THE BIOLOGY, ECOLOGY AND MANAGEMENT OF THE QUANDONG MOTH, Paraepermenia santaliella (LEPIDOPTERA: EPERMENIIDAE)

By

Kaye Louisa Ferguson, B.Ag.Sc.(Hons).

A thesis submitted to the University of Adelaide in fulfillment of the requirements for the degree of Doctor of Philosophy

Department of Applied and Molecular Ecology
The University of Adelaide

December 2001
SUMMARY

The native Australian quandong is in increasing demand as a unique Australian bushfood. A major factor reducing the quality of fruit is damage caused by larvae of the quandong moth, also a native species, about which little was known. Commercial growers presently use frequent applications of a broad-spectrum insecticide to try to manage the pest. The aim of the study was to detail the biology and life history of the moth and to investigate management strategies that would enable growers to manage the pest in an economically and environmentally sustainable program.

Regular sampling was conducted at two field sites in South Australia to determine the seasonal cycle of the quandong moth, the damage caused and to survey for natural enemies. There are three to four generations of the quandong moth in South Australia each year. The summer generations occur during flowering and larvae feed on the reproductive parts of the quandong flowers but because the natural shedding of flowers is high, damage during this period is not significant. The autumn-winter generation occurs during fruit development and larvae feed on the kernel and seed coat of developing fruit causing fruit to drop from trees. However, a large proportion of dropped fruit is not damaged by the quandong moth. The spring generation occurs during fruit maturity and larvae feeding on the flesh of quandong fruit cause the most severe damage. This damage directly reduces the quality of fruit at harvest, and in severe cases fruit may be completely unsuitable for consumption.

Several species of parasitoid wasps were reared from eggs and larvae of the quandong moth throughout South Australia. The parasitoids included *Trichogramma*, an egg parasitoid.
Chelonus, an egg-larval parasitoid and Dolichogenidea, a larval parasitoid. It is possible that all species collected are native and undescribed and their potential for use in biological control of quandong moth has not been evaluated.

Developmental rates at various temperatures were used to calculate degree-day estimates for the egg, pupal and adult stages of the moth. The estimates, along with field incidence were used to construct a model using Dymex to examine the number and timing of the generations of the moth. Although several assumptions were made during model construction, the model demonstrated the importance of the variation in nutritional status of the quandong throughout the year and the importance of accurate spray timing.

Yield loss assessments were used to determine economic injury levels and action thresholds for the quandong moth. Sequential sampling for eggs of the quandong moth was investigated and the results indicated it is not feasible to obtain precise population estimates for the quandong moth. Until more accurate action thresholds are developed, fixed sample size plans based on presence/absence counts are the most viable option.

Insecticide trials were conducted in the field to examine spray timing and investigate alternative insecticides. None of the spray regimes or alternative insecticides significantly reduced the incidence of larvae or severity of damage compared to the unsprayed control. High degrees of variation in larval incidence, inaccuracy of spray timing, variability among trees and variation in assessment dates may have influenced the results of the insecticide trials.
Monitoring, insecticides, conserving natural enemies and good orchard hygiene should all form part of an integrated pest management program for the quandong moth. Monitoring for eggs of the moth and only employing insecticides when the moth is present will result in more judicious use of broad-spectrum insecticides. Reduced use of insecticides will conserve the populations of generalist and specific natural enemies of the moth and decrease the risk associated with sustained and frequent use of broad-spectrum insecticides. The inclusion of insecticides that are specific to moths will also aid in conserving populations of beneficial insects and restore the ecological balance where it has been disrupted by sustained use of broad-spectrum insecticides.