Project Title:	Vining peas: monitoring and control of silver Y moth (*Autographa gamma*)
Project Number:	FV 192
Final Report:	1998
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Date Project Commenced:	April 1996
Date Completion due:	December 1998
Keywords:	Vining peas, silver Y moth (*Autographa gamma*), monitoring, pheromone traps, chemical control.

CONTENTS

PRACTICAL SECTION FOR GROWERS

Background

Contamination of vined peas by the caterpillars or pupae of the silver Y moth (*Autographa gamma*) can result in crop rejection by the processors. If undetected, in canned or frozen peas, customer complaints to the retailer add a high cost risk to the processors.

In this project, a study of the biology of the insect together with evaluation of a pheromone-based monitoring trap, has been made. The results have led to the construction of a monitoring system, together with the development of chemical control measures, providing a practical system for use by the grower to prevent losses as a result of product contamination.

Objectives

- To evaluate and compare the usefulness of commercially available pheromone traps in a strategy to control silver Y moth.
- To determine action thresholds on which to base decisions for control.

Summary of Result

The funnel type pheromone trap (Agralan Ltd.) was shown to be very effective in catching silver Y moth males in pea crops during 1996. Migrations of adults in 1996 began on 5th June with peak numbers recorded by 17th June. Caterpillar control was achieved following a two-spray programme of cypermethrin applied at the first pod stage (gs 204) and repeated 10 days later. Observations on moth activity, oviposition and caterpillar development allowed the formulation of a life cycle. In 1997 and 1998, trap catches were related to caterpillar infestation and a threshold was devised to be used in a crop protection strategy for vining peas. The work showed that a cumulative catch of 50 or more moths at the first pod stage (gs 204), warranted treatment of the crop to prevent contamination by caterpillars and pupae.

Action points

- A funnel trap should be sited in the pea field by mid-May
- Moths should be counted three times per week until the first pod stage
- A threshold catch is reached when the cumulative catch exceeds 50 moths by the first pod stage (gs 204)
- A spray of an approved pyrethroid insecticide should be made 7 - 10 days after the first pod stage.
- A second spray applied 10 days later at first swollen pod (gs 206)

Benefits

Growers using traps in their own crops are able to monitor immigration of moths into vining peas.

Decisions on control can be made on a threshold level of moth catches in traps, reducing the necessity of prophylactic treatment and allowing effective control of caterpillars by the optimum timing of insecticides, avoiding contamination of produce by caterpillars or pupae.

The system can be used as part of an IPM programme for vining peas.

SCIENCE SECTION

Introduction

Silver Y moth (*Autographa gamma*) is a frequent, although sporadic migrant pest of a wide range of horticultural and agricultural crops. The caterpillar feeds on leaves, stems and fruits or pods causing a degree of physical injury to the plant.

In vining peas, the caterpillar and its pupa becomes a problem as a contaminant of the produce after harvest.

Adults fly to crops from late May onwards and lay eggs on the foliage. The resulting caterpillars remain within the crop canopy and feed until mature. They then spin a web within the foliage and pupate inside a black shiny chrysalis. When the larval or pupal stage coincides with harvesting, they become dislodged during vining and are harvested together with the peas. The green coloured caterpillars are difficult to see in the factory and these and the pupae are difficult to remove from the produce. Contamination, if detected during the pre-load inspection, results in load rejection. Undetected contamination results in customer complaints to the retailer.

In the first year of this project, the use of pheromone traps to monitor immigrating moths was evaluated and spray trials were carried out to determine the optimum spray timing to prevent crop contamination. During 1997 and 1998, further trapping was carried out to determine a threshold number of trapped moths at which the risk of contamination is likely.

Materials and Methods

1. Trapping

In 1996, two types of commercially available pheromone traps were evaluated in the field. The sticky "Delta" trap and the funnel trap (type HC77) available from Agralan Ltd., The Old Brickyard, Ashton Keynes, Swindon, SN6 6QR.

