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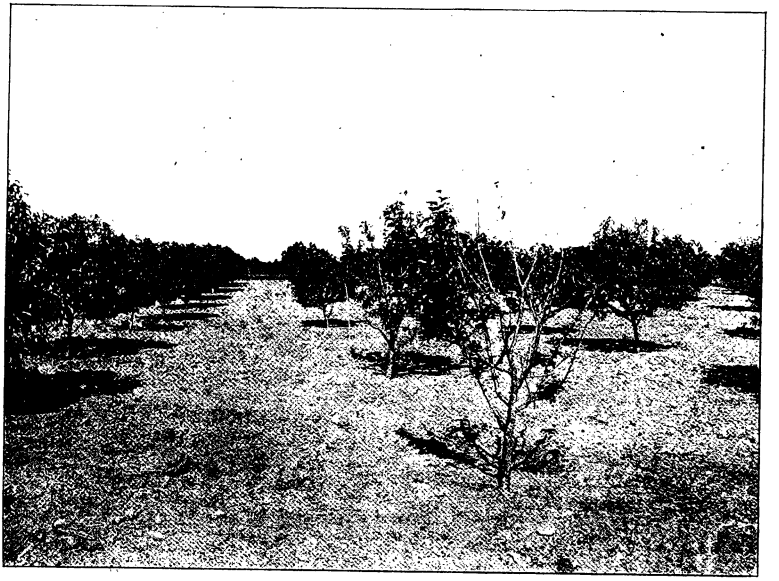

# TREATING SAN JOSÉ SCALE IN SOUTH-EASTERN NEW YORK.

F. H. HALL AND F. A. SIRRINE.

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

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¶Absent on leave.

POPULAR EDITION.*

OF

BULLETINS NOS. 209 AND 213.

# TREATING SAN JOSÉ SCALE IN SOUTHEASTERN NEW YORK.

F. H. HALL.

**Many-phased problem.**

Combating San José scale has given rise to many perplexing and conflicting results. The formula which kills the scale without injury to the trees in the hands of one experimenter proves too weak for scale destruction in another section of the country, or too strong for safe application to trees of a different kind or at a different period of growth. Because of these contradictory results the Station has found it necessary to carry on parallel series of experiments in the western and southeastern parts of the State. The tests here reported were made on Long Island and in Westchester County. The great effect of differing conditions should be kept in mind; as these explain in great measure any apparent conflict with results announced in previous bulletins. In fumigation, the condition of the covers used and the care in handling them, the proportions of the chemicals used in generating the gas, the method of computing the area to be filled in the case of tents, and the dampness or dryness of soil and trees are factors which materially influence the results.

In spraying with kerosene or crude petroleum, the stone fruits demand treatment at a different time from apple and pear, and a few days advance in spring growth may mean serious injury to trees which might have been sprayed safely while dormant. A slight difference in the grade or strength of the oil used may make a great difference in results.

* This is a brief review of Bulletins No. 209 of this Station on Orchard Fumigation and No. 213 on Spraying with Kerosene and Crude Petroleum, both by F. A. Sirrine. Anyone specially interested in the detailed account of the investigations will be furnished, on application, with copies 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.

## Orchard Fumigation.

**New fumigator.** In preliminary work on Long Island in fumigating trees with hydrocyanic acid gas, tents were used to cover the trees; but these were found unsuitable for exact experimental work, as their contents and consequently the strength of gas used could not be determined accurately. Other styles of fumigators in use had the same disadvantages as the tents, or were difficult and clumsy to handle, or were wasteful of gas and too bulky to transport any great distance or to store easily. A six-sided folding fumigator was finally constructed which meets these objections, and gives a gas-tight box of fixed capacity, which can be easily carried from tree to tree and closed quickly, and which can be folded into compact form for transporting to the orchard or for storing when not in use. A full description of this is given in the complete edition of Bulletin No. 209. Briefly, the box consists of six equal rectangular sides so hinged together that they will close flat, and a top composed of one rectangular section and two triangular pieces. One of these triangles of the top is raised to allow of opening two sides as a door to admit a tree the full diameter of the fumigator. The top has a groove about the edge into which the upper edges of the side pieces fit tightly, and is secured in place by hooks and screw eyes. The cover is made of heavy sheeting, coated with a filler of raw linseed oil, lamp black and beeswax. All joints are made gas-tight by strips of canton flannel tacked to the bearing surfaces.

Such a fumigator 10 feet in diameter and 12 feet high, or one 8½ feet in diameter and 15 or 16 feet high, can be handled easily by four men. With a set of four fumigators and five men, forty trees can be fumigated in a day; while with six fumigators the same men could probably treat ninety trees. The fumigators cost about $25 apiece, with 5 foot sides 11½ feet high; or $30 with 6 foot sides 12 feet high.

