

The general use of kerosene barrels in spraying has established the spraying barrel at 50 gal. This is what we may now regard as the liquid spray unit. Recently I made examination of several bulletins and found that the arsenical units for 50 gal. varied from one and 2-5 oz. to 7 2-10 oz. In other words there were five different quantities mentioned for the same purpose. Surely so wide a variation shows error somewhere. One professor in discussing lime-sulphur wash as a summer spray suggests that the stock solution be measured by Beaume's scale—28 degrees being a strength to require a dilution of 18 to 1. Here again we should meet with difficulties. It is not easy for common fruit growers to obtain hydrometers with Beaume's scale and it is not desirable that it should be used. The specific gravity can be better determined by weighing. Since, however, authorities differ in the amount of lime desirable to use in dissolving the sulphur it is evident the specific gravity of the resulting solution wash must vary with the amount of lime used. As the dominant force is sulphur and not lime it is evident that here too we need a definite sulphur unit. With the amount varying from 3-4 lb. to 1 1-2 lbs. of lime for one of sulphur there can be little uniformity of results. Unless shown to be better otherwise equal weights of lime and sulphur and so made as to have a specific gravity of 1.25 would give a definite sulphur unit. Whoever establishes definite spray units will confer a benefit on horticulture.

HOW TO MAKE BORDEAUX MIXTURE.

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You undoubtedly thought it queer when you glanced over your program and again saw there the subject of Bordeaux mixture. This subject, however, is like numerous other horticultural subjects, it never grows old and we never know all about it. Formulae for Bordeaux Mixture and descriptions for making it have been published so often that the subject ought to be well understood; yet many inquiries are made regarding it every year and very much trouble results from an improperly made mixture.

In making Bordeaux Mixture the first thing to take into con-

sideration is the materials. It is made of Copper Sulphate commonly called blue-stone or blue vitrol, stone lime and water. To make a satisfactory mixture the best materials it is possible to obtain should be used. Copper Sulphate often contains small percentages of iron sulphate but rarely in excess, or in sufficient quantities to interfere with the efficiency of the Copper Sulphate. If first class sulphate is bought very little difficulty will be experienced as far as it is concerned. The lime, however, often offers serious difficulties. Lime contains more or less impurities. If the percentage of calcium oxide is high the lime is technically known as a "fat" lime; this on addition of water, slacks quickly and completely and will perform its office in the compounding of Bordeaux Mixture in a satisfactory manner. If on the other hand the lime contains a large percentage of magnesia, clay or sand, it is known as "poor" lime. Such limes slack slowly and incompletely and do not make satisfactory Bordeaux.

Air slaked lime should never be used as mixtures made with such lime are not only extremely injurious to foliage but are less adhesive and do not remain in suspension as long as mixtures made with fresh stone lime. The water used in preparing the mixture has very little to do with the efficiency of the Bordeaux. In spraying large commercial orchards large quantities of water are necessary and it is essential that the supply be ample and conveniently located.

For the commercial orchard, wholesale quantities will be needed and the local drug store should not always be depended upon to supply the demand. Buy your materials from some reliable dealer and in quantities large enough to take advantage of wholesale prices.

The cost of materials will depend largely on the amounts bought, and the grade.

The amounts needed will depend upon the size of the orchard, age of trees, number of times the trees are to be sprayed, and the season at which they are sprayed. On the average, one barrel (50 gal.) will cover twenty, 20 yr. old trees. At the present prices—8c per lb. for Copper Sulphate and 1c per lb. for lime, 50 gal. Bordeaux Mixture will cost about 36c or 1.8 cents per tree. A 10 acre orchard with 104 trees per acre will require 50 to 60 bbls. or from 200 to 250 lbs. Copper Sulphate and the same amount of lime for one spraying. These figures cannot be made absolute because they are based on estimates

and the amount of spray used will vary with the leaf development of the trees.

After the materials are at hand the next thing to consider is the proper utensils which are to be used in compounding the mixture. If only a small amount of spray material is to be made we will need three 50 gal. barrels, 2 large wooden pails, such as candy pails, and a few gunny bags. If the mixture is to be made on a large scale, as for a commercial orchard, larger and more pretentious utensils will be needed. The tanks should be elevated so that the materials will not have to be lifted but may flow by means of gravity. In making Bordeaux Mixture use only wooden or earthen utensils as the Copper Sulphate corrodes metals.

There are numerous formulae for the manufacture of Bordeaux Mixture and they will vary as the use to which the mixture is to be put. The formula generally used and the one we will use as an example is the 4-4-50 formula. It must be remembered, however, that the ingredients of Bordeaux Mixture unite in certain definite proportions and that the proportions are designated by the formulae which should always be followed closely.

In making small amounts of Bordeaux Mixture the quantities of materials called for in the formula are weighed out and the Copper Sulphate is dissolved in water. The lime is slaked and the two then diluted each to 25 gals. They are then poured simultaneously through a gunny bag into a barrel. The resulting mixture is Bordeaux.

If any quantity of mixture is to be made, however, stock solutions are resorted to. Certain definite amounts of materials are weighed out and made up to certain volumes. As 50 lbs. Copper Sulphate made up to 50 gal. water and 50 gal. lime also made up to 50 gal. of water. Then 1 gal. of the stock solution contains 1 lb. of the material. In dissolving, the 50 lbs. are tied in a gunny bag and suspended at the top of a barrel of water. As the Copper Sulphate is heavier than water it sinks to the bottom as it dissolves and the water around the bag is thus always in an unsaturated state. The lime is slaked in a slaking box as in the shallow box it is easier to handle than when in a barrel. The lime should have enough water on it to keep it from burning but not enough to "drown" it. If lime burns or "drowns" all of it does not slake and the stock

solution will be lumpy. In using these stock solutions for the 4-4-50 formula 4 gals. of each are taken and diluted to about 10 or 15 gal. This dilution is done because it has been found that the materials when mixed in a concentrated form make a poor mixture and the resulting Bordeaux does not remain in suspension well. The diluted Copper Sulphate and lime are then poured into a third vessel through a gunny bag sieve and the result is Bordeaux.

Another way of making up stock solutions is by using a saturated solution of copper sulphate. This solution is obtained by using enough of the sulphate in the gunny bag which is suspended in the stock barrel so that the solution will become saturated. It has been found that 1 gal. of a saturated solution of at the average temperature contains 3 lbs. of sulphate. The lime stock solution is made up by slaking no definite amount of lime and making up to no definite amount in the stock barrel. The mixture is made by taking 1 1-3 gal. of the sulphate solution diluting it and mixing it with an amount of diluted stock lime. The resulting mixture is then tested with potassium ferro-cyanide or as it is commonly called yellow prussiate of potash. When a few drops of the potassium ferro-cyanide is dropped on the mixture if an excess of copper is present a dark brown precipitate will be formed. More lime should be added if this brown precipitate results. When enough lime has been added to neutralize the effects of the copper no brown precipitate will result upon adding potassium ferro-cyanide. The advantages of this method of procedure are that it is less trouble to make the stock solutions and that they will keep indefinitely with no danger of their changing strength.

In conclusion I will mention a few precautions to be exercised in the preparation of Bordeaux Mixture.

- 1st. Use good materials.
- 2nd. Do not use air-slaked lime.
- 3rd. Do not mix in a concentrated form.
- 4th. Do not use metal utensils.
- 5th. Always test mixture for free copper.
- 6th. Always make according to some well established formula.

If these precautions are observed satisfactory Bordeaux is sure to be obtained.