COMMERCIAL USE OF LEAFROLLER PHEROMONE TRAPS IN NELSON

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SUMMARY

Nelson orchardists used leafroller pheromone traps in 1991/1992 to monitor leafroller flight activity. These data were used to advise 83% of orchardists participating in the programme to make two insecticide spray reductions in the next season, and 13% to make one insecticide spray reduction. A questionnaire (93% response rate), indicated that orchardists were generally satisfied with the programme and highlighted areas for improvement. Eighteen percent of respondents had used pheromone traps for 3 or more years. Over 91% successfully reduced insecticide use in the 1992-93 season without an increase in fruit damage at harvest, and cost savings were achieved. An estimated 25% of Nelson pipfruit orchardists currently use pheromone traps.
Keywords: leafrollers, pheromone traps, questionnaire, consultancy

INTRODUCTION

Leafrollers pose a major threat to the export apple industry because of their quarantine status. In Nelson, leafroller control is achieved by routine insecticide applications at 10-14 day intervals from immediately post-bloom in early November to 2 or 3 weeks before harvest. As many as 10 to 12 insecticide applications may be made to late season apple varieties.

Pheromone traps provide a useful tool for monitoring leafroller flight activity. Trap catches can provide an indication of the risk of leafroller infestation on an orchard and the potential for insecticide spray reductions. The dominant leafroller species in Nelson is *Epiphyas postvittana* (Walker) (lightbrown apple moth or LBAM) (Suckling *et al.* 1990). Native leafrollers and codling moth, *Cydia pomonella* L., are generally not a problem on commercial orchards in this district. Several seasons of trap monitoring at Appleby Research Orchard established patterns of LBAM flight activity (Suckling *et al.* 1988). These patterns were generally consistent from year to year, allowing the development of a reduced insecticide spray programme based on gaps ("windows") between generations early in the season. Trials on a further 10 orchards confirmed the efficacy of a reduced insecticide spray programme, using up to two fewer sprays without any increase in fruit damage at harvest on properties where leafroller activity was low enough during "window" periods (Suckling *et al.* 1990). The success of these early results highlighted the potential for insecticide spray savings and led to the commercial introduction of pheromone traps in Nelson in the 1991-92 season. This paper reports on the use of pheromone traps by growers in the 1991/92 and 1992/93 seasons.

METHODS

Growers used triangular "Desire" traps with removable sticky bases, baited with rubber caps impregnated with sex pheromone (Suckling and Shaw 1990). The set of orchard traps consisted of four perimeter and two internal LBAM traps, with two perimeter traps for each of three native leafrollers found in Nelson (*Planotortrix excessana*, and either *Ctenopseustis obliquana* or *C. herana*, depending on orchard location). Traps were placed at 1.5 m height on apple trees internally and on

surrounding perimeter vegetation to maximise the chance of catching moths and to assess the potential leafroller pressure on each orchard. The choice and number of traps was made on the basis of earlier trapping results. Caps were changed six weekly and sticky bases were changed monthly or more often if required.

In 1991-92, 41 orchardists operated pheromone traps, and this increased to 62 in the 1992-93 season. In 1991-92, traps were retailed through local horticultural merchants, and their field staff were trained as consultants by the senior author with assistance from Christine Batt (formerly New Zealand Apple and Pear Marketing Board). In the 1992-93 season, five consultants with a suitable horticultural background were appointed to carry out this role. Growers were required to service their own traps weekly and record trap catches. A comprehensive instruction kit explaining all aspects of the programme was provided. Pheromone traps were operated from October to April and growers were asked to submit their trap catch data for graphical presentation and interpretation at a meeting. The operation of the reduced insecticide spray "window" programme was explained to 41 orchardists participating in the programme and recommendations on any insecticide spray reductions for the following season were made on the basis of individual trap results. Trapping continued in the second season to confirm the timing of the "window" periods. A questionnaire was used to gauge the growers response to the commercialisation of leafroller pheromone traps. Thirty-eight of the 41 orchardists involved in the programme in 1991-92 were contacted and asked to answer the questionnaire in an interview situation.

Spray programmes from 1991/92 were obtained for a sample of 24 orchardists not using pheromone traps, in order to establish a baseline for insecticide use. The cumulative frequency of post-bloom insecticides of this group was compared with results from a similar survey of post-bloom organophosphate insecticide use on 'Granny Smith' by Nelson orchardists conducted after the 1988-89 season, in cooperation with the NZAPMB. Interviews with a sample of orchardists with the variety 'Granny Smith' (chosen from random numbers) were conducted by NZAPMB field staff (n=25 orchards).