Both trap types were sited in two commercial crops of vining peas in mid-May. The site details are shown in Appendix 1. Each pair of 'Delta' traps were sited at least 500m from the single funnel trap in each field. Counts of adults were made three times per week throughout the period, ending approximately one week before the crops were harvested.

Air temperature was logged at one hour intervals using Tiny Tag ™ recorders sited in each field.

Single funnel traps were sited in four crops in 1997 and five in 1998 from mid-May (Appendix 2) and moths counted three times each week as before.

Temperature recordings were not made in those years.

2. Chemical control trials

In 1996, spray trials were carried out in the two crops in which the traps had been sited, and in a third site (Appendix 1) where no monitoring had been carried out.

Each trial consisted of plots 4m x 10m and the insecticide used was cypermethrin, applied as Cyperkill 10 at a rate of 250ml/ha in 200 l of water using an Azo plot sprayer with Lurmark O2/F110 nozzles at 2.5 bar provided by propane.

Sprays were applied according to crop growth stage and were as shown in Table 1.

Table 1. Spray application timings

Treatment No.	No. of sprays	Spray timing
1	Untreated	-
2	1	T_1 = First pod (gs 204)
3	1	T_2 = 10 days after gs 204
4	2	T_1 & T_2
5	1	T_3 = First swollen pod (gs 206)
6	2	T_2 & T_3

Each treatment was replicated four times in a randomised block design. Three to four days before harvest, the plots were examined for the presence of caterpillars by randomly shaking the plants within a $0.2m^2$ area at ten positions in each plot, and caterpillars counted according to size viz. Very small, small, medium and large.

3. Caterpillar infestation in monitoring sites

In 1997 and 1998, unsprayed areas of vining peas 40m x 20m were examined for caterpillars just before harvest by examining 50 areas of the crop $0.2m^2$ in area and vigorously shaking the plants within each area. Caterpillars were counted according to size as above. The site details are shown in Appendix 2.

Results

1. Comparison of traps and temperature recording

Trapping in 1996 commenced a few days before an unusually large migration of adults occurred. The funnel traps were significantly more successful in catching moths than the 'Delta' traps. The catch records are shown in Table 2 below.

Table 2. Trap comparisons 1996

Site:	Holbeach Hurn			Manor Farm		
Date	Delta A	Delta B	Funnel	Delta A	Delta B	Funnel
31.5	2	5	n/a	2	2	0
3.6	4	0	n/a	2	0	0
5.6	1	0	n/a	0	2	40
7.6	0	0	n/a	4	1	120
10.6	2	4	346	2	3	359
12.6	0	1	112	0	0	106
14.6	0	0	122	0	0	295
17.6	0	0	572	0	1	473
18.6	1	0	91	1	0	171
20.6	0	1	94	0	0	100
21.6	0	0	33	0	0	46
24.6	0	0	69	0	0	83
26.6	0	0	214	0	0	155
28.6	0	1	224	1	0	276
1.7	0	0	77	0	0	229

(n/a = trap not in site)

The funnel catch records for both sites, including the mean hourly temperature per day are shown in Figures 1 & 2 below.

