14-	9½	3½	2½+	2½+
26°	1.218	15	10	4	3	2½
24°	1.198	16½-	11	4½-	3½+	2½
22°	1.179	18½+	12½	4½+	3½-	3+
20°	1.160	20½+	13½	5½-	4½-	3½

Note: Where the + sign is used, employ a little more than the number of gallons indicated. Where the - sign appears use scant measure.

Spreaders. Materials used with a fungicide or an insecticide spray to increase the spreading and adhesive properties are sometimes of advantage, but frequently do not increase the fungicidal or insecticidal value. In some sprays, and especially certain combinations of sprays, it is very necessary to use spreaders. These recommendations are given specifically and in more detail wherever they may be used advantageously. Oregon Agricultural Experiment Station Circular 68 outlines how various spray materials may be mixed in the spray tank and suggests spreader treatment.

Neutral soaps have recently shown promise as a spreader and as agents to increase deposits *when used with lead arsenate*. It is important, however, that a special soap prepared for the purpose be used. About ¼ pound to 100 gallons is recommended. If larger amounts are used or if ordinary soap is added to the lead-arsenate spray, too much soluble arsenic may form and cause burning of foliage. Soaps should not be used with bordeaux or *Calcium arsenate*.

Bordeaux mixture of the highest quality can be made by the grower if the standard methods are followed (see Oregon Agricultural Experiment Station Bulletin on the preparation of sprays), but slip-shod methods give poor results. No commercial powdered bordeaux has thus far been found superior to the best home-made material although satisfactory commercial products are now manufactured. Different brands, however, differ in quality and there is evidence that deterioration may sometimes take place

in storage. In general they cost more than the home-made spray. Where commercial powdered bordeaux is used, $\frac{1}{4}$ pound of spreader should be added to 100 gallons if a spreading agent is not already contained in the commercial product. Home-made bordeaux must be used promptly unless a stabilizer is added as otherwise it soon starts to deteriorate. An ounce of sugar to 100 gallons of prepared bordeaux will prevent deterioration for a few weeks.

Instant bordeaux. Where the grower makes his spray up in the sprayer tank using hydrated lime and pulverized bluestone separately, experience shows that it is wise to dissolve the bluestone completely before adding it to the tank of dilute milk of lime. The lime must be fresh when used since it will air-slake if left standing and then will not make bordeaux of satisfactory quality. A somewhat better quality of bordeaux results if, instead of washing the dry powder through the strainer, hydrated lime is soaked in water over night. Follow directions in the Station Bulletin on *Sprays, their Preparation and Use*.

Non-caustic or wettable types of sulfur sprays. Within recent years substitutes for ordinary liquid lime sulfur and dry lime sulfur have been devised which do not have the caustic or burning action of lime sulfur and hence are safer to use on tender skinned varieties of pears and apples and on stone fruits. Most of these sprays are not so active as fungicides or insecticides when the weather is cool and rainy and hence cannot always be relied upon for effective action in the early spring. They are, however, active in warm weather such as may usually be expected from the time the pear and apple blossoms have fallen. They are safe and effective in warm weather for the control of scab, mildew, leaf spot, and brown rot. It is usually advisable to employ a spreader with them unless a spreader is used in the manufacture. These spray materials are preferable to the old self-boiled lime sulfur and are to be recommended wherever the latter has been advised in the past. The non-caustic sulfur sprays are used at the rate of 6-10 pounds to 100 gallons of water.

Among the non-caustic types of sulfur sprays are: (1) those pastes and powders which consist of sulfur dust with or without hydrated lime present and containing some material like casein or a clay which makes the sulfur "wetable"; (2) those in which the sulfur is present in colloidal form or as chemically precipitated particles as in the different types of colloidal and "flotation" sulfur sprays which are rapidly coming into use.

These preparations are added to the water in the spray tank. Published instructions should be followed, in general, in determining the quantities of material to be used. During very warm weather the presence of lime with the sulfur gives some protection from the danger of sulfur burn. In cool weather, however, the presence of any considerable proportion of lime may somewhat reduce fungicidal activity.

The comparative merits and limitations of these various kinds of non-caustic sulfur sprays have not all been tested out under Oregon conditions but the experience of growers thus far would lead to the expectation of good brown-rot control from any of them in warm weather.

Oil sprays. Great care should be exercised in the selection of the correct oil spray for the specific purpose needed. *There are two contrasting types of oil sprays:* those used for dormant sprays and those classified as summer oil sprays. The oils used in the preparation of the dormant oil sprays are of comparatively low purification and should not be used for summer spraying. On the other hand, the summer oil sprays are of higher purity and therefore more costly.