RESULTS AND DISCUSSION

Leafroller monitoring

As there is no established threshold to guide insecticide spray applications for leafrollers, we chose the subjective threshold for omitting insecticide applications during the "window" periods (second spray, mid-November and fourth spray, mid-December) of a catch of ≤ 1 moth per trap.day over two consecutive trapping occasions (Fig. 1). These insecticide spray omissions are not consecutive and secondary pests are adequately controlled by the first and third cover sprays (Suckling *et al.* 1988). Only the flight activity for *E. postvittana* is shown, as native leafrollers are relatively unimportant in Nelson orchards (Suckling *et al.* 1990). Orchardists were advised not to use trap data outside the "window" periods as a guide to insecticide spray applications, as a low trap catch does not guarantee zero infestation risk. Trap data obtained from a subsample of 23 orchards for 1991-92, was used as the basis for a proposal that 19 orchardists could omit two applications in the following season and three could omit one application. The remaining orchardist was advised not to make any reductions to his insecticide spray programme. Examination of the spray dairies used in the following season revealed that of the 19 orchardists advised to omit two sprays during the "window" periods, 10 actually made both reductions and eight orchardists omitted only one spray from their programme, while one made no reductions (Table 1). The three orchardists who were advised to use one fewer spray application actually made zero, one, and two spray reductions, and the grower advised not to change his insecticide programme actually didn't apply an insecticide spray over a long 40 day interval during the "window" period (Table 1). This variability was probably influenced by each orchardist's attitude to the programme. A cautious orchardist may make fewer reductions than recommended, while others could interpret a period of low trap catch to mean an insecticide spray is not necessary, and decide

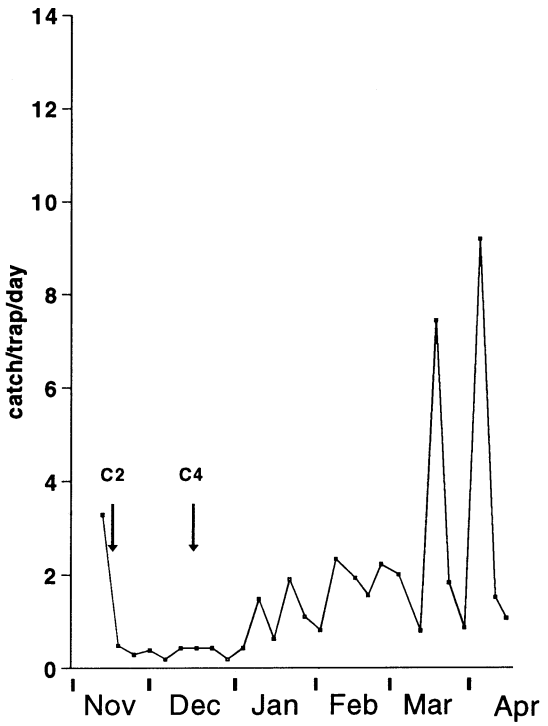

Figure 1: **Typical *Epiphyas postvittana* flight patterns in Nelson, showing the two "window" periods (pesticide applications 2 and 4).**

to omit sprays. Since fungicide and insecticide sprays are usually mixed in the same tank and applied together there is a trend for many growers to increase their spray intervals during January until harvest, as the risk of disease diminishes with drier weather. However, leafroller pressure increases over this period and growers stretching spray intervals risk leafroller damage at harvest. Although many Nelson growers may be able to make two spray reductions, pheromone trap data from individual orchards should be obtained first to guide spray decisions over the "window" periods. Any grower making spray reductions without the benefit of trap data would be taking an unwarranted risk.

TABLE 1: Distribution of recommended and actual insecticide application reductions made by orchardists in the 1992-93 season.

Number of orchards	Suggested insecticide reductions	Actual insecticide reductions		
		2	1	0
19	2	10	8	1
3	1	1	1	1
1	0	0	1	0

There appears to be little opportunity to make further spray reductions after December as a subsequent change in larval feeding preference occurs from foliage to fruit (Warren Thomas pers. comm.) and hence there is greater risk of leafroller damage to fruit, even if flight activity is low. It is to be expected that the usual increase in flight activity during March and April (Fig. 1) would encourage maintainance of insecticide cover up to harvest to avoid fruit damage. There is preliminary evidence that growers using traps have shorter insecticide spray intervals post-Christmas than non-users (unpublished data).

The benefits

The benefits of the trapping programme to orchardists and the industry look very encouraging. The omission of two insecticide applications represents a 20 - 25% reduction in number of insecticide applications, depending on variety. While residues at harvest are not reduced by the "window" programme, this reduction in organophosphate insecticide applications represents a real environmental benefit. The cost saving of one to two insecticide applications at $50 - 60 per ha per application is also significant. The "window" programme provides an opportunity to use an insecticide control programme based on leafroller phenology rather than routine calender spraying. Some orchardists have used site-specific trap data to identify leafroller 'hot spots' around their orchards, and where practical have removed surrounding host plants to reduce the risk of leafroller immigration into the orchard. Orchardists who have monitored leafroller for 3 or more years use the trap data to confirm the presence and timing of the "window" periods from year to year, giving them more confidence in making spray decisions.

