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### Insect pest - white wax scale

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# INSECT *Pests*

## AND THEIR CONTROL

By C. F. H. JENKINS, M.A., Government Entomologist; D. G. SHEDLEY, B.Sc. (Agric.), Entomologist; B. A. B. EDWARDS, B.Sc. (Hons.), Entomologist

### WHITE WAX SCALE

(*Ceroplastes destructor* Newstead)

**R**ECENT investigations in Western Australia have shown that white wax scale can be very effectively controlled by the application of white oil and of white oil-soda sprays. Wax scales derive their name from the typical waxy covering which covers the female insect. Of the two species, the white wax and the pink wax scale, which have been recorded from Western Australia, only the former has gained a permanent footing and is of interest to the citrus grower. For many years the scale was referred to as the Indian wax scale (*C. ceriferus* Anderson) but was later identified (O'Connor, 1933) as the African white wax scale (*C. destructor* Newstead).

In its adult stage, the scale is covered by an irregular mass of white wax which is not unlike candle-grease in appearance. The actual insect underneath the wax is a uniform dull red in colour. It is flattened on the under surface, rounded above and tapers to a point at the posterior end. Like all scale insects, the mouth parts are produced into a thread-like sucking tube and the legs and antennae are rudimentary.

#### DISTRIBUTION

The white wax scale was first recorded in the field in Western Australia infesting citrus trees in the Kalamunda district (Newman, 1911) but it had previously been observed in a Perth nursery. Its spread since 1911 has been slow, but the infestation is now widespread in the Darling Range area from Mundaring to Karragullen. The associated coastal districts including the metropolitan region are also affected, and scattered infestations occur at Chittering.

#### HOST PLANTS

Apart from citrus trees, several cultivated fruit trees, e.g., pears, persimmons, apricots and apples, are also susceptible to

attack, but usually this only occurs when they are in close proximity to infested citrus trees. Some ornamental shrubs, including *Pittosporum* spp., Lillypilly (*Eugenia* spp.) and Privet (*Ligustrum* spp.) are

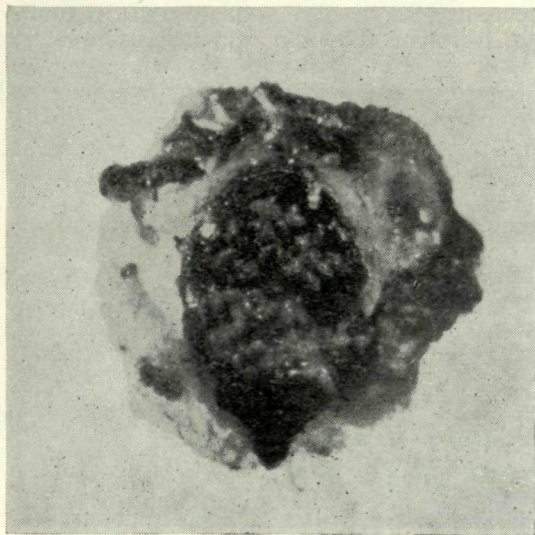


Fig. 1.—Eggs under parent scale. Magnified about 20 times



attacked, together with several native trees and shrubs, such as the Christmas tree (*Nuytsia floribunda*), Ti-tree (*Melaleuca* spp.), Australian Blue-bell (*Sollya fusiformis*), Pink Myrtle (*Hypocalymma robustum*) and *Daviesia* sp.

### MEANS OF DISPERSAL

As the wax scale only infests the twigs and foliage, there is little chance of spreading the pest by means of the fruit. The principal means of dispersal seems to be wind, as the "crawlers" may be carried for considerable distances. Birds and insects may also serve as carriers, as the young larvae often cling tenaciously to foreign bodies.

Infested nursery stock is the chief danger to be guarded against by orchardists in clean areas. There seems to be no doubt that it was by this means that the pest first reached Western Australia.

