R.H. Wakelin[1]
L.E. Jamieson[2]
and D.M. Suckling[3]
Richard-Betty.Wakelin@xtra.co.nz

DMG24241

Plant & Food **RESEARCH**
RANGAHAU AHUMĀRA KAI

Guava moth (*Coscinoptycha improbana*) mating disruption using asian peach moth (*Carposina sasakii*) pheromone dispensers

[1] 336 One Tree Point Road, Ruakaka, New Zealand
[2] The New Zealand Institute for Plant & Food Research Ltd
Private Bag 92169, Auckland Mail Centre
Auckland, New Zealand
[2] The New Zealand Institute for Plant & Food Research Ltd
Private Bag 4704, Christchurch Mail Centre
Christchurch, New Zealand

www.plantandfood.com
THE NEW ZEALAND INSTITUTE FOR PLANT & FOOD RESEARCH LIMITED

Introduction

Guava moth, *Coscinoptycha improbana* Meyrick (Lepidoptera: Carposinidae) was first recorded in New Zealand in May 1997 on feijoa fruits in Kaitaia and has become a serious pest of commercially grown macadamias and feijoas in Northland. Guava moth has now been reported as far south as Tuakau in Auckland (Nor-west News 2008) infesting home garden fruits including loquat, plum, peach, apples, feijoa, guava, nashi pear, citrus and macadamia (Jamieson et al. 2004). The use of insecticides to control this internal fruit pest is not a viable option and alternative control strategies are required.

Mating disruption (MD) is an environmentally friendly control method (Suckling et al. 2008). MD involves introducing synthesised sex pheromone to confuse males, which are then unable to locate females and mate, and thus the pest population collapses. The cost of the formulation of guava moth mating disruption dispensers could prove prohibitive; however, there is a commercially available polyethylene tubing pheromone dispenser for the related Asian peach moth (APM - *Carposina sasakii*).

Small-plot MD trials were carried out in a macadamia nut orchard in Kerikeri using the APM pheromone dispensers (Shin-Etsu Chemical Company Ltd, Tokyo, Japan). In addition, aspects of the guava moth biology and ecology were investigated, such as adult longevity, sex ratio and optimal height for trapping moths.


Adult female guava moth.


Guava moth larvae.


Macadamia field trial site.

Methods

Red delta traps (Desire®) with guava moth pheromone lures (4-component blend - Gibb et al. 2006) as a surrogate for female moths, were used in trap height and small-plot MD trials at a macadamia orchard in Kerikeri.

To determine the optimal height for maximising trap catch of male guava moths, traps were placed at heights of 1, 2 or 3 metres in trees and trap catches were compared.

Pupae were collected from trays of sawdust beneath infested fallen macadamia nuts. To determine how long adult guava moths live and the natural sex ratio, emerged adults (<24 h after emergence) were sexed and placed in a tube with a cotton wool plug soaked in either 10% honey, water, or nothing, and examined daily.

To determine if APM dispensers reduced the ability of male guava moths to find females, trap catch in single-tree MD plots with three APM pheromone dispensers per tree was compared with catch in traps in trees with no dispensers (no MD) and traps with no lures (blank, as an indication of chance catch). In addition, trap catch in the centre of 9-tree MD plots (1 APM dispenser in each of 9 trees) was compared with trap catch in no-MD plots about 50 m and 100 m away from the 9-tree MD plots.

Desire delta trap with a guava moth pheromone lure.


Guava moth pupae in bundles of sawdust.


APM pheromone dispenser in a macadamia tree.

Results

The optimum height for maximising trap catch of guava moth males in macadamia orchards is at 3 m, near the top of the canopy (Figure 1). Adults live for about 2 weeks (Figure 2) and the natural sex ratio is about 1.2 females:1 male. A nectar source did not enhance adult survival.

Pheromone traps acting as surrogate guava moth females in single-tree and 9-tree MD plots trees caught significantly fewer guava moth males than traps in no-MD plots (Figures 3 & 4). A total of 139 male guava moths were trapped in single-tree plots with no MD, while only 19 were trapped in single-tree plots with MD over a period of 21 days. Only 3 male guava moths were trapped in the 9-tree MD plot, compared with 172 and 354 approximately 50 and 100 metres from 9-tree MD plots over a period of 49 days.

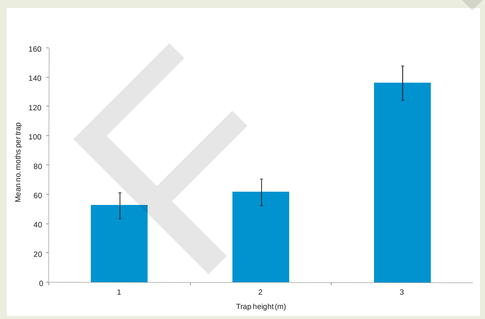

Figure 1. Mean (±SEM) number of male guava moths (*Coscinoptycha improbana*) caught per trap in pheromone traps placed at 1, 2 or 3 metres in macadamia trees from 22 January until 4 March 2009 (n = 10 traps/height).

