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Bulletins and News Notes From the Staff at Pullman.



VIEW OF WASHINGTON AGRICULTURAL COLLEGE AT PULLMAN, WASH.—ITS SOLE AIM IS TO AID AGRICULTURISTS.

Spraying in the Spring and Summer

BY H. L. REES, Plant Pathologist.

THE annual Spring spraying during the dormant season is the one which the owner of a home or commercial orchard is liable to be rather careless about. Spraying must be done at the right time and very thoroughly to make it successful and profitable. The fault or habit of "putting it off" when applied to spraying, causes more loss and dissatisfaction than any other factor. Everything should be ready in ample season, so that when the proper time to spray arrives the work can be done immediately. Fungi and insects do not wait for the tardy fruit grower. While he is hunting up pumps, nozzles, hose and sprays, and preparing them for use, the pests keep right on developing, growing and spreading damage and death. When finally the procrastinating grower is ready to spray he finds the pests so thoroughly entrenched that at the most he can only succeed in destroying a part of them. His delay has removed his chances to prevent or eradicate these pests, whereas prompt and vigorous action on his part at the right time would have assured a healthy and unaffected crop.

In the April, 1914, Monthly Bulletin, two comprehensive articles on sprays, spraying and spraying machinery were published, and while the points and facts noted there are still true in the main, this article is published at this time to remind the growers that it is necessary to take steps immediately to combat the orchard pests if they are to be kept under control this Summer. To successfully combat any pest there are four essential problems which must be settled first before spraying is begun.

1. What is the pest against which we are working?
2. What spray should be used?
3. When should the spray be applied?
4. Will the available equipment apply the spray efficiently and economically?

Reasons for Failure.

When these questions have been satisfactorily answered and the proper equipment provided, the grower is ready to spray. Many growers fail because of the lack of attention to these problems. Probably the most failures result from one of the following points:

1. Use of the wrong spray.
2. Spraying at the wrong time.
3. Lack of necessary pressure.
4. Lack of thoroughness in applying spray.

The use of the wrong spray or improper methods in mixing or diluting spray will render it valueless. Likewise the application of it too soon or too late will not give the desired results. The necessary amount of pressure needed is usually overlooked by the grower. As long as he has enough to send the spray a few feet distant from the nozzle he may think that that is sufficient, regardless of its penetrating power. It must be remembered that a single cylinder hand pump of any kind must be worked energetically and faithfully to give the desired results. The nozzle is probably given the least thought and yet its importance is considerable. Without going into a discussion of the relative merits of the different nozzles, suffice it to say that the large chambered disc nozzle is the best. Then finally there is the personal element. With every other condition right, absolute failure may result from carelessness in the method of applying or lack of thoroughness.

As stated before the annual Spring spraying is one about which the growers are inclined to be careless; but which is important. The horticultural law of the State of Washington requires a Spring

dormant spraying of fruit trees, likewise later spraying for protection and prevention.

The following spraying programmes for Spring, Summer and Fall, have been found to be efficient and satisfactory both in Washington and Oregon and are recommended for Western Washington orchards.

Apples and Pears.

1. In the Spring just as the tips of the leaves are emerging or just before. Slight injury may occur to the tips of the first leaves but this is not serious.

Lime sulphur, 1-10 or 12; black leaf, 40, 1-1000. Dilute lime sulphur and add black leaf 40 at the rate of 1 pint to 120 or 125 gallons of spray. This spray is for mosses, lichens, scale insects, aphids, pear leaf blister mite and red spider.

2. When the flower buds have separated in the cluster and show pink:

Bordeaux, 5-5-50 or lime sulphur, 1-30, preferably the former.

Lead arsenate, paste form, 2 pounds, or powdered, 1 pound to 50 gallons of diluted spray. Black leaf 40, 1-1000 if aphids are present.

This is the first scab spray and will control the bud moth if the Fall spray has not been applied, and also the tent caterpillars and other leaf eating insects. The lime sulphur will also kill the red spiders if any are present.

3. Just after the majority of petals have fallen:

Lime sulphur, 1-30.

Lead arsenate as under No. 2, if bud moth or leaf-eating insects are present.

Black leaf 40, as under No. 2, if aphids are present. Add whale oil soap 1 pound to 100 gallons of spray if black leaf 40 is added.

