TESTING SPRAY MIXTURES FOR SAN JOSE SCALE

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The Bulletins published by the Station will be sent free to any farmer applying for them.

* In Second Judicial Department.
Previous bulletins of the Station have indicated the practicability of fall spraying with sulphur washes for San José scale; and the experiments of 1904-5 confirm these indications. The effect of fall spraying upon the scale, in the five orchards under test, was excellent, the percentage of live scales remaining being reduced to a very small figure. Only in exceptional instances, where the trees were seriously weakened by scale attacks or from other causes, was there any lasting injury to the tree. In some cases the leaf-buds and fruit buds did not develop as well in the spring on the sprayed trees as on the checks; but before the season closed all such retardation or injury would be overcome and the sprayed trees, through greater vigor from the lessened numbers of scale or from the absence of foliage diseases, would be much more luxuriant and thrifty. All five of the sulphur sprays were tested,—boiled and self-boiled lime-sulphur-salt mixtures, boiled and self-boiled lime-sulphur caustic soda mixtures and the boiled lime-sulphur wash.

The mixtures boiled by fire or steam give more uniform results and are recommended for use wherever it is possible to prepare them without too much labor. The self-boiled mixtures are sometimes convenient, because more easily made, though slightly

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*This is a brief review of Bulletin No. 273 of this Station, on Spraying for San José Scale, by H. E. Hodgkiss, F. A. Sirrine and E. L. Baker. Any one specially interested in the detailed account of the investigations will be furnished, on application, with a copy of the complete bulletin. The names of those who so request will be placed on the Station mailing list to receive future bulletins, popular or complete as desired. Bulletins are issued at irregular intervals, as investigations are completed, not monthly.
less reliable unless carefully prepared and thoroughly applied.
No advantage has been shown from the use of salt in the mixtures.
In general it may be said that the fall applications of sulphur washes were not, on the whole,
detrimental to the trees; and they kept the scale
well under control. It is not safe to conclude
that spraying in the fall is unattended with danger,
as the resistance of the tree may be weak because of previous poor condition, or because it is of a naturally tender variety.
"Whether or not it is advisable to spray in the fall seems
to be a matter of expediency. A profitable orchard infested with
scale will soon cease to be remunerative if neglected; and spraying, if it cannot be done in the spring, should be done in the fall.
The losses likely to follow will be more than compensated by the increased vigor of the trees and value of the fruit produced."

One of the newer insecticide combinations for
treatment for San José scale consists of a mixture
of kerosene in water produced by the use of lime
in very fine particles. This combination, with
several modifications to adapt it for use against
biting insects and against diseases, has been strongly recommended by a few experiment stations and has been used on a large scale with a more or less satisfactory degree of success by some orchardists. If as reliable as the lime-sulphur combinations as a scale destroyer and as safe to use, it possesses advantages over these sulphur washes in being more easy to prepare because no boiling is required.

But tests made at this Station during 1905 indicate that the lower strengths of the "K-L" mixtures are not efficient against scale and that the stronger mixtures—those containing larger percentages of kerosene—are liable to injure the trees because certain portions of the mixtures contain much more of the kerosene than other portions. In other words, the mixture is not uniform or not permanent.

In the original preparation of these K-L mixtures at the Delaware Station a commercial form of lime, known as Limoid, was used, but later other forms of water-slaked or finely ground lime were found to give about the same results.
In making the mixtures, the kerosene and lime are first united to form a "sloppy" mass, the required amount of water added and the whole vigorously stirred to throw the "sloppy" mass into suspension. The mixture is then pumped back into itself with the spray pump for from three to five minutes to secure thorough emulsification of the ingredients. In the tests at Geneva and other localities in this State during the fall of 1904 and spring of 1905, grade and superfine Limoid, ordinary hydrated lime, and grade and superfine Marblehead limes were used in making the mixtures; and the percentage of oil was raised successively from 10 per ct. to 40 per ct. by 2½ per ct. and 5 per ct. increases.

To make the 10 per ct. strength, 5 gals. of kerosene and 20 lbs. of lime were used, with water to make 50 gals. of mixture; while to secure a 40 per ct. mixture, 20 gals. of kerosene and 80 lbs. of lime were required for 50 gals.

The tests were made in five orchards, on cherries, plums, peaches and apples; and applications were made in fall, winter and summer. Some difficulty was met with in applying the mixtures having the higher percentages of oil, because of the small quantity of water used in proportion to the amount of lime employed. In the fall treatment, even with small percentages of oil, the first few trees of a series showed marked signs of injury from the spray, while trees receiving the last portions of the mixtures showed no injury. In one plum orchard where trees sprayed with sulphur washes served as checks, the comparison was noticeably against the "K-L" mixtures. Four Burbank plum trees sprayed with 40 per ct. oil combined with a hydrated lime bore only one-fifth of a crop of fruit, while the adjoining sulphur-sprayed trees produced full yields.