The pheromone trapping programme has been successfully introduced to commercial orchardists. Two years after commercial release, approximately 25% of registered Nelson orchardists are operating traps. Most (>85%) are already making spray reductions based on the technology.

Grower surveys

A comparison of the cumulative frequency distributions of post-bloom insecticide use by a sample of growers that were not pheromone trap users in either 1988-89 or 1991-92 indicated a general reduction in frequency of growers applying more than 11 insecticide applications per season (Fig. 2). The mean number of post-bloom insecticide applications used by orchardists in 1988-89 (10.6 sprays, SE=0.48) was the same as the mean (10.5 sprays) reported for 84 Nelson orchardists in 1980-81 (Hancox and Penman 1982), suggesting little change during the 1980s. By 1991-92, a significant reduction in post-bloom insecticide usage on 'Granny Smith' apples had occurred (9.1, SE=0.36, $t=2.5$, $P<0.05$) indicating that growers applied ca. one fewer application per season in 1991-92. Because the original 1988-89 spray diaries are not available, it is unclear whether changes stem from early season reductions, as advocated for pheromone trap users. The savings from the pheromone trap programme represent a further downward shift in insecticide use.

Thirty-eight of the 41 orchardists supplied with traps in the 1991-92 growing season were interviewed. Most of the orchardists questioned (>60%) had only trapped for one season, but others had been trapping for up to four or more seasons (Table 2). Results indicated that orchardists were generally satisfied with the programme and could follow the instructions provided in the information kit. The trapping programme was considered to be "user-friendly" and orchardists understood the aims. Many orchardists recognised the benefits from the programme, such as spray reductions confirming "windows", identifying "hot spots" and cost savings. None of the orchardists questioned who had operated traps and omitted spray applications had noted any increase in leafroller damage to fruit at harvest. Orchardists who had trapped for 2 or more years were familiar with the programme and preferred to interpret their own trap data and make their own decisions on spray reductions during the "window" periods without the need for further consultancy. The time commitment required for servicing traps (30-40 mins/week) was a problem for some orchardists, especially once harvesting began. Consequently some orchardists did not monitor traps for the full season.

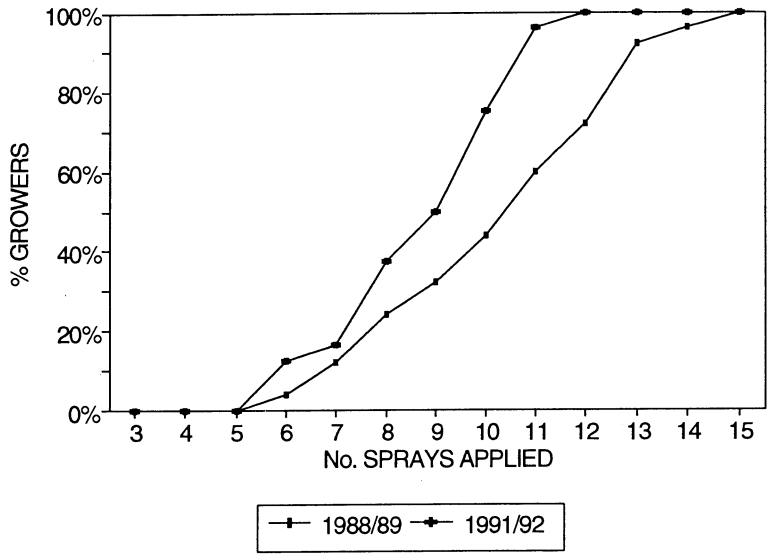

Figure 2: Cumulative frequency distributions of post-bloom insecticide applications by Nelson orchardists not using pheromone traps, in the 1988-89 and 1991-92 seasons.

This is a reflection of the degree of fit between trapping as an innovation, and the users of the technology (Wearing 1988), some of whom in this case were sensitive to the time costs of trapping.

TABLE 2: The trapping experience of orchardists responding to the questionnaire after the 1991-92 season.

Number of orchardists	No. of years trapping 1	2	3	≥4
38	24	7	3	4

There was a general feeling amongst orchardists that the delivery of the trapping package, level of technical support and reporting by the horticultural merchants was inadequate and had not taken place as originally envisaged. To address this problem, a consultancy service was set up by Hort Research in the 1992-93 season. Five consultants with a horticultural background were trained in all aspects of the programme. Each consultant had 10 - 12 orchardists to whom they were responsible. Assistance and advice were provided in setting up and operating traps, and orchardists were contacted again during the season to see if they had had any problems. Consultants provided interpretation of results and made recommendations on spray programmes to individual orchardists at an end of season meeting where results could be compared.

Orchardists have been encouraged to follow the trapping programme themselves and only use their appointed consultant as a back up when technical support is necessary. This approach will allow more orchardists to join the programme and make the most efficient use of the consultants' time, as well as raising the pest management

expertise of participating orchardists. A considerable promotional effort will be required if the programme is to expand in the future but this is possible given that the necessary consultancy support is now in place to assist the technology transfer.

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