Dormant oil sprays are available in two forms: the old type miscible oil containing cresylic acid and the newer so-called *quick-breaking* type oil emulsion. By overspraying, the latter type may deposit excessive amounts of oil on the tree surface, while the miscible oil drains off. To avoid injury, dormant oil sprays should be applied in the spring before the bud scales separate and before the buds show green. Injury may result if dormant oil spray (4 gallons or more to the 100 gallons of water) are applied during the critical period (delayed dormant) of bud development. This period occurs during the time the buds first show green and the cluster bud stage (pre-pink). In the Hood River Valley, however, miscible oils when used for the control of leaf-roller have not ordinarily caused injury during this critical period when combined with bordeaux mixture.

Home-prepared oil emulsions may be made by the orchardist for either dormant or summer application. Directions for preparing these emulsions may be obtained in Station Circular 107. More than ordinary care must be taken by the orchardist when preparing these emulsions, in order to avoid injury to the tree.

Oil spray dilutions. Commercial oil emulsions vary greatly in the amount of oil which they contain. The effectiveness of the diluted spray depends primarily upon its actual oil content. Hence all of the recommendations in this bulletin give the percentage of actual oil to be used. See Oregon Experiment Station Bulletin on *Sprays, their Preparation and Use*.

Spray combinations. Any of the materials mentioned in this spray program in connection with any particular application may be successfully combined except the combination of oil and lime sulfur. The combination of bordeaux mixture and lime sulfur should never be used. The best order in which they should be added to spray tank is given in Station Circular 68.

Dusting. Dusting with finely divided sulfur prepared for orchard use has given good results where properly applied in warm weather for the control of such troubles as brown rot and powdery mildew. The dust should be fine enough so that practically all will pass through a sieve with 300 meshes to the inch. To prevent the particles from clumping, some other material like hydrated lime or other filler should be present in small amount, otherwise the covering power and spread are not satisfactory. In cool, moist, spring weather dusting has not proved as effective as the usual liquid sprays for such a trouble as apple scab. No practicable dusting method for the control of such diseases as apple-tree anthracnose or peach blight has so far been demonstrated in Oregon.

For red spider-mites sulfur dusts have not proved as effective as have the standard liquid sprays. Dusting with lead arsenate for codling-moth control has given good results in certain districts when properly applied.

Dormant dusting for scale insects, peach twig miner, and blister-mite control is yet to be demonstrated as effective. In cool, moist spring and early summer weather nicotine dust has not proved as effective as the liquid spray for aphid control. Later in the season, when summer temperatures are high, nicotine dusting may be used with good results.

Effective dusting is impossible unless the air is perfectly quiet as in the early morning.

SPRAY PROGRAM FOR PRUNES AND PLUMS

Time of application	Pest or disease	Spray material and strength
1. Dormant spray. As winter buds are ready to open.	San Jose scale, spider-mite, twig miner, except common red spider-mite.	Lime sulfur 12 to 100. If scale is absent dilute 10 to 100. (See spider-mites, p. 3.)
	Brown apricot scale.	An oil emulsion to give 4 to 6 per cent actual oil. (See p. 12.)
	Thrips. If no thrips are present delay spray to green tip and preblossom applications.	An oil emulsion 2 gallons and nicotine sulfate 1 pint to 100 gallons of water.
2. Green tip spray. Most of buds green at tip.	Thrips.	An oil emulsion 2 gallons and nicotine sulfate 1 pint to 100 gallons of water.
3. Preblossom spray. Buds white just before opening.	Brown rot (Monilia) blossom blight.	Bordeaux 4-4-50. (See p. 7 regarding clean-up measures)
	Bud moth.	Lead arsenate 3 or 4 pounds plus hydrated lime 2 pounds to 100 gallons.
	Aphids.	Nicotine sulfate $\frac{3}{4}$ pint to 100 gallons.
4. First fruit spray. As soon as shucks fall.	Cylindrosporium leaf spot and brown rot.	Use a non-caustic type of sulfur spray or sulfur dust. (See p. 11.)
5. Later sprays or dustings.	Cylindrosporium and brown rot.	As under 4. Apply about once a month or whenever brown rot begins to develop. Apply last time 3 or 4 weeks before harvest.

SPRAY PROGRAM FOR PEACHES AND APRICOTS

Time of application	Pest or disease	Spray material and strength
1. Late dormant spray. Just as first buds are ready to open.	Peach twig miner, San Jose scale, spider-mite, except common red spider-mite.	Lime sulfur 12 to 100. If scale is absent dilute 10 to 100. (See spider-mite, p. 3.)
	Bud moths, aphids.	Lead arsenate 3 pounds plus hydrated lime 2 pounds to 100 gallons. If aphids present add 1 pint nicotine sulfate to 100 gallons.
2. First fruit spray. As soon as shucks fall.	Peach blight (fruit spot), mildew, or brown rot.	Use a non-caustic type of sulfur spray. (See p. 11.) If bad repeat once or twice at 2- or 3-week intervals.
3. Summer sprays. Whenever disease appears and a month before picking.	Brown rot.	Same as No. 3 or use dusting sulfur, applied when the air is still.
4. Early fall spray. As soon as each variety is picked.	Peach blight, dieback, and leaf curl.	Bordeaux 4-4-50. Cover every bud.
5. Leaf curl spray. December or as soon as leaves are off.	Peach leaf curl.	Bordeaux mixture 6-6-50. Cover every bud.