**Strength of gas to use.** Many trees were treated under these fumigators during March and April, 1901, using gas of varying strength and continuing the exposure for different lengths of time. From the results it appears: (1) That it is unsafe to leave peach trees exposed to the action of the gas for 12 hours, no matter what the

PLATE I.—METHOD OF CLOSING FUMIGATOR.

strength of gas. That is, it will not do to leave peach trees under the fumigators all night. (2) That all vigorous trees, even those as tender as peach, can be safely treated with as much as 2½ ozs. of cyanide per 100 cu. ft. (.75 gram per cu. ft.) for a period of not over 30 minutes if the trees are dormant. (3) That peach trees which have their vitality reduced by scale infestation are liable to be injured after Apr. 1 by the use of gas of the strength given, but usually recover and make good growth after such injury. (4) That peach can be treated in the orchard for from 30 to 60 minutes with 50 grams cyanide per 100 cu. ft. even after the fruit buds show color. (5) That walnut and chestnut will stand the same treatment as peach. Plums and cherries are probably similar to peach in resistance. Pears can not stand quite as much as peach after the flower buds are exposed.

The figures given are, however, considerably above the limit necessary for killing the scales, so that the margin of safety is large on all dormant trees. Under favorable conditions the scales were all killed by the use of .15 gram per cu. ft. (one-half oz. cyanide to 100 cu. ft.), but other experiments proving rapid absorption of the gas by moist soil indicate that it is usually safest to use twice this amount of cyanide if the trees and soil are wet or snow-covered.

Various formulas were tested to ascertain the proper proportions of cyanide, acid and water to use. It was found that one part by weight of 98 per ct. cyanide in the ordinary broken lumps, one and one-half parts by volume of commercial sulphuric acid and 3 parts by volume of water gave the best reactions. This differs only in having a little more water, from the usually accepted formula, 1–1½–2¼, so that the latter formula can be used, adding a little water if the action is too violent.

**Conclusions.** Taken as a whole, the tests show plainly that tents are most economical in the use of chemicals, as they fit closely about the top of the tree and so have little waste space; but that they wear rapidly and leak, are difficult to handle and fail to insure thorough and accurate work. Box fumigators are of fixed dimensions and allow of thorough work but are somewhat wasteful of gas because of extra space in them.

With perfect covers and without accidents, such as blowing over or tipping of fumigators, it is possible to kill all the scales on medium-sized trees without injury to the trees.

The ordinary 1–1½–2¼ formula gives good results, using a little more water if the action of the chemicals is so violent as to cause spattering.

The scales will, under favorable circumstances, be killed by one-half hour's fumigation with .15 gram of cyanide per cubic foot of space, but it is probably best to use twice this amount in orchard fumigation, where conditions are not perfect.

## Spraying with Kerosene and Crude Petroleum.

**Kerosene mechanical mixtures.**

In the spraying experiments both kerosene and crude petroleum were tested, either undiluted or combined with water in different proportions by means of a spray pump which mixes the water and oil so that they form a temporary emulsion. The pump can be adjusted for different percentages, but the resulting mixtures will vary nearly 5 per ct. each way from the fixed amount.

**Low grade kerosene.**

In one series of tests 100° flash test oil was used, the "distillate" of the refiners, costing 12¼ cts. a gallon. Oil of this grade, whether undiluted, or in any strength down to an emulsion containing 85 per ct. of water, was injurious to the trees sprayed. Apple trees were not usually killed, though some were; but all suffered noticeably. Peaches generally died after the treatment. This is in line with previous experiments on nursery trees; so no one should be tempted by the slightly lower price, to use inferior grades of kerosene for spraying.

**Good kerosene safe.**

The best grade of kerosene, 150° flash test, the "water white" or ordinary illuminating oil may be used with safety under proper conditions. Dormant apple and pear trees will stand the application of pure oil of this grade with but little injury, and trees of these kinds in leaf may be sprayed with 15 per ct. emulsion of it; but greater strength than this should not be used

after the sap begins to flow in such trees. March 1 proved too late in some cases on Long Island.

Peaches and other stone fruits, on the contrary, should *not* be sprayed while dormant even with dilute emulsions; as some injury is liable to follow. These trees must be sprayed while growth is just beginning; that is, between the swelling of the buds and the opening of the same. At this time even pure kerosene of 150° test, may be used without harm.

Even dilute emulsions are fatal to the insects, especially to young ones unprotected by scales.

**Crude petroleum.**

Crude petroleum of two grades was tested in orchards in two different localities. The same general tendency was found to hold with the petroleum as with the kerosene-water mixtures. Stone-fruit trees can not be safely sprayed while dormant but may be sprayed while buds are opening; apple and pear can be treated with much stronger emulsions when dormant than when starting into growth or in foliage.

Petroleum having a specific gravity of 0.837 that of water (35° on Baume oil scale) ("reduced oil" or "gas oil") is unsafe to use on trees of any kind at any time; while the lighter grade, with a specific gravity of 0.79 (44° on Baume oil scale) can be used without injury in proper strength and at the proper time.

On peach and plum it is quite safe to use a 25 per ct. emulsion of this grade of petroleum after the buds have begun to swell; but if treated while dormant with this strength of mixture or if treated at any time with a higher percentage, injury is liable to follow.

Apple, *while perfectly dormant*, may be safely treated with even a 50 per ct. emulsion of this grade of oil, and pears, *dormant*, with a 25 per ct. emulsion but not with one as strong as apples will stand. Neither apples nor pears can be treated with even a 15 per ct. mixture after the beds have started without danger of injury.

Emulsions of strength safe to use will destroy the scales, but it is extremely difficult to cover all parts of trees more than 20 feet high, and impossible to reach scales in protected places. Spraying can not be counted on to *eradicate* the pests; but it will hold them in check.