This is the second scab spray, and lead arsenate and black leaf 40 are to be added if necessary.

If previous spraying has not killed the oyster shell scale, black leaf 40 applied about June 1 when they are hatching will destroy all of them provided the spray covers them.

4. Ten days or two weeks later.

Lime sulphur, 1-30.

Lead arsenate and black leaf 40 as under No. 3.

5. First to 15th of September.

Bordeaux, 4-4-50.

Lead arsenate paste 2 pounds, or powdered, 1 pound to 50 gallons of water.

If anthracnose is serious or has previously affected the fruit, use Bordeaux at this time. It has been found in Oregon that this is the best time of the year to kill the bud moth. Lead arsenate should be applied if it has not been controlled by other sprays.

6. After the fruit is picked:

Bordeaux, 6-6-50 or lime-sulphur, 1-10.

This spray is for the control of apple anthracnose and should be applied immediately after the fruit is picked. Lime sulphur may control it, but Bordeaux is certain to. If the disease is serious, apply again in about two weeks.

Orchard Pests.

The four principal pests of stone fruits are leaf curl and brown rot, caused by fungi, and aphids and slugs.

Leaf curl—Bordeaux 5-5-50 or lime-sulphur 1-10 or 12 as the buds are swelling in the Spring. The latter if scale insects are present.

Brown Rot—Difficult to control in moist weather.

1. Two weeks after blooming.

2. Three weeks later.

3. One month before fruit ripens.

On prunes, cherry and plum, use Bordeaux 5-5-50 or atomic sulphur 1-10. On peaches, atomic sulphur 1-10. Omit third spray on cherries. In any case a sticker should be added. Resin fish-oil soap is recommended.

Aphids—Black leaf 40, 1-1000 as soon as they appear.

Cherry and Pear Slug—Lead arsenate paste 2 pounds or powder 1 pound to 50 gallons of water, or throw lime, ashes or dust over each slug, thoroughly covering them, until they disappear.

Apple Mildew—Dormant and scab spraying may control. If not, apply

atomic sulphur 3-50 as soon as the mildew begins to appear.

Peach Mildew—Atomic sulphur 1-10 as soon as the mildew begins to appear.

Apple Tingis and Apple Leaf Hopper—When insects become abundant, spray with black leaf 40, 1-1000 to which has been added 1 pound of whale oil soap to each 100 gallons of spray.

Bud Weevils—If insects become abundant, band trees with tanglefoot, since they cannot fly.

Bordeaux Mixture.

Bordeaux mixture is made of copper sulphate (bluestone) and stone lime (quick lime). Under no circumstances should lime that is either partly or wholly air slaked be used. Bordeaux mixture is employed in various strengths, the 4-4-50 and the 6-6-50 being the most common. The first figure indicates the number of pounds of copper sulphate, the second indicates the number of pounds of lime and the third the number of gallons of water used in the mixture. A 4-4-50 solution then would contain four pounds of copper sulphate and four pounds of lime in every 50 gallons of water.

One of the two methods may be used in making Bordeaux. Either it may be made directly or stock solutions made and these stock solutions used whenever the fungicide is needed. In making the spray directly take the number of pounds of copper sulphate indicated by the first number of the formula—for instance, for a 4-4-50 solution use four pounds, or the proportionate amount necessary to make up the desired quantity.

Put it in a coarse gunny sack, and hang it in a barrel containing 25 gallons of water so that the copper sulphate hangs in the upper part of the water. The copper sulphate will dissolve much more readily in this manner than if placed in the bottom of the barrel. In another barrel slake four pounds of lime, using enough water to slake it slowly. When the lime is slaked add enough water to make 25 gallons.

Pour the copper sulphate solution into the lime water while stirring. It is desirable to have a slight excess of lime, since it prevents any injurious action of the copper salts. If there is an excess of copper, foliage injury is liable to result. However, if the lime used is fresh and pure it will be found that the amount indicated in the formula is sufficient.