Spray residue on cherries. Severe infestation of cherries with the cherry fruit-fly may require the application of one to four poisoned-bait sprays to obtain satisfactory control. These sprays consist of a sweetened poisoned bait that contains lead arsenate in the proportion of 5 pounds to 100 gallons of spray. Unless great care is exercised to apply these sprays as a bait and not a drenching spray, excessive amounts of the lead arsenate residue will be present on the cherries at harvest time.

Recently Federal health officials have established a lead tolerance in addition to the arsenic tolerance that has prevailed during the past few years. During the 1935 season the arsenic tolerance remains at .01 grain arsenous oxide per pound of fruit. For lead the temporary tolerance will be .018 grain per pound. In the event that little or no rain occurs during the month prior to harvest, it may be necessary to wash the cherries before sale will be permitted. More detailed information relating to spray residue on cherries may be obtained from Station Bulletin 298. Methods for the

SPRAY PROGRAM FOR CHERRIES

Time of application	Pest or disease	Spray material and strength
1. Dormant spray. As winter buds are about ready to open.	San Jose scale, European red mite and brown mite (but not common red spider-mite).	Lime sulfur 12 to 100 (See p. 8) or an oil emulsion diluted to give 5 per cent actual oil (See p. 12.)
	Leaf spot (Cylindrosporium).	Plow under old leaves before bloom starts.
2. Preblossom spray. Blossom buds white just before opening.	Brown-rot blossom blight (Monilia).	Bordeaux 4-4-50. (See p. 7 regarding clean-up measures.)
	Syneta beetle. Bud moth.	Lead arsenate 4 pounds plus hydrated lime 2 pounds to 100 gallons of water or bordeaux. (See pp. 8-10.)
	Aphids.	Add nicotine sulfate 1 pint to 100 gallons.
3. Petal-fall spray. When most of petals have fallen.	Brown-rot blossom blight.	Same as in No. 2.
	Syneta beetle.	Same as in No. 2.
4. Shuck-fall spray. As soon as shucks fall from fruit.	Leaf spot (Cylindrosporium) and brown rot.	Any non-caustic type of sulfur spray. See pp. 10-11 or dust with 300-mesh sulfur in still air.
5. Later sprays.	Brown rot and leaf spot.	Same as in No. 4. Apply at least every 3 or 4 weeks where these are serious. Give a last application 2 or 3 weeks before picking.
	Cherry fruit maggot.	See p. 5. Use sweetened poison-bait spray 1 pint to 1 quart per tree on leaves, first, when Royal Anns show good color; second, ten days later; third, a week after second. Repeat immediately after rain. (Do not combine with other sprays).

removal of the spray residue are also suggested. Proper spraying procedure in order to avoid spray residue complications as much as possible may be learned from Station Circular 35.

Tree Paint. In case of bark injury from any cause, all loose bark should be trimmed back to healthy tissue. Where branches two inches or more in diameter have been cut or broken off, the stub should be trimmed flush with the surface of the trunk. All exposed wood and bark should be covered with an antiseptic coating. Bordeaux paint has given excellent results if applied after the wound has seasoned for a couple of weeks and is *dry*. This must be made the day it is used, slowly stirring raw linseed oil into a quantity of commercially prepared bordeaux powder until a very smooth paint is formed.

Whitewashing of trees is widely used as a preventive of sunburning or winter injury of young trees and for the protection of old trees which may have exposed parts.

The United States Government Lighthouse Formula for whitewash is as follows:

Lump or stone lime, 30 pounds (about 2 pecks)
 Salt, 18 pounds (about 1 peck)
 Rice or soft wheat flour, 3 pounds
 Whiting (or precipitated chalk), $\frac{3}{4}$ pound
 Glue, 1 pound
 Water in sufficient quantity to make a thin brushing paste when warm

Method of preparation:

1. Slake the lime in a vessel of about 10-gallon capacity and strain through sieve or cloth to remove lumps.
2. Dissolve salt in warm water and add to the milk of lime.
3. Boil the rice flour in sufficient water to form a thin paste; soak the glue in water and heat until dissolved; combine the rice flour paste and glue and then stir the whiting into the mixture.
4. Add the mixture to the milk of lime and salt, stirring all well together. If the mixture is too thick, add sufficient hot water, stirring thoroughly, until the proper consistency is reached.

The whitewashing will last longer if applied warm but it should not be hot enough to cause injury.

Shading tree trunks for protection. Boards or barrel staves are sometimes driven into the ground on the south side of the young trees to afford shade in the middle of the day.

ORCHARD PEST CONTROL COMMITTEE:

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