MONITORING LEAFROLLER MOTHS IN BAY OF PLENTY KIWIFRUIT ORCHARDS

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SUMMARY

Bait and pheromone trap records from the 1988-89 and 1989-90 seasons in Bay of Plenty kiwifruit orchards are presented and their potential use for deciding when to spray leafrollers is discussed. Pheromone trap catches were higher for lightbrown apple moth (LBAM) (*Epiphyas postvittana*) than brownheaded leafroller (BHLR) (*Ctenopseustis obliquana*). Their abundance in bait trap catches was the reverse. For LBAM, pheromone trap catches did not show either clear flight peaks indicating synchronous emergence of generations, or periods with low flight activity. For BHLR, pheromone catches were also without a clear pattern. BHLR bait trap catches, although very low, indicated two extended periods of relative moth abundance with a gap in March.
Keywords: kiwifruit, leafroller, pheromone, bait trap

INTRODUCTION

A variety of leafroller species can be found feeding on kiwifruit vines (Steven 1990). Currently these and other major pests are controlled with calendar spray programmes. However, it has been suggested for some time that critical periods exist for leafroller control on kiwifruit, which would allow better timing of sprays and reduced frequency of insecticide application for leafroller control (Ferguson 1980; Wearing *et al* 1980). This has been confirmed by subsequent studies in the Bay of Plenty (Steven unpub.) and Waikato (Tomkins unpub.). Attempts to use this knowledge have been hindered by the lack of a suitable technique to monitor leafroller populations on kiwifruit. More recently a method has been developed to enable better targeting of sprays against armoured scale insects on kiwifruit (Hill *et al* 1988) and this has increased the necessity to develop improved ways of monitoring leafrollers. Pheromone traps have been successfully used to schedule spray applications against lightbrown apple moth (LBAM) (*Epiphyas postvittana*) on apples (Suckling *et al* 1988, 1990). The elucidation of pheromones for the key leafroller pest of kiwifruit, the brownheaded leafroller (BHLR) (*Ctenopseustis obliquana*) and more recently for other species is now providing a potential tool for this purpose. This paper discusses the use of bait and pheromone traps for monitoring leafroller moths in Bay of Plenty kiwifruit orchards.

MATERIALS AND METHODS

Bait traps consisted of 1 litre plastic pails suspended in a metal frame beneath the canopy of kiwifruit vines inside the orchard blocks. Port wine (ex. Te Kauwhata Research Station) was used as the bait, with approximately 600 ml used in each trap. Traps were maintained throughout the year and inspected weekly when moths were removed and subsequently identified to species and sex. During trap inspection, the port wine was topped up or periodically completely replaced. Bait traps were operated in an unsprayed block at Te Puke Research Orchard, and in commercial orchards at Tauranga.

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The pheromone traps used and their system of operation have been described by Suckling *et al* (1990). In the 1988-89 season, these traps were operated in 16 orchards located between Katikati and Te Puke. All of these orchards were sprayed according to standard export spray programmes. In most of the orchards, there were three traps of which two were for BHLR and one for LBAM. Several orchards had up to nine traps for each of these two species. Traps were maintained from November until April inclusive. In the 1989-90 season, traps were operated in six of the orchards used in the previous season and at 14 new sites. Each orchard had between 3-46 BHLR and 3-30 LBAM traps per orchard. A longer trapping period was maintained from mid-August until mid-April. Results are presented for the average numbers of LBAM and BHLR trapped in 1988-89 from 18 and 36 traps and in 1989-90 from 86 and 126 traps respectively.

RESULTS AND DISCUSSION

Bait or pheromone traps may be used to determine leafroller phenology and the relative importance of different species.

Table 1 shows relative abundance of the more common or economically important species of leafrollers caught by the bait traps in the Tauranga and Te Puke kiwifruit orchards. There were large differences in the numbers of moths trapped between seasons and the species composition between sites. Fewer moths were caught in the 1989-90 season, and the non-pest species, the brindled bell moth (BBM) *Epalxiphora axenana,* represented the largest proportion of the leafroller species trapped in the Tauranga orchard. Although BBM moths are commonly trapped in kiwifruit orchards their larvae are only rarely encountered on vines (Steven 1990). The species of leafroller larvae most commonly found on kiwifruit vines is BHLR (Ferguson 1980; Wearing *et al* 1980; Steven 1991). Regular monitoring on unsprayed vines at the Te Puke orchard has revealed increasing numbers of black-lyre leafroller (BLLR) (*Cnephasia jactatana*) larvae since the early 1980's (Steven 1991). The port wine trap records at this site give some indication of the increased importance of this species.

