SPRAYS OF UP-TO-DATE INTEREST.

BY L. L. PALMER.

Among the different sprays, insecticides, and fungicides of proven value and in practical use are some of more recent date which, to the writer's knowledge, have not been extensively tried under Okanagan conditions. These I have been asked to discuss under the above title, "Sprays of Up-to-date Interest." Since many of them are worthy of long, detailed study, it will not be possible to consider the relative values of each at any great length.

The 1914 season found the fruit-growers of the Okanagan still fighting the same insect pests and diseases that troubled this district in 1913, and, in addition, many instances of new insects and previously unknown diseases have appeared to augment the already complex spraying problems; at least, it is correct to state that effective spraying was never in greater need by Okanagan fruit-growers than at present. Perhaps I should put the question more strongly and say, as I believe, that many growers have practised false economy in 1914 by neglecting to spray where so doing meant bigger crops, cleaner fruit, and healthier trees. Consequently, the question of sprays and spraying is of more vital importance than ever before.

Before entering into the subject of "Sprays of Up-to-date Interest," the writer wishes to prelude his remarks with this statement: Do not attempt new or untried sprays if the ones you are accustomed to are giving desired results. No matter how interesting or novel experimental spraying may be, on a commercial scale the average orchardist cannot afford it, and even if he could, from an economic standpoint, he would probably loose money. Still, in the Okanagan Valley many insect pests and diseases thrive unchecked, and the orchardist must in the future do more spraying. In the majority of orchard conditions in the valley I believe the common and well-known insecticides and fungicides, properly mixed or combined and sprayed in the correct season by men and machinery competent to do the work thoroughly and effectively, will control the chief economic insect pests and diseases.

However, there may arise, either through neglect or especially adverse climatic conditions, an orchard status which requires an exceptionally severe spraying or a spray combination which will positively not burn fruit or foliage. To meet such a necessity we have some new and interesting sprays, tested and proven in some other locality for the same reason for which we are trying them. A few such combinations are worth studying. But you must remember, after all, that they do not differ greatly from the common sprays to which you are accustomed, and some of them contain the same chemical compounds.

Since sprays composed of insecticides and fungicides, mixed or combined, and applied to the trees in one application are becoming more and more needed as the pests and diseases increase in number, the importance of the problem as to just which spray materials can or cannot be combined has also grown. I am therefore tabulating a few "dont's" for guidance in the combining of different insecticides and fungicides.

(1.) Do not combine Bordeaux mixture and Black Leaf 40 or other nicotine ingredients.

(2.) Do not combine Bordeaux and acid arsenate of lead. (NOTE.—Most standard arsenate pastes are acid arsenates and not safe in combination spraying.)

(3.) Do not combine lime-sulphur with acid arsenate.

(4.) Do not combine lime-sulphur with soap or kerosene emulsions.

(5.) Do not use atomic sulphur in place of lime-sulphur in dormant insecticide combinations.

(6.) Do not use any spray materials the purity or strength of which is in doubt.

The first four combinations may be used in dormant season with little danger, but for spring and summer application they are apt to be disastrous.

Among the most interesting and effective of the newer insecticides are the different oil-sprays. These have been especially brought to our attention through

experimental and practical use in California. They are very closely allied to the common insecticide, "whale-oil soap and quassia-chips," and the more recent "kerosene emulsion."

The orchardist can obtain commercial oil emulsions and miscible oils of different penetrating strengths, just as he can buy commercial lime-sulphur of guaranteed strength, but, as in the case of comparative costs of commercial and home-made lime-sulphur, the commercial is a great deal more expensive. Even though this is an important economic fact, the average orchardist would do better by buying the prepared oil sprays than by attempting to make anything but the simplest oil emulsions on the ranch.

There are many factors hard to overcome in the home manufacture of oil emulsions. The ideal emulsion is undoubtedly one made from miscible oils, which are those made by mixing mineral oils of paraffin base with vegetable and some creosote oils, and are not oils in their natural crude state. In simple words, a miscible oil, or one which mixes uniformly in water and is therefore capable of dilution for spraying, is an oil for which a proper soap has been found for the purpose of emulsifying. Thus in British Columbia we can buy many different types, such as crude oil, topped crude oil, fuel and stove distillates, and kerosene, all of which need a different soap for proper emulsion.

Not only does each type of oil require different soaps, but the penetrating power varies greatly with the gravity strength of the oil, and therefore the amount of dilution necessary to prevent injury is hard to ascertain. Oil companies sell their products under certain tests indicated in degrees Baume. It must be noted that the higher the figure in degrees Baume, the lighter the oil. In measuring densities of liquids lighter than water, the Baume scale begins at 10, which is the density of water. For measuring liquids heavier than water, the density on the Baume scale is placed at zero. Consequently the Baume scale is an almost obsolete measure of density, and in order to get the exact density of any liquid, conversion tables are necessary if the Beaume hydrometer is used.