### TYPE OF INJURY

The most obvious damage caused by the scale and that causing the greatest concern to most orchardists, is the associated growth of "sooty mould" on the surface of the leaves, stems and fruit. The mould itself feeds on the honey-dew secretion given off by the scales. Its accumulation on the leaves prevents free access of air and light and therefore reduces the feeding and breathing of the tree. Of more immediate importance to the grower is the necessity to wash or scrub the fruit, spoiling its natural bloom and keeping quality

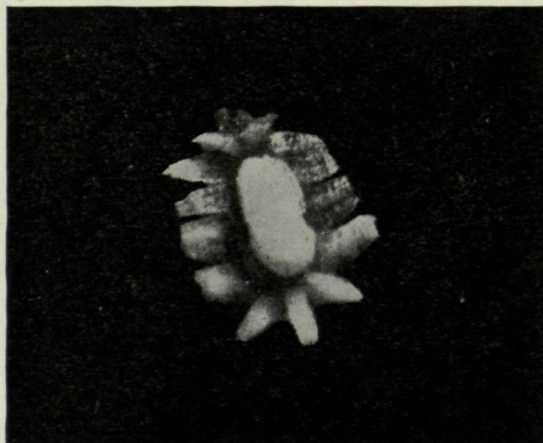


Fig. 2.—Typical young scale two weeks old. Magnified 25 times

and increasing the cost of handling. The presence of large numbers of scale which feed from the sap also has a detrimental effect on the tree itself and on the crop.

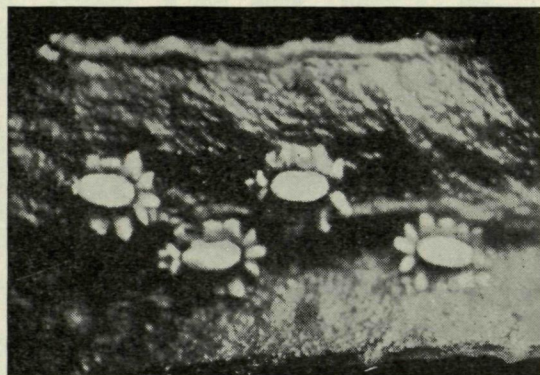


Fig. 3.—Young scales, two weeks old. Magnified about 12 times

### LIFE HISTORY

In efforts to control the scale a sound knowledge of the life history is essential as it can then be attacked during its most vulnerable stage.

It has been stated (Newman, O'Connor, Andrewartha, 1929), that there is only one generation of scales produced each year, although there is variation in hatching and development. Observations over the past few years have confirmed this statement.

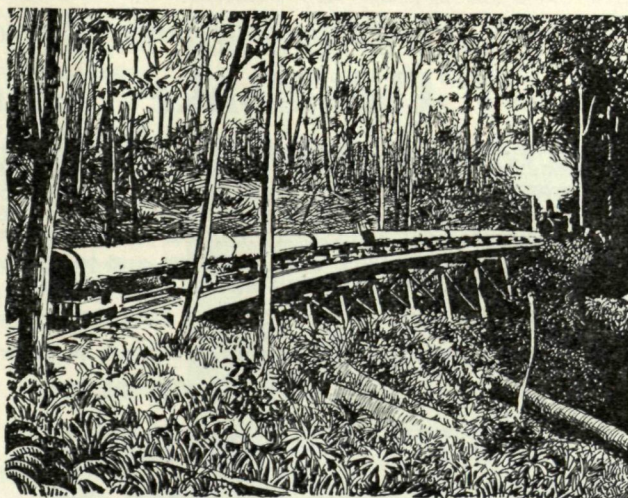
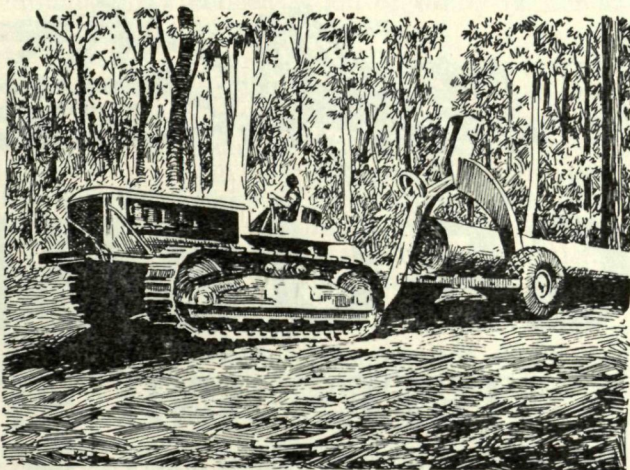
**Eggs.**—The scale insects commence laying in early October and by the first week in December almost all the eggs have been laid. They develop under the scale covering and waxy secretion and gradually take the place of the body of the parent.

