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STUDIES ON THE BEHAVIOUR OF MALES OF CALIFORNIA RED SCALE

AONIDIELLA AURANTII (MASKELL)

by

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A thesis submitted for the degree of

Doctor of Philosophy in the Faculty of Agricultural Science

at the University of Adelaide

Please note that while Mr. Yan submitted the thesis for the degree of Doctor of Philosophy, he was in fact awarded the degree of Master of Agricultural Science.

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August, 1985

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SUMMARY

California red scale, Aonidiella aurantii (Maskell), is the most important pest of citrus in Australia, California and the Mediterranean countries.

Both the male and female are active following emergence during the wingless "crawler" stage of the first instar. After wandering for a few hours on the host plant the crawler begins to feed and to form a waxy scale covering. The female does not move again; the male is again active for a short time as an alate adult.

Observation indicated that almost all the males of red scale emerge during the afternoon and are dead by the next morning. Mortality commenced 3 h after emergence, about half the males were dead within 5-6 h, and all were dead within 12 h. Copulatory activity occurs shortly after emergence.

Environmental factors such as temperature, relative humidity and light may affect male emergence and longevity. With an increase in temperature the distribution of emergence was shifted closer to midday i.e. the peak emergence at higher temperature occurred earlier than at lower. The time of peak emergence was earlier at higher light intensity and was delayed by lower light intensity. The daily rhythm of emergence of male is entrained by an interaction between the light and temperature cycles. The light is apparently the critical cue for the release of emergence, with darkness or extreme high and low temperature inhibiting it. Emergence was delayed at higher humidity, a result of the accumulation of moisture in the waxy scale which prevented free emergence. The longevity of male was longest at the lowest light intensity and temperature.

Regulation of mating activity of red scale is affected by both light

and temperature. Copulatory activity of males was found to increase with light intensity and temperature.

Virgin females emit a highly attractive sex pheromone. Females were attractive from the time the gray margin began to developed (26 days from crawlers at 25°C). They were most attractive during the first week of life.

A special trap was designed to test the responses of flying males to sex pheromone released by virgin females. Responding males were found to be stimulated by the pheromone and to orient upwind and fly towards the source. The effect of wind speeds of 0, 0.5 and 1 m/sec on male behaviour was determined. Observation showed that in nominal wind speeds of 0.5 and 1 m/sec most males flew upwind, whereas at a nominal zero wind speed, there was no significant preference for either direction.

By allowing males on emergence to walk over fluorescent dust as a marker, free flight and pheromone-searching behaviour of the males were observed under ultraviolet light.

The number of males captured by traps baited with living caged females was influenced by the elevation of traps above the soil surface. A greater number of flying male scales were trapped in the middle third of the trees. Wind direction and velocity are also important factors influencing trap capture in the field. Traps placed upwind attracted more males than the traps placed downwind, a larger number of males were attracted to the traps placed 4 and 8 m from their release point than at any other distance in the field.

It is possible that the control of red scale, could be based on the release of sufficient synthetic female sex pheromone spread over large areas to disrupt of male attraction to female.

DECLARATION

This thesis contains no material which has been accepted for the award of any other degree or diploma in any University and, to the best of my knowledge and belief, contains no material previously published or written by another person, except when due reference is made in the text of the thesis.

(Jwo-Yee Yan)

August, 1985.

ACKNOWLEDGEMENTS

I am grateful to my supervisors Professor T.O. Browning and Dr. P.W. Miles for their guidance and their constructive criticisms during the course of this study.

In particular, I would like to thank Dr. Ring T. Carde', for his helpful discussions and suggestions, and critical review of the manuscript.

I am indebted to members of the Entomology Department, all of whom have helped me in various ways. Especially, I would like to thank Dr. R. Laughlin, Miss P. Phillips and Mr. P. Coombe for their assistance in some of the statistical analyses and to Professor W.P. Rogers for his helpful criticism during the study.

I would like to thank Mr. C. George for the use of his orchards during this study.

I also wish to thank the various members of the Library for their cooperation.

Thanks are due to Mr. B. Palk for printing the photographs and Mrs. M. Brock for typing the thesis.

Finally, my thanks to my wife, Kuei-mai, for her help and her encouragement.