SAVING OLD ORCHARDS FROM SCALE

SUMMARIZED BY
F. H. HALL
FROM BULLETIN BY
P. J. PARROTT, H. E. HODGKISS AND W. J. SCHOENE

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Control of the pest in old apple orchards is, without question, the most important San José scale problem in New York State today. In plantations of other kinds, young apple, peach, plum, pear, cherry and even currant, progressive fruit growers no longer fear scale. They, of course, greatly prefer not to have it, since its coming means continuous warfare; but careful work and moderate expenditures of time and money will protect such small trees and bushes, keep the scale down to harmless numbers and prevent loss from spotted fruit. Thorough measures are absolutely necessary, however, in every section where scale has established itself; for neglect means loss of fruit within a season or two and death of trees in a very few years. The scale is undoubtedly the worst foe of the New York fruit grower; and only vigilance and prompt action will save any threatened fruit plantation from severe loss. This danger has become so well understood that in many sections of the State annual spraying for the scale is as much a feature of orchard work as spraying for scab or codling moth. Where this work is done annually and done well, the scale, while not eradicated, is so completely controlled that the trees retain their full vigor and little or no spotted fruit is ever found.

*This is a brief review of Bulletin No. 296 of this Station, on Control of Scale in Old Apple Orchards, by P. J. Parrott, H. E. Hodgkiss and W. J. Schoene.

Any one 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 mailing list to receive future bulletins of the Station, popular or complete as desired. Bulletins are issued at irregular intervals, as investigations are completed, not monthly.
In old orchards of apple, however, favorable results have been much less common, until by many fruit men, the future of such orchards is regarded as very unpromising unless more successful methods of protection are proven practicable. In many cases, the trees in these orchards are tall and widely spreading. The upper branches are very difficult to reach with spray mixtures and the large branches interfere with the movement of the outfit and with the view of the operator, and so prevent perfect distribution of the mixture. Unless thorough, even distribution is secured, many untouched twigs and branch tips, cracks, crevices and protected places under the bark will harbor scales enough to produce millions before the end of the season. Spraying in such orchards, as many have done it who lacked experience or trusted the work to untrained men without constant supervision, has only saved the trees from immediate decline,—it has not prevented the production of enough scales to spot the fruit badly and render it unmarketable. Such spraying has often been expensive also, and, being without compensating gains in marketable product, has seemed like wasted effort. For these reasons some have believed it not worth while to spray old orchards when badly infested with scale, and many trees in such orchards are being severely injured by scale work. Others have thought successful treatment of such trees possible only after “dehorning” them so severely that several crops of fruit are lost and others lessened.

The Station realized some time ago that such dangers threatened the apple industry; and began in such orchards a series of cooperative tests to ascertain whether the grand old trees could not be saved without great expense. These tests have now continued for several years in different localities, and have proven clearly that it is possible, without great expense, to protect such trees so thoroughly that the crops are not lessened and that little if any of the fruit shows spotting.

In all, five orchards have been under test, but the results in three of these only are discussed in the bulletin: One at
Youngstown, another at Yorktown and, as a check, one at the Station. In this work the cooperating orchardist selects his own sprays, employs his own machinery and manages the spraying for most of the trees. The Station has general supervision of the work, gives advice when requested and endeavors to have the tests a fair comparison of the efficiency on scale and of the cost of each mixture used. Only the most reliable sprays are employed and the ones selected will vary in number each year according as they stand the test and as more promising mixtures are introduced. An accurate account is kept of the cost of spraying materials, amount of labor required, the wear of machinery, and various other items that enter into an experiment conducted from a commercial standpoint.

The orchard at Youngstown consists of 20 acres of the leading commercial varieties and the trees are 47 years of age. Scale was discovered in the experiments, orchard in 1900, and increased rapidly for two years, causing conspicuous injuries to many of the trees and making much of the fruit unsalable. Treatment began in 1902, with an attempt to control the pest by spraying the worst-infested trees with boiled lime-sulphur-salt wash. In the next season the entire block of trees in which the scale first appeared was sprayed with the sulphur wash and in 1904 individual trees in all parts of the orchard were sprayed.

In 1905 the cooperative work began. The orchard was first prepared for thorough work by pruning very freely, taking out dead and infested wood and removing from 5 to 10 feet of the tops of the taller central branches. This was done to allow easier access to all parts of the tree; yet the cutting was not so severe as to destroy or lessen seriously the bearing capacity of the tree. The trees were not dehorned in any case, but good strong lateral branches were left on all shortened branches. They bore continuously and by the third season had completely reformed themselves and produced full crops.