**Larvae.**—On hatching, the young larvae or "crawlers" remain protected under the scale for a period until emergence occurs. The main emergence usually takes place between the last week in December and the first week in January with a few larvae appearing until early February.

These naked six-legged scales crawl mainly on to the leaves where they settle down. Here they begin to feed and commence secreting their typical waxy covering which is at this stage composed of 13 lateral processes and gives them a star-like appearance. It is at this stage in the life cycle of the scale that it is most vulnerable and many perish from various causes.



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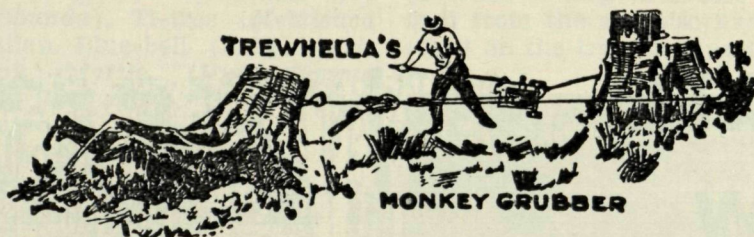
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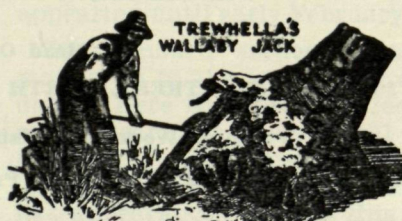
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Three weeks to a month later, the remaining living scales migrate back to the young wood. The bulk of the scales have, therefore, become settled in their permanent positions by the end of January and it is at this time that they lose their legs. About mid-February the central part of the waxy covering becomes pointed, a condition known as the peak stage. Later, further secretions of wax occur, completely covering the body of the scale.

**Adults.**—On reaching the adult stage, the scales continue feeding and develop fertile eggs.

A feature of interest is that all the scales observed on the trees are females since the males of this species are rare and have not yet been discovered in Western Australia.

### CONTROL

In 1952 an experiment was conducted on the property of Mr. R. C. Owen, Pickering Brook, to compare the effectiveness of various insecticides applied at different times of the year and at varying concentrations.

One hundred and five uniformly scale-infested Valencia orange trees were used, and the efficiency of the treatments was assessed by making random counts of the scale insects found on the terminal twigs the following winter. The accompanying table summarises the results of the treatment and demonstrates the efficiency of oil and oil-soda sprays.

Type of Treatment	Scale Counts
White Oil, single application .....	773
White Oil, two applications .....	82
White Oil followed later by White Oil-Soda .....	165
White Oil-Soda, single application (half quantity of spray liquid per tree) .....	866
White Oil-Soda, single application (normal quantity of spray liquid per tree) .....	359
White Oil-Soda, single late application .....	55
Control (unsprayed) .....	3,911

It is proposed to publish the full details of this experiment elsewhere.

**Oil and Soda Sprays.**—Although one white oil spray applied soon after the main emergence (late December) of larvae has been found to kill many scales, it is necessary to repeat the application a fortnight later if really satisfactory results

are required. It is recommended that white oil be used at a strength of one gallon in 40 gallons of water. Where white wax scale occurs on deciduous trees, e.g., pears, the concentration of white oil should be reduced to 1 in 80.