TABLE 1: Composition of total season trap catch of leafrollers (mean number per trap, and percentage of total catch) in port wine bait traps located in a Tauranga and a Te Puke kiwifruit orchard during 1988-89 and 1989-90.

	Percentage composition				
Mean No./trap	BHLR	LBAM	GHLR	BLLR	BBM
1988-89					
Tauranga:					
77	33.3	1.3	4.8	8.7	51.9
Te Puke:					
91	35.4	4.4	26.5	20.4	13.3
1989-90					
Tauranga:					
37	19.6	1.8	1.8	10.7	66.1
Te Puke:					
25	17.9	4.1	21.1	44.7	12.2

The bait traps caught only very low numbers of LBAM (Table 1, Figure 1). In contrast, bait traps placed in apple orchards tend to catch similar or higher numbers of LBAM as compared with *Ctenopseustis* spp. (Tomkins *et al* 1987; Suckling *et al* 1990). Pheromone trap catches in individual kiwifruit orchards were often higher for LBAM than BHLR (Table 2). Overall, the numbers of LBAM trapped were approximately 5-10 fold greater than numbers of BHLR (Figure 2). However, larval searches at the Te Puke orchard confirmed that BHLR larvae were far more abundant than LBAM on adjacent unsprayed kiwifruit vines (D. Steven, unpublished). A relatively higher catch of LBAM in relation to *Ctenopseustis* sp. by pheromone traps as compared with bait traps was also reported by Suckling *et al* (1990).

TABLE 2: Average numbers of brownheaded leafroller or lightbrown apple moth caught per pheromone trap in four commercial kiwifruit orchards during the 1988-89* and 1989-90 seasons (number of pheromone traps in brackets).

Orchard	LBAM		BHLR	
	1988-89	1989-90	1988-89	1989-90
A	23.5 (2)*	81.4 (5)	26.3 (4)	29.1 (9)
B	53.0 (1)	67.5 (2)	34.0 (2)	18.5 (6)
C	6.0 (1)	125.6 (6)	10.0 (2)	64.2 (6)
D	80.0 (1)	80.0 (3)	26.5 (2)	16.0 (4)

*Trapping periods: Orchard A — 6.2.88-24.4.89, 2.10.88-16.4.90; Orchard B — 28.11.88-24.4.89, 2.10.89-16.4.90; Orchard C — 26.12.88-24.4.89, 9.10.89-16.4.90; Orchard D — 5.12.88-27.3.89, 2.10.89-5.3.90.

Bait trapping showed that leafrollers were flying all year round (Figure 1). A similar situation has been recorded in Auckland apple orchards (Green 1984). This is due to the relatively milder winter conditions of the northern North Island. In contrast, very few leafrollers fly during winter months in Canterbury (Tomkins *et al* 1987) as temperatures may fall below the lower thresholds for leafroller flight (i.e. 8-11° for LBAM (Danthanarayana 1976)).

Fig. 1: Port wine bait trap catches of female leafrollers in the Bay of Plenty.