In making stock solutions, dissolve copper sulphate in water at the rate of one pound to one gallon of water. Slake the lime slowly in another receptacle, and when slaked add water until a thick lime milk containing one pound of lime to one gallon of water is formed. This is done by using 50-gallon barrels. Fifty pounds of copper sulphate is dissolved in 50 gallons of water, and 50 pounds of lime is slaked in the other and then water added until the whole is 50 gallons. Care must be exercised to avoid burning the lime while slaking. When using the stock solution in making up the spray mixture, one gallon of copper sulphate solution represents one pound of copper sulphate and one gallon of lime water represents one pound of lime. The proper amount of stock solutions should be diluted in separate vessels before mixing, and each should be poured together in equal amounts when mixed. If a 5-5-50 Bordeaux mixture is desired, five gallons, or a proportionate amount of copper sulphate solution and five gallons of lime water are put in separate barrels and 20 gallons of water added to each. When these are mixed there will be five pounds each of copper sulphate and lime in each 50 gallons of spray. Strain when pouring into the spray tank and agitate thoroughly while spraying.

Lime Sulphur.

Directions for the preparation and dilution of home boiled and commercial lime sulphur will be found in the April, 1914, Monthly Bulletin. Too much emphasis cannot be placed on the necessity of using a hydrometer in diluting any lime sulphur.

The manufacturer may state the strength of any commercial lime sulphur, but this only applies at the time it left the factory and too concentrated a spray will mean a financial loss by using more than necessary, and may mean foliage injury, while a too weak solution means loss of efficiency and failure to control

pests. Since a Beaume hydrometer may be purchased at from 85 cents to \$1, more than the price of it will be saved in a single season.

Lead Arsenate.

For all eating insects arsenate is the standard insecticide. There are now on the market three different kinds of lead arsenate under at least 10 or more different names, which to the grower are meaningless. There are in reality, however, only two kinds and the third is some combination of the two. These two kinds have been known as "acid" and "neutral." It should be understood, however, that the term "acid" does not imply that any free acid is present and consequently liable to cause foliage injury. "Acid" simply refers to its chemical nature.

The "acid" form is of higher arsenic content and possesses less rapid settling properties than the "neutral." However, since only relatively small amounts of soluble arsenate are liberated from the "neutral" form, it has been found in some cases to cause less foliage injury than the "acid," and usually none.

Since foliage injury is more common in the moist conditions of the Pacific Northwest, the "neutral" form was devised to meet these conditions. At this time, however, in the light of our present knowledge, the writer believes the grower should try the "acid" form either separately or in combination. If foliage injury does not result the indications are that he will get better results. But if injury results then the "neutral" form should be substituted. It must be remembered, however, that since the powdered form of the "neutral" lead arsenate has a great tendency to settle, the paste form should be used. Either the powdered or the paste form of the "acid" lead arsenate may be used.

Caution.—Never mix lead arsenate with any other spray until ready to use, as the chemical decomposition which takes place on standing may render it valueless or very injurious or both.

Black Leaf 40 Sprays.

This is the standard tobacco or nicotine spray for all sucking insects and is by far the best insecticide known for controlling aphids of any kind on any plant.

Black leaf 40 is a commercial preparation manufactured by the Kentucky Tobacco Products Company, Louisville, Ky. The use of home made tobacco preparations is not recommended for three reasons: (1) The cost of the materials for each is about the same and quite a little work is necessary to prepare the home made solution; (2) it is impossible to know whether the home made preparation contains sufficient nicotine since the amount in leaves and stems is variable, and (3) since the nicotine in the home made preparation is in a very volatile form it may evaporate to such an extent that the solution is valueless.

This is not true of Black Leaf 40. It should be used at the dilution of one part of Black Leaf 40 to 1000 parts of water. This would be at the rate of one pint to 125 gallons of water or in smaller quantities, one tablespoonful to four gallons of water, or one teaspoonful to one gallon of water.

It must be noted that this is a contact insecticide and must cover the insect to kill it.

Congressman Bryan, of the State of Washington, has introduced in the House a bill for the construction by the Government of a railroad from Marysville, Utah, southward into the National forest in Arizona.

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A page of interesting items from the Oregon Agricultural College at Corvallis will alternate in the farm weekly with a page of news notes from the Washington State College at Pullman. This will afford an interchange of views from the two big agricultural colleges of the Northwest that should prove of benefit to the reader, for the institutions deal with similar problems.