When the scales have reached the peak stage and secretion of the typical wax covering has begun, it is necessary to use soda-ash in conjunction with white oil. It will be seen that a thorough application of white oil (1 in 40)-soda ash (4oz. per gallon) applied during the late peak stage (March) gave the most satisfactory result in the experiment under consideration.

**Note.**—Washing soda at the rate of 10oz. per gallon may be used instead of soda ash.

**Application.**—As the materials recommended will only be effective when they come in contact with the insects, they must be applied thoroughly. The necessity for thorough application is clearly demonstrated by the figures in the table,

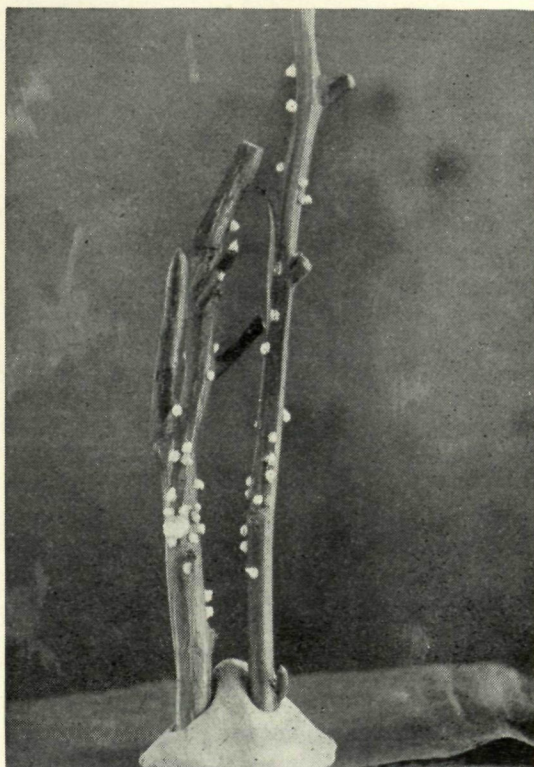


Fig. 4.—Twigs showing scale two months old. Natural size





Fig. 5.—Scales two and a half months old on twigs.  
Natural size

as lightly-sprayed trees carried a much heavier scale population than those receiving a correct spray cover.

For best results, a power spray operating at approximately 300lb. per square inch is desirable, and for a medium-sized citrus tree three and a half to four gallons of spray should give a sufficient cover.

Many growers have complained that soda spraying has caused burning of the foliage. In work carried out, very little burning occurred with either soda ash or white oil mixtures. It is suggested, however, that spraying should not be undertaken when temperatures exceed 90° Fahrenheit.

**Warning.**—When preparing the spray mixture the following procedure should be followed. Dissolve the soda in warm water and mix white oil to a thin cream with an equal quantity of water. Add the white oil to the soda mixture and stir vigorously during the process. If the reverse order of mixing is followed, some free oil may be produced with consequent injury to the tree foliage.

**Winter Sprays.**—In order to reduce the possibility of foliage damage from summer

applications of oil-soda sprays, winter treatments were carried out with higher rates of soda ash. Concentrations of up to 1lb. of soda ash to the gallon of white oil spray mixture were applied in July and August on well-developed scale insects. No adverse effects were noticed on the trees and the waxy scale covering was thoroughly softened. Despite this, however, the insects were not killed and a large emergence of young appeared the following summer.

**New Insecticides.**—Some of the newer insecticides have been tried against white wax scale, but have failed to give a satisfactory control at the times and concentrations used. Of these, chlordane, aldrin and dieldrin were used as 0.5% sprays a fortnight after the main emergence of larvae, and parathion was used as a 0.03% spray at the early peak stage.

DDT and BHC sprays have also been used prior to hatching and at hatching time, but with disappointing results (Jenkins and Forte, 1947).