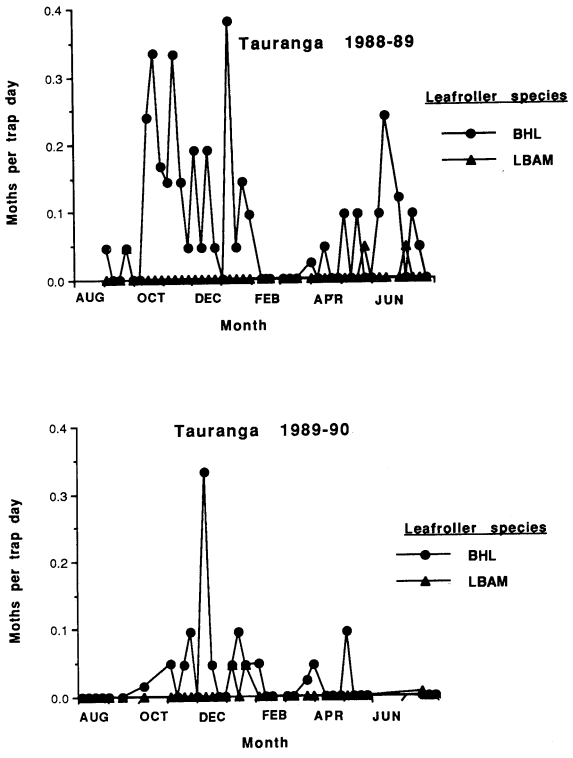
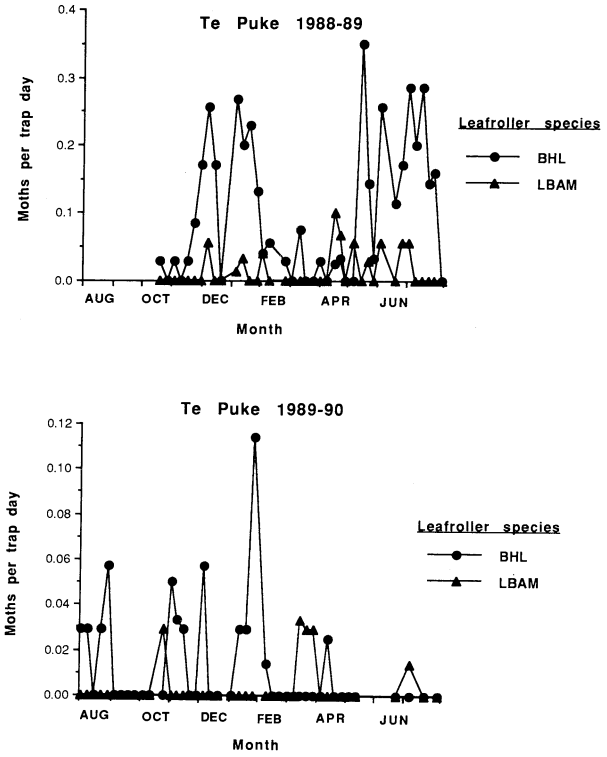


Figure 1 continued . . .



The peak in the numbers of LBAM caught per trap occurred during September (Figure 2) corresponded with the flight of the overwintering generation which gives rise to the first (spring) of the four generations described by Green (1984). In contrast, this peak was the smallest of several recorded during a season by Green (1984). This difference may reflect a lack of competition between pheromone traps and calling female moths early in the season (Tomkins *et al* 1987) or the effects of spraying during the growing season. Later flight peaks described by Green (1984) were not clearly discernible.

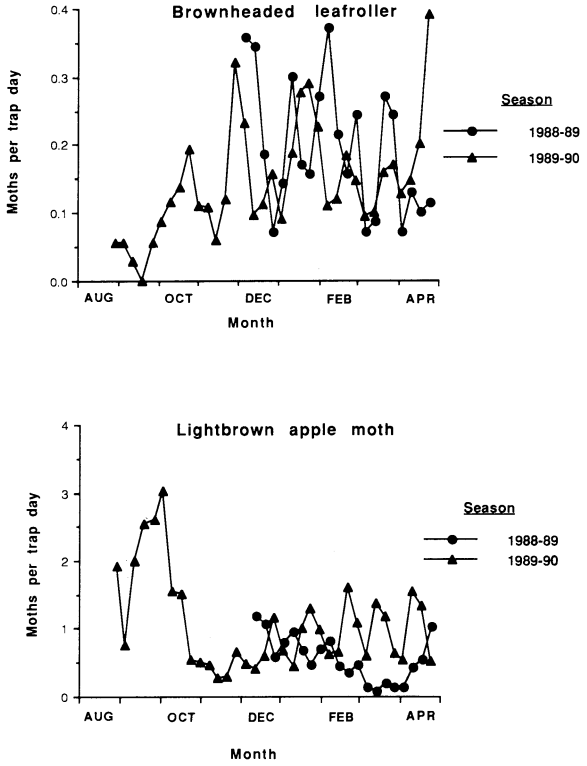
It was not possible to pinpoint any 'window periods' (Suckling *et al* 1988) of low LBAM flight activity occurring with consistency between seasons (Fig. 2). The absence of any 'window periods' probably reflects the lack of generation synchrony and the large numbers of sources (i.e. gullies containing scrub) of leafrollers commonly found in and around Bay of Plenty kiwifruit orchards. The detection of flights is more critical for LBAM later in the season as the larvae of this species tend to become relatively more common then (Wearing *et al* 1980). Further trapping over a larger number of seasons is required before firmer conclusions can be reached.

