

### Lime-Sulphur--Its Use as a Fungicide and an Insecticide

By Prof. P. J. O'Gara, Pathologist. Written especially for the Medford Mail Tribune.  
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INSTALLMENT I.

Introduction.

This bulletin is written to meet the demands of two classes of fruit growers; first, those who are more or less acquainted with the use of lime-sulphur; second, those who have had no orchard practice and may be classed as beginners. Among those belonging to the first class I may say much will be found in the bulletin which will seem to them as elementary, but, on the whole, enough of the history, chemistry and the new uses of lime-sulphur will be given to make the matter not only interesting, but instructive. Enough of technical matter will be introduced so as to give those who have had college work opportunity to easily find food for thought as well as study. For the growers who have had no technical training, I may say that the bulletin will contain enough of the elements and will lead up gradually to the technical so that they may be able to comprehend the text without any great difficulty. It will be so arranged that such matter as they may not desire to use for practical purposes may be left out so far as they are concerned.

The writer has realized for a long time that the fruit growers of the valley have no up-to-date bulletins giving instruction as to the use of lime-sulphur, or, for that matter, fungicides in general. In the numerous lectures which have been given in the past, the writer has also realized that on the whole the growers of the Rogue River valley are capable of comprehending technical matter, either from the lecture platform or from texts and bulletins. In no other district with which the writer is acquainted does such a condition obtain. Of course, the reason is self-evident, since a large percentage of the growers are men who have had technical training and have left other walks of life where education seemed far more necessary to them than is usual with the man who tills the soil.

The growers of the Rogue River valley as a whole are therefore fully equipped to carry on their new occupation of fruit growing with much greater intelligence than those who have not had the training necessary to the understanding of the technical methods now employed on all successful farms. The novice in fruit growing in the Rogue River valley usually becomes a well trained horticulturist within a very short time.

History of the Use of Sulphur as an Insecticide.

The chemical element sulphur has been known for a great many years, even from very ancient times, having been used as a medicine by the Greeks and Romans. The alchemists considered it an essential portion of all combustible substances and during this period, while credit was given to the phlogiston theory, it was looked upon as a compound of sulphuric acid with phlogiston. Sulphur, of course, is found uncombined and therefore any method for preparing the element from its compounds is of no essential value in the laboratory. Sulphur, while occurring in the free state in nature, is also found in many of the rocks, and pyrites of iron is often used to secure sulphur. This is done by heating the rock. Rocks containing sulphur, as well as free sulphur, exist in the neighborhood of volcanoes and some of the greatest deposits are found in southern Italy and Sicily. Free sulphur is also found in Louisiana, California and other parts of the United States.

The sulphur which we find upon the market is found in three forms, namely: the flowers of sulphur, flour of sulphur and the stick sulphur or brimstone. The flowers of sulphur consists of sulphur which has been sublimed and is made directly from the crude sulphur or brimstone by heating, causing the sulphur to pass into a cooling chamber where it deposits upon the walls in a very finely divided state. It is this grade of sulphur that is commonly used to control grape mildew. The flour of sulphur is nothing more or less than the ground or powdered brimstone. Either the flowers of sulphur or flour of sulphur may be used in the preparation of lime-sulphur.

The use of sulphur as an insecticide dates from the year 1854 and appears to have been first proposed by John Rutherford in New South Wales, Australia. The sulphur was combined with tobacco and was known as the tobacco-and-sulphur dip, the formula consisting of one pound of tobacco leaves, one pound of flowers of sulphur, and five imperial gallons of water. This formula was used as a dip for the control of sheep scab, which for a long time had been one of the great menaces to sheep raising throughout the world. Later lime and sulphur were combined in various ways and they were termed the lime and sulphur dips. The various lime and sulphur dips were known as the Victorian lime-

and-sulphur dip, first proposed by Mr. Stowe and adopted by the Australian sanitary authorities as official; this contained 20 5-6 pounds flowers of sulphur, 10 5-12 pounds fresh slaked lime, and 100 gallons of water; the South African official lime-and-sulphur dip which contained 15 pounds of flowers of sulphur, 15 pounds unslaked lime, and 100 gallons of water.

Following these two formulae came a large number of others which were used throughout Australia, Africa and the United States. The states of California and Oregon were probably among the first to make use of the lime-sulphur as a sheep dip, following the example of the Australian sheep raisers.