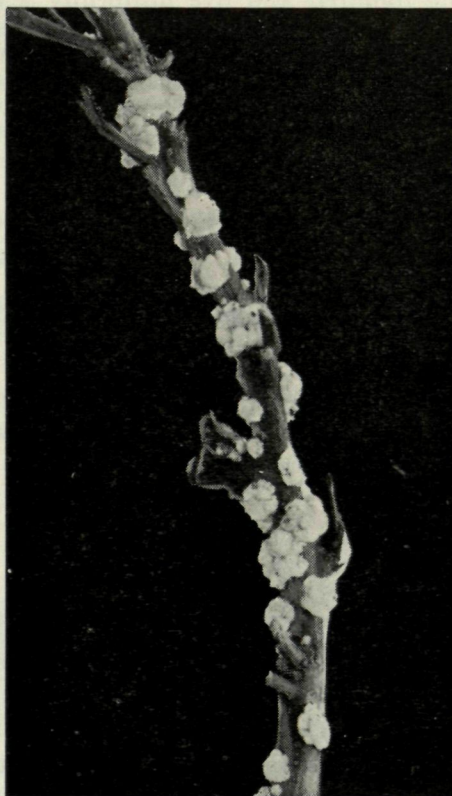


Fig. 6.—Full-grown scales. Natural size



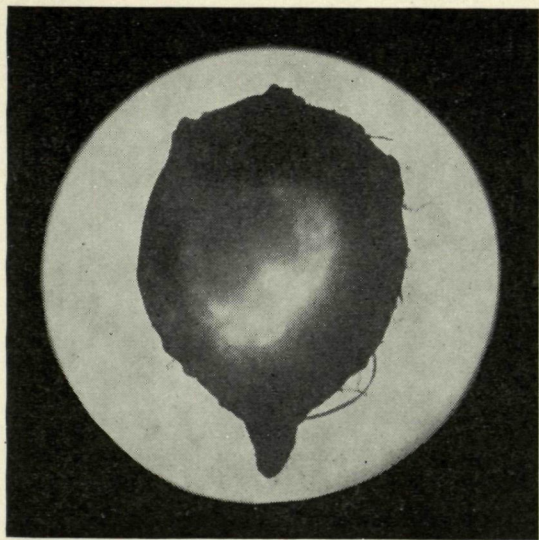


Fig. 7.—Adult coccid with waxy covering removed. Magnified about 12 times

### BIOLOGICAL CONTROL

Although attempts have been made to introduce parasites of the white wax scale into Australia (Gurney, 1936), no effective control has been achieved by these, and native parasites and predators have proved of little value. It is probable that birds, especially silver-eyes (*Zosterops australasiae*), destroy some of the adult scales, as irregular punctures may sometimes be found in the waxy scale coverings. The damage is too gross to be caused by parasitic wasps or ladybirds, and the fact that silver-eyes are known to feed on various other types of coccids supports the present suggestion.

### ACKNOWLEDGMENT

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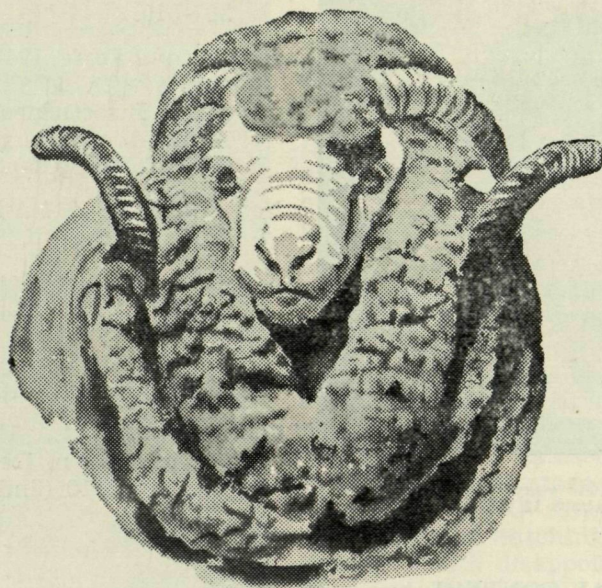
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