In the first season, crude petroleum was used on about one-third of the trees.—those worst infested,—sulphur wash on
most of the remaining trees, and kerosene-lime wash on about
70 of them. No injury resulted from the sulphur wash. The
crude petroleum destroyed a large percentage of the fruit
buds and retarded leafing; but the trees recovered rapidly
and, except for a few weakened by scale and collar rot, were
in excellent condition by August. The petroleum was very
effective in killing the scale, so that for two years the influence
of the reduction in numbers was plainly shown. The kerosene-
lime mixture injured a few trees so severely that they had to
be reshaped, but was harmless on most of the trees. It was
not however, satisfactorily effective against the scales. It is
a disagreeable spray to handle and is liable to unevenness
when made in large quantities, owing to separation of the
oil.

In 1906, the boiled lime-sulphur wash was used, without
injury and with good results upon the scale. A late, warm
fall allowed sufficient increase from the few scales that were
left so that some fruit was slightly spotted but not enough
so to be unmarketable.

In 1907 home-made oil emulsion, containing 20 per ct. of
oil, a proprietary miscible oil and the boiled lime sulphur
wash were used in a comparative test. In this season supple-
mentary sprayings were made, to cover the tips of the small
branches and the twigs and thus to reach the scales protected
by the pubescence of the new growth. No injuries resulted
from any of the sprays, though the crude oil emulsion possibly
hastened the decline of a few trees weakened from other causes.
Both the sulphur wash and the emulsion gave perfectly
satisfactory results, as the trees were very free from scales
and there was practically no spotting of the fruit. Nearly
every tree treated with the proprietary miscible oil showed
some spotted fruit,—considerable more than those treated
with either of the other mixtures. This was somewhat dis-
appointing, as others report good success with these miscible
oils; but, in each of the orchards under test, in spite of great
care to insure thorough application, more spotting of the fruit
has occurred with the oil than with the sulphur sprays. These
oils are, however, very convenient to use and less unpleasant to apply than the more caustic sulphur washes. They have, in all the tests, protected the trees from injury.

In the orchard at Yorktown, most of the trees Westchester are about 50 years old, the others about 33. County Scale was found in the orchard in 1900 and tests experiment. of methods and materials for control of the pest have been made yearly since that time. Because only parts of the orchard were treated each year up to 1906, other parts being left untreated as checks, the scale has never been completely controlled. In 1906 the entire orchard was sprayed with the boiled lime-sulphur wash, with excellent results in destroying scale and preventing spotting of the fruit. The only places where this occurred to any noticeable extent were on trees that had previously been left as checks and were, therefore, very badly infested.

In 1907, the lime-sulphur wash and a miscible oil were compared, both as to cost of treatment and efficiency. Both gave very good results, the sulphur wash again the better, as the trees treated with this were absolutely free from spotted fruit. Some late applications of the miscible oil, made just as the leaves were breaking, destroyed many leaves and blossoms so that the effect was noticeable throughout the summer. Earlier treatments were without injurious effect. The oil was less effective than the sulphur wash in preventing spotting of the fruit, but this may have been due to imperfect spraying of some parts of the trees; as the oil does not show readily on the trees and the operator can not always be certain that every part has been covered.

The Station orchard consists of trees from 30 to Ontario 55 years old. Scale was found in the orchard in County 1901, but was kept under control for several experiment. years by spraying only infested trees and their neighbors. In 1906 the use of crude brimstone instead of flowers of sulphur, detected too late, gave wash of weak insecticidal power and this, with a coincident favorable breeding season, allowed the scale to spread rapidly. In 1907,
therefore, the entire orchard was sprayed using sulphur wash, crude oil emulsions and a proprietary miscible oil in different sections. No injury resulted from any of the applications and all the mixtures proved equally efficient. Most careful examination showed a few spotted fruits only, on each of 18 trees out of 504 in the orchard.

Of course, the cost of treatment will vary, orchard to orchard and year to year, as so many factors enter into the operation. But that the expense is only small as compared with the returns from a good bearing orchard will be clear from the following summary of the cost, exclusive of interest and wear on machinery in the three orchards:

**Spray Treatment for Scale: Quantity Applied and Cost, per Tree.**

**Niagara County Orchard.**

Trees 47 Years Old. Machinery, Power Outfits.