The different prepared emulsions put on the market are carefully made from oils of a definite gravity test in an emulsion carrying about the following proportions: 85 per cent. hydrocarbon oils (paraffin series), 4 per cent. phenols (mostly cresylic acid), and about 11 per cent. inert matter. These have proven to be very satisfactory in commercial use when diluted so that 20 and 16 gallons respectively make 200 gallons of spray, and seem to carry nearly correct physical characteristics to give proper penetration without injury to trees.

Both the crude and distillate oil emulsions contain the same ingredients as given above, the advantage of the distillate over the crude being mainly that for spring and summer use it dilutes more uniformly and can be sprayed on the trees with less danger of injury. The crude-oil emulsion is used chiefly as a dormant insecticide.

Now, in home manufacture, the orchardist can but follow certain cautious principles gleaned from the experience of those engaged in scientific manufacture, and so make the best of oils obtainable, such as kerosene, gas, lubricating, stove, and slop distillates, and crude oil. He will have to emulsify them by using ordinary whale-oil soap (olin acid) with common lye. Emulsions made from crude oil or slop distillates, in the writer's opinion, should be used only as dormant insecticide sprays. As such they are effective and fairly safe. Tested by Baume scale, they will run from 13 to 19 degrees, with a specific gravity of 0.9800 in crude oil to 0.9400 in the slop distillates. This, you will note, is not as good an oil as the commercial concerns put into their crude-oil emulsion, which is generally a natural crude oil, testing 23° Baume, and is not commonly obtainable in British Columbia. However, for purely winter use, a safe insecticide can be made from a 19-degree slop distillate by the following formula used successfully by Oregon State Experimental Station: Fish-oil or whale-oil soap, 5 lb.; lye, 1 lb.; crude oil, slop distillate, 6 gallons; water, 43 gallons; making a total of 50 gallons.

Close attention must be given to mixing. Water *never* should be added after the oil has been poured into the solution of soap and lye. Dissolve the soap in 8 to 10 gallons of boiling water and place in barrel or tank; add the rest of the water to make up 43 gallons. If using tank, start the agitator, add the lye, follow up with the oil, pouring the same slowly into the thoroughly stirred suds.

(Note.—This will not make a stock solution, which can be safely kept any time, so should be sprayed as made.)

Whenever a better oil or distillate is obtainable, I would not advise the use of the above crude oil, since often it contains so much foreign matter that it forms a poor emulsion and makes spraying more dangerous through non-uniformity of mixture. This crude emulsion should never be used except where it is possible to apply at least 200 lb. pressure with a good angle nozzle which throws a finely divided spray.

The chief advantage of the crude-oil emulsion is its apparent cheapness, but in reality the cost is about the same where a good stove distillate testing 29° Baume can be procured. Laid down in the Okanagan last year the costs were about as follows (to make up 200-gallon tank), F.O.B. Vernon: Slop distillate (crude oil), 19° Baume, 10 to 12 cents per gallon; fuel distillate (little better than stove), 35° Baume, 18 cents per gallon.

To make up 200-gallon tank requires: Crude oil, 24 gallons at 10 cents, $2.40; fuel distillate, 16 gallons at 18 cents, $2.88; kerosene, 12 gallons at 28 cents, $3.36; lime-sulphur, 20 gallons at 13 cents, $2.60.

(Note.—Kerosene used by ordinary formula would take approximately 12 gallons to make 200 of the dilute emulsion. Lime-sulphur for comparison only.)

In making the stove-distillate emulsions the same ingredients should be used, but both the amount of soap and the quantity of oil should be reduced. The following is satisfactory: Whale-oil, 4 lb.; lye, 1 lb.; distillate, 4 gallons; water, 45 gallons; total, 50 gallons. In the use of distillate, as in crude oil, do not add water after the oil has been poured in. In other respects follow the same rules.

There are several other interesting new sprays, such as the soda nitrate, used to stimulate growth and early development of fruit-buds, and powdered arsenates of lead to replace the ordinary paste. As a fungicide, atomic sulphur has proven very effective, and combines readily with both oil emulsions, soap solutions, Black Leaf 40, and arsenates of lead, therefore being more adapted to combination spraying than its predecessor, Bordeaux mixture.

Any of the above-mentioned spray materials could be studied separately, but time will not allow it here. Neither have I taken up the insects and diseases combated by the sprays mentioned, since they are known through study of more common sprays, which are all applied at the time most suited to kill or control the insect or disease in question.

THE TARNISHED PLANT-BUG (LYGUS PRATENSIS LINN.).

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In consideration of the comparative prevalence of fire-blight (*Bacillus amylovorous*) in various parts of the Okanagan District, I have thought it advisable to draw your attention to the fact that the disease is capable of being spread by means of several and sundry insects of the orchard. Mr. L. L. Palmer, Horticulturist, Coldstream Estate, at the meeting of this Society last July in Vernon, made mention of the fact that the several species of aphides are chief among the economic pests of the Okanagan. This is an important point, for it is clearly proven that aphides, and in particular the green apple-aphis (*A. pomi*), are capable of spreading the disease.

Naturally, then, the disease of fire-blight varies in extent in accordance with the prevalence of aphides, and the obvious control of the blight is accomplished, in