The effect of the 10 per ct. and 20 per ct. mixtures on scale was not satisfactory, as young scales on trees treated with these mixtures were as numerous in the following autumn as on check trees, though the treated trees were smoother because of the removal of the old scale-incrustations through weathering off of the wash. Even where the higher percentages of oil were used the
trees showed considerable numbers of young scales, though there was some improvement over the checks.

The spring treatments resulted in a similar lack of uniformity of effect, some trees being seriously injured or even killed by applications that did not effect other trees in the same series to any noticeable extent; while even the 40 per ct. strength was not wholly satisfactory in killing scales.

The same conditions marked the summer treatments also. Careful examination of the various mixtures showed the lack of uniformity to be due to imperfect emulsification of the ingredients. That is, the mixtures, though made by the same formula, from similar ingredients and handled the same way, would show great variation in the amounts of true emulsion, of water and of precipitate, as shown by layers into which the material soon separated on standing. These variations ran from 0 to 500 parts of emulsion to each 1000 of the mixture made with superfine limoid, from 100 to 1000 parts of water and from 175 to 450 parts of precipitate. Two of the 15 samples showed some free oil. The mixture made from grade Marblehead lime showed from 0 to 625 parts of emulsion, from 115 to 962 parts of water and from 12 to 885 parts of precipitate. Every sample contained some free oil, one of them showing as high as 125 parts per thousand. Similar variations occurred with the grade Limoid and the superfine Marblehead lime, showing plainly that, as ordinarily made, these "K-L" emulsions, so called, may give, at the nozzle, pure oil, pure water, whitewash or an emulsion.

Chemical determinations were made, by Mr. Baker, of the amounts of oil in the upper and lower layers of two samples of the 10 per ct. mixture made from each of the four grades of lime. The percentages varied from 2½ per ct. to 3½ per ct. for the lower layers and from 49 per ct. to 62½ per ct. for the upper layers. Thus by far the greater part of the kerosene is found in the upper layer, while only a small portion of the oil is carried to the lower layer by the lime as it settles down.

As kerosene, when applied pure, may cause severe injury, the above figures explain why these "K-L" mixtures have injured some trees while others were unaffected. The figures also
explain why enough scales escape to stock the trees with young, since a 3 per ct. or 5 per ct. strength, such as would be given by the lower layers, would have practically no effect upon the scales unless they were buried or suffocated by the whitewash.

It is possible that some means will soon be

**Conclusion.** devised for making a perfect emulsion from kerosene, lime and water; and the mixture would be a most valuable one. The tests so far made, however, would not justify abandonment of the well-known standard sprays until a safe and efficient combination of lime and oil can be made. Some new insecticides, the soluble oils, which

**Scalecide.** have recently come into prominent notice, have been tested rather extensively by the Station as opportunity has presented. The results with Scalecide indicate the probable value of these miscible oils as orchard sprays. This has been tested as a spring and summer wash and appears promising as a dormant-season treatment.

Spring applications caused a retardation of buds, but, except with the 15 per ct. strength of the oil, the retarded buds opened later, so that there was little difference between sprayed and unsprayed trees. The retardation from use of the 15 per ct. oil was very severe.

Summer spraying with the Scalecide caused severe injury in every case. In these tests, 3 per ct. Scalecide had no appreciable effect on the scales, 5 per ct. and 10 per ct. applications seemed to destroy from 80 per ct. to 95 per ct. of the insects, and 15 per ct. seemed to give entire control of the scale.

"While the Scalecide at first gave promising results it seems best, in view of the variable results upon scales and trees in all instances in the later work, to continue these tests, to determine its merits as an orchard spray."
NOTICE TO APPLE GROWERS.

The Station is about to publish a bulletin treating of the distribution of varieties of apples in the State. This bulletin is based upon information collected in preparing the two volumes of "The Apples of New York." It will include the descriptions, in concise, tabular form, of the varieties given in that work; and will also indicate the adaptability of each variety to each of the ten districts into which the State has been divided.

The bulletin will be too valuable to send to our entire mailing list, since many on that list are not interested in apple growing. We wish to place it in the hands of all who can use it to advantage and will send it, without request, to all who are listed as members of the Western New York Horticultural Society or of the New York State Fruit Growers' Association and to the nurserymen of the State.

We will also send it to others who notify us, by postal card, that they desire it. Please specify "Apple Catalogue."
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