<table>
<thead>
<tr>
<th>Treatment Description</th>
<th>Number of gallons</th>
<th>Cost of treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulphur wash, average for 1905-'6-'7</td>
<td>14</td>
<td>31 Cts.</td>
</tr>
<tr>
<td>Sulphur wash, average for 1907</td>
<td>13</td>
<td>27 Cts.</td>
</tr>
<tr>
<td>Sulphur wash, followed with crude oil emulsion</td>
<td>17</td>
<td>38 Cts.</td>
</tr>
<tr>
<td>Sulphur wash, followed with kerosene emulsion</td>
<td>17</td>
<td>38 Cts.</td>
</tr>
<tr>
<td>Crude oil emulsion, 20 per ct. oil</td>
<td>11</td>
<td>43 Cts.</td>
</tr>
<tr>
<td>Crude oil emulsion, with supplementary treatment</td>
<td>15</td>
<td>54 Cts.</td>
</tr>
<tr>
<td>Miscible oil, 10 per ct., at 40 cts. per gal.</td>
<td>10</td>
<td>50 Cts.</td>
</tr>
<tr>
<td>Miscible oil, with supplementary treatment</td>
<td>13</td>
<td>69 Cts.</td>
</tr>
<tr>
<td>Miscible oil, 10 per ct., at 50 cts. per gal.</td>
<td>10</td>
<td>59 Cts.</td>
</tr>
<tr>
<td>Miscible oil, with supplementary treatment</td>
<td>13</td>
<td>83 Cts.</td>
</tr>
<tr>
<td>Crude oil</td>
<td>5</td>
<td>58 Cts.</td>
</tr>
<tr>
<td>Kerosene lime wash, 25 per ct. oil</td>
<td>15</td>
<td>66 Cts.</td>
</tr>
</tbody>
</table>
WESTCHESTER COUNTY ORCHARD.

Trees 33 Years Old. Machinery, Hand Pump Without Tower.

<table>
<thead>
<tr>
<th>Description</th>
<th>Number of Gallons</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulphur wash</td>
<td>17</td>
<td>66</td>
</tr>
<tr>
<td>Miscible oil, 10 per ct., at 40 cts. per gal</td>
<td>9</td>
<td>79</td>
</tr>
<tr>
<td>Miscible oil, 10 per ct., at 50 cts. per gal</td>
<td>9</td>
<td>88</td>
</tr>
</tbody>
</table>

ONTARIO COUNTY ORCHARD.

Trees 30 Years Old. Machinery, Power Outfits.

<table>
<thead>
<tr>
<th>Description</th>
<th>Number of Gallons</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulphur wash</td>
<td>21</td>
<td>36</td>
</tr>
<tr>
<td>Sulphur wash, followed with oil emulsion</td>
<td>22</td>
<td>39</td>
</tr>
<tr>
<td>Oil emulsion, 15 per ct. oil</td>
<td>8</td>
<td>21</td>
</tr>
<tr>
<td>Miscible oil, 10 per ct., at 40 cts. per gal</td>
<td>13</td>
<td>63</td>
</tr>
<tr>
<td>Miscible oil, 10 per ct., at 50 cts. per gal</td>
<td>13</td>
<td>77</td>
</tr>
</tbody>
</table>

In the experiments described, the results of the Summary treatments have been very encouraging. With efficient labor and adequate spraying machinery, no especial difficulty has been experienced in preventing important injuries to the trees and producing yields of fruit which have, for the most part, been unspotted. The one exception has been the Youngstown orchard where the production of an entirely clean crop of fruit has always been difficult of attainment, largely for the want of more time to respray portions of those trees which have not been well treated by the first application, and the experimental use of untested remedies. But even in this orchard, much progress has been made in the control of the scale; and a large crop of clean fruit, bringing high prices, was harvested this year. Annual spraying has reduced the amount of scale on the trees and the
appearance of the orchard has been much improved. Experience, derived from our own endeavors and observations on the efforts of commercial fruit growers, demonstrates, with increasing emphasis each year, that the control of the scale on old apple trees is practicable, and that efficient protection can be afforded at a relatively nominal expense, compared with the returns from a well managed orchard.

Of the various sprays that have been tested, the sulphur wash and the home-made oil emulsions have, on the basis of efficiency, economy and safety to the trees, proven the most satisfactory remedies. Of the two, the oil emulsions have generally been somewhat more efficient than the sulphur wash in the treatment of old apple trees, and excellent results have been obtained with a light treatment of emulsion on trees previously sprayed with the lime-sulphur wash, to reach the scales on the young wood. Either of these sprays singly or the emulsions supplementing an application of the sulphur wash, if thoroughly applied, can be depended on to control the scale.

Miscible oil in the proportions used has prevented important injuries to the trees and has generally proven an efficient remedy for the scale. These preparations of good grade are among the most satisfactory substitutes for orchardists who do not desire to employ home-made mixtures.