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WEST VIRGINIA UNIVERSITY
AGRICULTURAL EXPERIMENT STATION
MORGANTOWN, W. VA.

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A Test of Different Sprays

FOR THE

San Jose Scale

Entomological Department

[The Bulletins and Reports of this Station will be mailed free to any citizen of West Virginia upon written application. Address Director of Agricultural Experiment Station, Morgantown, W. Va.]

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A Test of Different Sprays for the San Jose Scale

W. E. RUMSEY AND FRED E. BROOKS.

The rapid spread of the San Jose scale in the eastern states has fully demonstrated the necessity for a continued and greatly increased use of contact insecticides in our fruit orchards. As a natural consequence of the wide interest taken by experiment stations, orchard owners, and others, in devising ways and means for suppressing this insect, many private companies have taken up the manufacture of concentrated materials of various kinds, to be used as sprays upon infested trees. The processes of manufacture of these sprays are secrets, protected by patents, and are sold under significant trade names. At present they are being advertised widely by the agricultural press and in other ways, and the fruit grower in looking about for spraying material is likely to have his attention directed to them. Crude petroleum, and the lime-sulphur sprays have been used extensively against the scale for many years in certain parts of the country, but the proprietary sprays are of comparatively recent appearance and introduce a new element into the warfare against this most serious orchard enemy. Tests of these concentrated mixtures have been made in several states but the results have not always been uniformly good. The formulæ for preparing some of the mixtures are evidently being improved and new brands are constantly being introduced. With such an abundance of material on the market, the selection of the most effective and economical spray becomes quite a problem to the orchardist who has to contend with the San Jose scale. For the purpose of obtaining information

along this line, which would be of value to the fruit growers, the Experiment Station made a test of several of these sprays in the winter of 1905-6.

THE SPRAY MATERIALS USED.

In making the test the following brands of concentrated scale destroyers were used at a strength of one gallon to twenty gallon of water according to the directions of the manufacturers.

Target Brand Scale Destroyer, manufactured by the American Horticultural Distributing Company, Martinsburg, West Virginia; Scalecide, manufactured by B. G. Pratt Company, New York, N. Y.; Kil-o-Scale, sold by Griffith & Turner, Baltimore, Maryland; and Horicum, manufactured by Hammond's Paint and Slug Shot Works, Fish-kill-on-Hudson, New York. Horicum is a lime-sulphur preparation and the others are oils so treated as to make them readily soluble in any quantity of water. They are put up in large or small packages to suit the convenience of the user. The prices of the materials named are as follows: Target Brand Scale Destroyer, 50 cents per gallon by the barrel; per single gallon, \$1.00. Scalecide, 50 cents per gallon by the barrel; per single gallon, \$1.00. Kil-o-Scale, \$1.00 per gallon by the barrel; per single gallon, \$1.50. Horicum, 50 cents per gallon by the barrel; per single gallon, \$1.00.

ORCHARD USED IN MAKING THE TEST.

The trees, selected for the experiment, were in a young apple orchard near Tablers, West Virginia, and belonged to Hon. Alexander Clohan. On December 13, 1905, fifty trees were chosen, all more or less infested with the San Jose scale. These trees were divided into blocks of ten each and, after a careful examination, were marked, the degree of infestation being designated by the words slight, medium, bad, and very bad, as shown by the following table:

CONDITION OF TREES BEFORE SPRAYING.

The following table represents the condition of the trees as to scale infestation before the application of the sprays:

Target Brand Scale Destroyer

No. of tree.	Scale Infestation.
1	Slight.
2	Slight.
3	Slight.
4	Slight.
5	Slight.
6	Slight.
7	Slight.
8	Bad.
9	Slight.
10	Medium.

Kil-o-Scale.

No. of tree.	Scale Infestation.
1	Very bad.
2	Medium.
3	Slight.
4	Medium.
5	Slight.
6	Slight.
7	Bad.
8	Slight.
9	Very bad.
10	Medium.

Scalecide.

No. of tree.	Scale Infestation.
1	Slight.
2	Slight.
3	Slight.
4	Bad.
5	Very bad.
6	Bad.
7	Slight.
8	Medium.
9	Bad.
10	Slight.

Horicum.

No. of tree.	Scale Infestation.
1	Slight.
2	Slight.
3	Medium.
4	Slight.
5	Slight.
6	Slight.
7	Bad.
8	Very bad.
9	Slight.
10	Slight.