Because BHLR are more commonly found damaging kiwifruit there is a greater need for reliable monitoring of this species. The numbers of BHLR caught by pheromone traps in 1989-90 peaked in October and then increased to a second and higher peak in early December (Figure 2). In both seasons the pheromone trap data indicated the existence of a flight peak during December. Over the same period bait trap

catches were also high (Figure 1). A similar bimodal peak was found for this species in November-December by Green (1984). The existence of a flight over this period is important as this corresponds with kiwifruit fruit set, a key period for leafroller damage (Ferguson 1980; Wearing *et al* 1980; Steven 1991). If this flight can be reliably monitored and it can be determined that pheromone trap catches are related to larval numbers then this could assist spray decisions. Thresholds set for this period would probably not apply throughout the season as few BHLR larvae attack fruit after the critical post fruit set period in spite of their continued presence on foliage (D. Steven unpub.; A.R. Tomkins unpub.).

The number of BHLR generations per season in the Bay of Plenty cannot be distinguished from these pheromone trap records. Some trends are apparent with the December peak followed by crests of activity during January/February and from April onwards. However, trap records over a longer period indicate a less distinct pattern (Steven 1990). Even so, there is some indication from the bait trap catches (Figure 1) of a period of low flight activity during March.

Fig. 2: Pheromone trap catches of male leafrollers in the Bay of Plenty.



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REFERENCES

Danthanarayana, W., 1976. Flight thresholds and seasonal variations in flight activity of the light-brown apple moth *Epiphyas postvittana* (Walk.) (Tortricidae) in Victoria, Australia. *Oecologia 23:* 271-282.

Ferguson, A.M., 1980. Are there critical periods of caterpillar damage to Bay of Plenty kiwifruit? *Proc. 33rd N.Z. Weed and Pest Control Conf.:* 96-99.

Green, C.J., 1984. Bionomics of *Epiphyas postvittana, Ctenopseustis obliquana, Planotortrix excessana* (Lepidoptera: Tortricidae) and *Stathmopoda "skelloni"* (Lepidoptera: Stathmopodidae) on apple cv. 'Doughtery' in Auckland. Ph.D. thesis, Auckland University. 137p.

Hill, G., Charles, J. Steven, D., Tomkins, A. and Blank, R., 1988. Towards integrated pest management. *N.Z. Kiwifruit J.: Special Research Issue 2:* 35-37.

Steven, D., 1990. Entomology in kiwifruit. pp. 362-412. *In:* Kiwifruit Science and Management. (Eds.) I.J. Warrington, G.C. Weston, R. Richards, Auckland. 576p.

Steven, D., 1991. Pest Lepidoptera of kiwifruit in New Zealand. *Acta Horticulturae:* In press.

Suckling, D.M., Walker, J.T.S., Shaw, P.W. and White, V., 1988. Spray less for leafroller control. *Orchardist of N.Z. 61:* 21-22, 24.

Suckling, D.M., Thomas, W.P., Burnip, G.M. and Robson, A., 1990. Monitoring lepidopterous pests at two Canterbury orchards. *Proc. 43rd N.Z. Weed and Pest Control Conf.:* 322-327.

Tomkins, A.R., Penman, D.R. and Chapman, R.B., 1987. Use of traps for monitoring adult leafrollers in apple orchards. *N.Z. J. Exp. Ag. 15:* 91-95.

Wearing, C.H., York, M. and O'Kane, P., 1980. Supervised spraying of lepidopterous pests of kiwifruit in Bay of Plenty. *Proc. 33rd N.Z. Weed and Pest Control Conf.:* 100-104.