Insect pests and their control - White wax scale (Ceroplastes destructor, Newstead)

B.A. B. Edwards

D. G. Shedley

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WHITE WAX SCALE
(Ceroplastes destructor Newstead)

THE EVALUATION OF CONTROL METHODS, THE USE OF ORGANIC INSECTICIDES AND SCALE DISTRIBUTION ON CITRUS TREES IN WESTERN AUSTRALIA

VARIOUS treatments of white oil and white oil-soda sprays have been tested in Western Australia against the white wax scale (Ceroplastes destructor Newstead) which mainly attacks citrus trees. Reference has been previously made to this experiment (Jenkins, Shedley and Edwards, 1953).

Outstanding results were obtained using a white oil (1 in 40)-soda (4 ozs. per gallon) spray applied at the late peak stage.

Equally good results were also obtained with two 1 in 40 white oil sprays applied two weeks and four weeks after the main emergence of larvae.

At the early peak stage a single white oil-soda spray gave good control. Using half the concentration of soda a similar application following a white oil spray a fortnight after the main emergence of larvae gave comparable results.

Indications from a trial are that no effective control can be obtained using chlordane, aldrin or dieldrin as 0.5 per cent. sprays a fortnight after the main emergence of larvae.

On the experimental site the scale population was less dense on the west side and lower portions of the trees.

INTRODUCTION

A native of South Africa, the white wax scale was first recorded in Western Australia in the field in 1911 (Newman, 1911) infesting citrus trees near Kalamunda but had been observed prior to this in a Perth nursery. The scale was referred to as C. ceriferus Anderson until it was identified in 1933 as C. destructor (O'Connor, 1933). Its spread since 1911 has been slow, but the infestation now occurs in most of the Hills district from Chittering in the north to Armadale in the south and also the associated coastal districts.

Measures for the control of the scale up to the present have been confined to the application of sprays at different times in its development, but there has been no attempt to compare and contrast these methods. The possible effect of the newer organic insecticides on the larvae of the scale has also aroused considerable interest.

EXPERIMENT, 1951-1952

The main experiment was designed to compare the control of white wax scale by white oil alone and by a combination of white oil and soda ash applied at different times in the life history of the insect.
Treatments.—After a survey of available literature, it was decided to apply the following treatments:

(1) One white oil spray applied 14 days after the main emergence of crawlers. (Applied January 9, 1952.)

(2) Two white oil sprays. The first application as in (1)—the second a fortnight later.

(3) One white oil spray as in (1) followed by a white oil-soda ash (2 ozs. per gallon) spray soon after at the early peak stage. (Applied February 27, 1952.)

(4) A white oil-soda ash spray applied at half the quantity normally used at the early peak stage. (Applied February 27, 1952.)

(5) A white oil-soda ash spray applied thoroughly at the same time as (4).

(6) A white oil-soda ash spray applied at the late peak stage. (Applied April 23, 1952.)

(7) Control—no treatment.

White oil was used at a strength of 1 gallon to 40 gallons of water in all cases. Soda ash, except where stated, at the rate of 4 oz. per gallon.

Site.—The site selected was on the property of Mr. R. C. Owen, Pickering Brook, where a suitable number of uniform Valencia orange trees were located with a reasonably constant scale infestation.

Design.—A randomised block design was used with five replications of seven treatments. Each plot consisted of three adjacent trees in an approximate north-south line.

Application.—The sprays were applied with a power spray operating at a pressure of approximately 300 lb. per square inch and delivering nearly two gallons per minute. From 3½ to 4 gallons were applied to each tree except in Treatment (4) where half the normal amount of spray (approximately 2 gallons) was used.
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Sampling.—As most of the scales settled on or near the extremities of the twigs, it was decided to sample by counting the number of scales on the terminal six inches of a twig. Since it was thought that the number of scales counted might vary with the position of the twig, 12 positions on each tree were selected, viz., north, south, east and west with lower, middle and upper places on each side of the trees. The twigs were picked at random and by this procedure 36 samples per plot were obtained.

Sampling was completed on October 15, 1952, with four persons sampling and one recording. The positions of sampling for each person (e.g. north) remained constant over the entire sampling.

Results.—(See Table 1).

The tabulated figures in Table 1 are the total number of scales occurring on the twigs in the 12 positions selected on each tree.

Due to the skew distribution of the population an analysis of variance using the log (1+x) transformation was made.

Examination of the results from Table 1 allows the following conclusions:

(i) All treatments show significant control of white wax scale at the 0.1 per cent. level.

(ii) The white oil-soda spray applied at a late peak stage (April 23) was outstanding and significantly better (0.1 per cent. level) than white oil-soda sprayed thoroughly or lightly at the early peak stage February 27).

(iii) Two applications of white oil (January 9 and January 24) were as good as a white oil-soda spray applied on April 23.

(iv) The thorough application of a white oil-soda spray on February 27 was significantly better (1 per cent. level) than the white oil-soda spray applied at half the rate of application on the same date.

Scale Distribution on the Trees.—See Table 2.

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Arithmetic Mean of each column: 803.5
Mean log (1+x) for each column: 2.9776
### TABLE 2.

Control Plots—Numbers of Scales.

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Log mean (1+ x).

- **For Height.**
  - Lower: 0.9750
  - Middle: 1.2255
  - Upper: 1.4140

- **For Direction.**
  - Lower: 1.2416
  - Middle: 1.2278
  - Upper: 1.3219

Least Differences for Significance.