SPRAYING.

The application of the different sprays was made on December 14th. Four of the blocks of trees were each sprayed with one of the insecticides, the remaining block being reserved as a check. The spraying was done as thoroughly as possible, the greatest care being taken to drench every part of the trees. Notwithstanding this precaution it is possible to miss an occasional scale.

FIRST EXAMINATION.

On February 10th, two months after the spraying was done, and examination was made of two trees of each lot. In each case three hundred scales were removed and the condition of the insects carefully noted. The following table shows the number of live scale found in each three hundred:

Material.	Live Scale in 300.
Target Brand Scale Destroyer.....	32.
Kil-o-Scale	34
Scalecide	32
Horicum	207
Check Trees	231

At the time of the first examination the merits of the three oil sprays seemed practically the same while the lime-sulphur preparation was greatly inferior and almost without result.

SECOND EXAMINATION.

A more thorough examination was made on April 4, 1906. At this time eight trees of each lot were inspected and two hundred scale insects examined on each tree, the observations being made on trunk, branches and twigs. The following table gives the result of the second examination:

Material.	Live Scale in 1600.
Target Brand Scale Destroyer.....	2
Kil-o-Scale	2
Scalecide	37
Horicum	538
Check Trees	792

THIRD EXAMINATION.

The third, and last, examination was made on May 31, 1906. Every tree used in the experiment was examined on this date and careful counts made of two thousand scale insects treated with each spray. The results are as follows:

Material.	Live Scale in 2000.
Target Brand Scale Destroyer.....	0
Kil-o-Scale	5
Scalecide	53
Horicum	351
Check Trees	532

RESULTS.

It will be seen that in this experiment Target Brand Scale Destroyer gave, apparently, the best, and Horicum the poorest results. However, there was practically no difference between Target Brand Scale Destroyer and Kil-o-Scale. It should also be noted that there was considerable difference in the amount of San Jose scale on the blocks of trees used in the experiment, as can be seen by referring to the table on another page. On this account some variation would naturally be expected to occur in the results. Scalecide was least effective of the soluble oils and in using showed the additional disadvantage of not spreading over the surface of the tree as readily as was the case with Kil-o-Scale and Target Brand Scale Destroyer. For this reason it was necessary to use a greater quantity of the liquid in order to cover thoroughly a given surface.

In Special Bulletin No. 3, of this Station, entitled "San Jose Scale in West Virginia," a brief account is given of this insect and a lime-sulphur spray recommended as a remedy. The indifferent results obtained in this test from the use of Horicum, must not be regarded as applying to the lime-sulphur spray when prepared as directed in that bulletin, or in any similar manner.

CONCLUSION.

These concentrated soluble oil preparations are the most convenient to use of any material yet devised for the destruction of scale insects. They mix readily with cold water and are not injurious to spray pumps, harness, horses nor the face and hands of the user. None of them, however, seem to possess the fungicidal properties of the lime and sulphur sprays, but as scale killers some, at least, are entirely satisfactory and greatly simplify the matter of combating scale insects on fruit trees. The ease with which these materials may be prepared for use in small orchards and fruit gardens, as well as larger plantations, offer good reason for the hope that in the future more interest will be

taken in the matter of spraying by those who own scale infested trees.

SUMMARY.

1. In this section about three-fourths of the San Jose scale normally die during the winter. This fact must be taken into account in considering the effectiveness of any treatment for destroying this insect.

2. Of the four spray materials used in the experiment, Target Brand Scale Destroyer and Kil-o-Scale gave the best results, being practically identical.

3. Of the three soluble oils used, Scalecide was the least satisfactory.

4. Horicum is a compound of "lime, sulphur, etc.," but does not contain sufficient strength to kill the insects when diluted with twenty parts of water. The manufacturers plainly state that one application is not sufficient to kill all the insects.

5. At the strength of one part to twenty parts of water, all these materials must be used while the trees are dormant. For summer spraying a greater quantity of water should be added.

6. These materials offer to the public a method, both convenient and effective, for destroying the San Jose scale and similar insects. They are especially convenient for use in towns and cities where but few trees are to be treated.

7. The action of all these sprays upon the San Jose scale is slow. Their effectiveness can not be accurately determined for at least several weeks after the application is made.