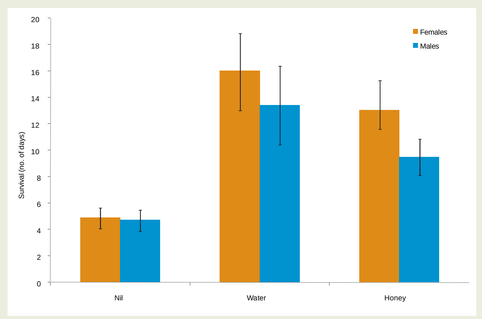

Figure 2. Mean survival (number of days ±SEM) of adult guava moths (*Coscinoptycha improbana*) when exposed to 10% honey, water or nothing.

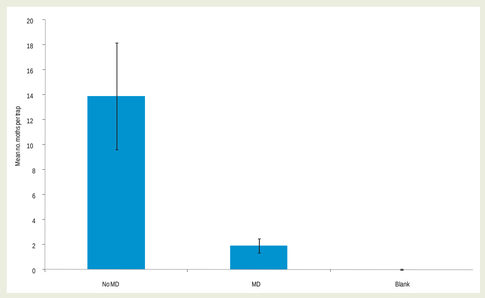

Figure 3. Mean (±SEM) number of male guava moths (*Coscinoptycha improbana*) caught per trap in trees with mating disruption (MD – three Asian peach moth pheromone dispensers), with no MD, or in traps with no guava moth pheromone (Blank) from 11 March until 1 April 2009 (n=10 traps/treatment).

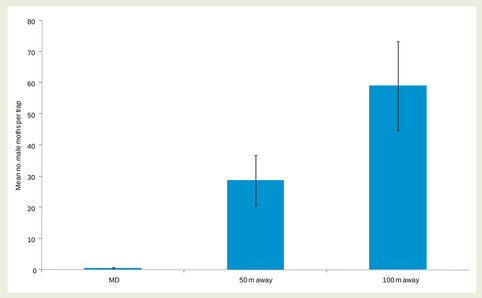

Figure 4. Mean (±SEM) number male moths trapped in the centre of a 9-tree mating disruption (MD) plot, 50 m from the MD plot and 100 m from the MD plot from 1 April until 20 May 2009 (n=6 plots/treatment).

Conclusions

Male moths were significantly disrupted from locating pheromone traps (as a surrogate for female moths), by commercially available APM pheromone dispensers in single-tree (86.3% disruption) and in 9-tree plots (98.3–99.2% disruption).

Mating disruption is most effective when used on large areas and the immigration of mated females can be minimised. Given the wide host range of guava moth and the patchy distribution of its host trees in small orchard blocks and urban backyards, the use of mating disruption may not be effective enough to reduce damage if mated females enter the area (Suckling 2000).

Further research to investigate the potential of APM dispensers to reduce guava moth larval populations and damage on a larger scale is warranted.

Acknowledgements

Thanks to EnviroLink for funding, Northland Regional Council for support, Royal Society for organising the Teacher Fellowship, Graeme Clare at Desire® for supply of pheromone dispensers and traps, Lee-Anne Manning for making pheromone lures, and Jeff Cleghorn for allowing field trials to be conducted on his property.

References

1. Gibb, A.R., Suckling, D.M., Morris, B.D., Dawson, T.E., Bunn, B., Comskey, D., Dymock, J.J. 2006. (Z)-7-tricosene and monounsaturated ketones as sex pheromone components of the Australian guava moth. Journal of Chemical Ecology 32(1): 221-237.
2. Jamieson, L.E., Dymock, J.J., Dawson, T., Froud, K.J., Seldon, D.S., Suckling, D.M., Gibb, A.R. 2004. Guava moth in New Zealand – Distribution, hosts, life cycle observations and discussion of pest management options. New Zealand Plant Protection 57: 13-19.
3. Nor-west News 2008. Pest moth problem is widespread.
4. Suckling, D.M. 2000. Issues affecting the use of pheromones and other semiochemicals in orchards. Crop Protection 19: 677-683.
5. Suckling, D.M., Walker, J.T.S., Lo, P. L., Shaw, P.W., McLaren, G.F., Clare, G., El-Sayed, A.M. 2008. Progress with pheromones and other semiochemicals for fruit pest management in New Zealand, pp 99-107 In Butcher, MR, Walker, JTS and Zydenbos, S. Future Challenges in Crop Protection: Repositioning New Zealand's Primary Industries for the Future. New Zealand Plant Protection Society, Hastings.