Lime-sulphur as an insecticide was first used for treating sheep scab and no thought was given as to its possible use for keeping insects injuring plants under control. Its use in the orchards of this country came about as an accidental discovery. It may be stated that some of the first formulae of lime-sulphur also contained salt, and we find that it was this type of mixture that was used first in California as early as 1886.

The discovery was made by F. Duxey of Fresno, Cal. He tested the sheep dip obtained from a neighbor who had been treating a herd of sheep for scab, thinking that if it killed the lice or scab on sheep, it ought to kill insects affecting trees. This happy discovery soon became known quite generally, but the use of lime-sulphur did not become general for several years afterwards, perhaps for at least ten years or more. The first attempts at using lime-sulphur in the eastern states were far from successful, largely because little was known as to the best strength to use and the best time to apply it. In fact, some of the first tests made by prominent entomologists were reported as failures and the recommendations were made that miscible oils, kerosene emulsions and other sprays were more effective as a scaleicide.

The first use to which lime-sulphur was put in the orchards of this country was that of destroying scale insects, principally of the San Jose scale. It has only been within comparatively recent years that its value as a fungicide has become such as to compare favorably with what has always been thought to be the most important fungicide, namely, the Bordeaux mixture. As a matter of fact, within certain limits it may be said that lime-sulphur has largely taken the place of Bordeaux, both as a dormant spray and a summer spray. While the present lime-sulphur wash is recognized as one of the most important spray materials, both as a contact insecticide and fungicide, it is also recognized as one of the most convenient and disagreeable. In fact, its disagreeable nature is the only thing that the orchardists of the present day have against it. Some one has said that it is the dirtiest, messiest and nastiest spray mixture ever invented and perhaps for that reason it is one of the most effective. The commercial lime-sulphur compounds have now so largely taken the place of the home made lime-sulphur that the trouble and inconvenience of making it has been removed, but the inconvenience of applying it still remains. It is possible that in the future we will find a mixture or compound which will be just as effective as a fungicide and insecticide, and not have the disagreeable nature of lime-sulphur, but, until such a spray is found, we shall have to content ourselves with what we already have, namely, one of the best, if not the best all round fungicide and insecticide yet discovered. With the various combinations of lime, sulphur and other compounds, which as yet have not been fully developed, we may expect in the future many things of great importance to the fruit grower and farmer in general.

It was reported when the \$200,000,000 merger was announced that the Key Route would be extended to that city.

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### Melba, the Queen of Song, To Make Last Tour.



Mme. Nellie Melba, once the peer of all songsters, after an absence off the concert stage of two years is going to make her farewell tour of the United States. Mme. Melba has enough money to retire now, but answering the request of her many friends has promised one more tour. There have been many reports that age has marred the wonderful Melba voice. Patti's farewell tour, it will be recalled, was one of sorrow, for her musical powers had bowed before age.

#### SMITH MERGER GETS \$1,000,000 RAILWAY

SAN FRANCISCO, Feb. 13.—The East Shore and Suburban Railway company, an electric line that cost \$1,000,000 and furnishes the local passenger connection between Richmond in Contra Costa county and Oakland and other cities in Alameda county, was acquired yesterday by the United Properties company, recently formed, with F. M. Smith as one of the leading factors.

The transfer of the property has not actually been made, but an agreement was reached whereby the United Properties company can take over the Richmond line at any time. This, it is expected, will be within a few days.

The change in ownership of the East Shore and Suburban means extension of the Key Route into Richmond at an early date.

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#### POPE REPRESENTED AT RYAN OBSEQUIES

PHILADELPHIA, Pa., Feb. 13.—With Monsignor Falconio, papal delegate to the United States, present as special representative of the pope, the funeral of the late Archbishop Patrick John Ryan, will be held here on Thursday. Cardinal Gibbons, Archbishop Glennon and Farley and a dozen bishops will attend.

The pontifical high mass will be celebrated by Bishop Prendergast of Philadelphia. Cardinal Gibbons will conduct the services for the dead. Archbishop Glennon will preach.

#### FRISCO HOLIDAYS IN HONOR OF EMANCIPATOR

SAN FRANCISCO, Cal., Feb. 13.—The postoffice and all banks were closed here today in honor of Lincoln's birthday and appropriate exercises were held in the public schools.

end of the city to the bay shore.

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