- **For Height.**
  - At 5% level: 0.1426
  - At 1% level: 0.1887
  - At 0.1% level: 0.2427

- **For Direction.**
  - At 5% level: 0.1647
  - At 1% level: 0.2179
  - At 0.1% level: 0.2802
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<table>
<thead>
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<th>Width</th>
</tr>
</thead>
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</tr>
</tbody>
</table>

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As a survey of the population of scales indicated differences between the positions of sampling, an analysis of variance (Table 2) was made using log (1+x) transformation as in the main analysis. Figures obtained for the control plots were used for this purpose.

Examination of this analysis allows the following conclusions:

(i) For Height Positions.
   (a) The lower portions of the trees had significantly less scales (0.1 per cent. level) than both the middle and upper portions of the trees.
   (b) The population of the scales in the middle part was significantly less (5 per cent. level) than the upper part of the trees.

(ii) For Direction.
   (a) The population of scales on the trees was significantly less (0.1 per cent. level) on the western side than on the eastern side of the trees and also significantly less (5 per cent. level) than the northern and southern sides of the tree.
   (b) The northern, southern and eastern sides of the trees do not show significant differences in population from each other.

Spray Damage.—Particular care was taken to see that treatments were not applied during the experiment when the temperature was above 90°F. Only very slight burning of the foliage was observed in any of the treatments.

TRIAL, 1951-1952

A small trial was undertaken to test the effectiveness of the new organic insecticides chlordane, aldrin and dieldrin.

Two navel oranges trees were used for each treatment. Three gallons of spray were applied to each tree with a knapsack spray, a 0.5 per cent. solution of each insecticide being used in each case. The treatments were applied a fortnight after the first emergence of the larvae, i.e. on January 9, 1952.
An inspection of the trees some time after treatment suggested that there was no appreciable diminution in the number of scales present as compared with those present on untreated trees.

Counts were made in the same manner as for the main experiment and are listed in Table 3.

### TABLE 3.

**Number of Scales.**

<table>
<thead>
<tr>
<th>White Wax Scale Trial</th>
<th>Tree X</th>
<th>Tree Y</th>
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<tr>
<td>Chlordane</td>
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<td>Aldrin</td>
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<td>274</td>
</tr>
<tr>
<td>Dieldrin</td>
<td>84</td>
<td>173</td>
<td>257</td>
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<tr>
<td>Control</td>
<td>206</td>
<td>190</td>
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</table>

From these results the indications are that the insecticides at the time and strengths used did not give a control which could be compared with the recommended treatments.

**DISCUSSION**

From the results of the work carried out over the present experiment, it can be seen that both a white oil-soda spray at the late peak stage and also the application of two white oil sprays two and four weeks after the main emergence of the larvae, are the best methods for control of white wax scale in Western Australia.

Alternative treatments, which should give satisfactory control, are a white oil-soda spray applied at the early peak stage, and a white oil spray a fortnight after the main emergence of larvae followed by a white oil-soda spray at the early peak stage using half the normal amount of soda.

The timing and thoroughness of the spray applications were most important factors in obtaining good results with the materials used. In an effort to show the effect of inefficient spraying, one treatment was applied at half the rate used in all other treatments, and from the results was significantly inferior to the thorough application of the same date. In all the other treatments with a power spraying unit operating at a pressure of approximately 300 lb. per square inch, 3½ to 4 gallons were used for a medium sized tree.
An early observation that the intensity of the population of scales varied according to the position on the trees was borne out by an analysis. Generally the west sides of the trees were found to be less heavily infested and the population tended to be denser on the upper portions of the trees.

When applied as 0.5 per cent concentration sprays a fortnight after the main emergence of larvae, chlordane, aldrin and dieldrin gave results which indicate that they do not give satisfactory control of white wax scale at the strength and time used.

ACKNOWLEDGMENTS
The authors wish to thank Mr. C. F. H. Jenkins (Government Entomologist) who suggested the project and for his interest while it was being carried out.

We wish to thank Mr. R. C. Owen, M.L.A., Pickering Brook, on whose property the work was carried out and whose assistance was greatly appreciated.

We are also indebted to Mr. N. Stenhouse, Research Officer, Section of Mathematical Statistics, C.S.I.R.O., Western Australia, who carried out the main part of the statistical analysis.

For their help in spraying and sampling of the experiment we are grateful to other members of the Entomology Branch of the Department of Agriculture.

REFERENCES


Book Review:

TIMBER IN DOMESTIC BUILDING

So much timber goes into house building that it behoves those using it to have sufficient knowledge of its properties and preparation to use it well and, since world supplies are on the decline, to use it economically. This is particularly important in Australia which is fortunate in the number and variety of its timber species.

Ample information on timber is available in the excellent publications produced by the C.S.I.R.O. Division of Forest Products, and by several State Forestry Departments. However, most of these pamphlets deal with particular aspects of the subject. For this reason the latest number in the Notes on the Science of Building series No. SB 34, “Timber in Domestic Building” is of special interest.

In SB 34 the Commonwealth Experimental Building Station has set out to help the small home builder to select and use wisely the timbers available to him. The Note discusses the general properties of timbers required for various purposes, and reviews briefly the important subjects of strength, grading and seasoning. It then examines the selection of timber for framing, cladding, flooring and joinery. A section on decay and insect attack completes the Note.

Notes on the Science of Building No. SB 34: “Timber in Domestic Building,” published by the Commonwealth Experimental Building Station, price 9d. (postage included), may be obtained from the Station, Box 30, CHATSWOOD, N.S.W., or from the Building Research Liaison Service, Box 2807AA, MELBOURNE.
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