Figure 1. Holbeach Hurn 1996

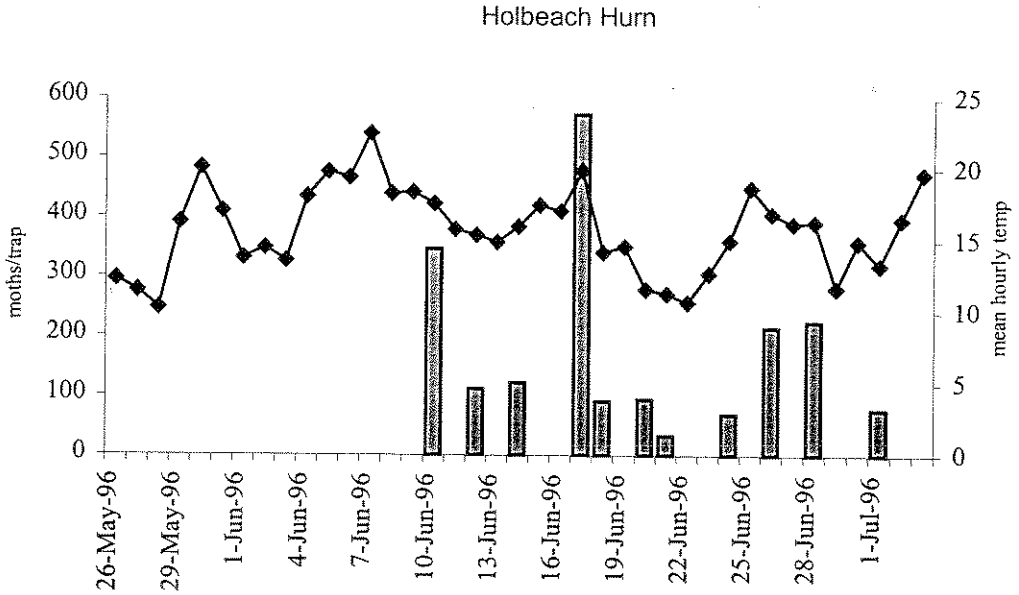
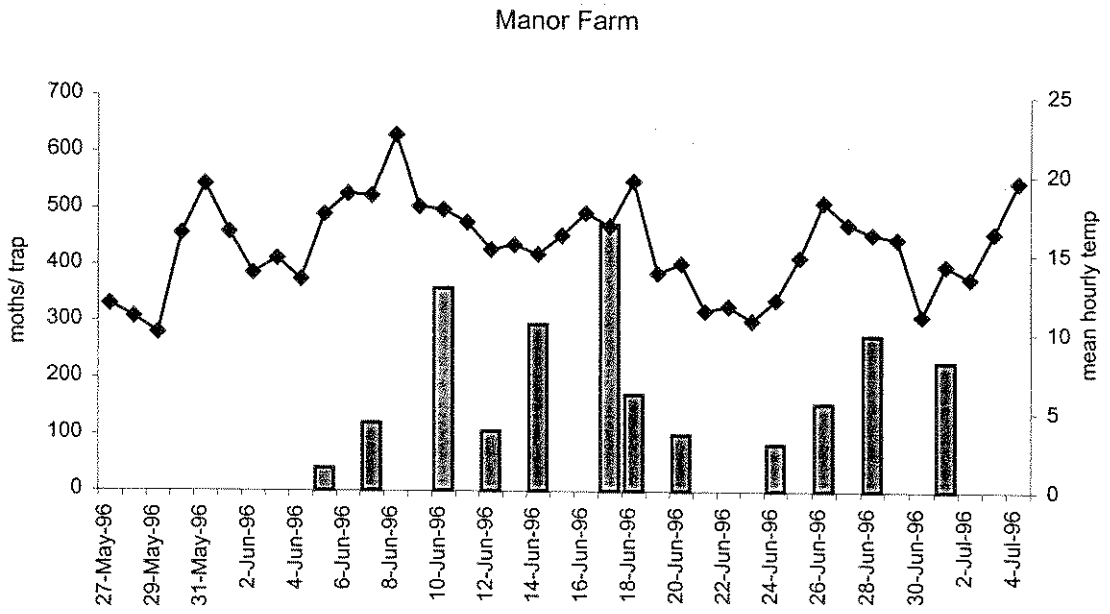


Figure 2. Manor Farm 1996



In 1997 and 1998, the single funnel traps were placed in commercial crops and monitoring was carried out as before. No temperature recording was made. In 1997, the period of highest moth catches was between June 2nd and 11th, which was of similar duration to that experienced in 1996. In 1998, moths were caught on May 20th and numbers were variable until June 10th, reaching a peak on June 29th but continuing at all the sites until mid July. The weather over the summer period was generally cool with frequent rain showers, which may have affected insect activity.

The results of the trapping at the nine sites are shown in Figures 3 - 11 below:-

Figure 3. 1997 Site 1

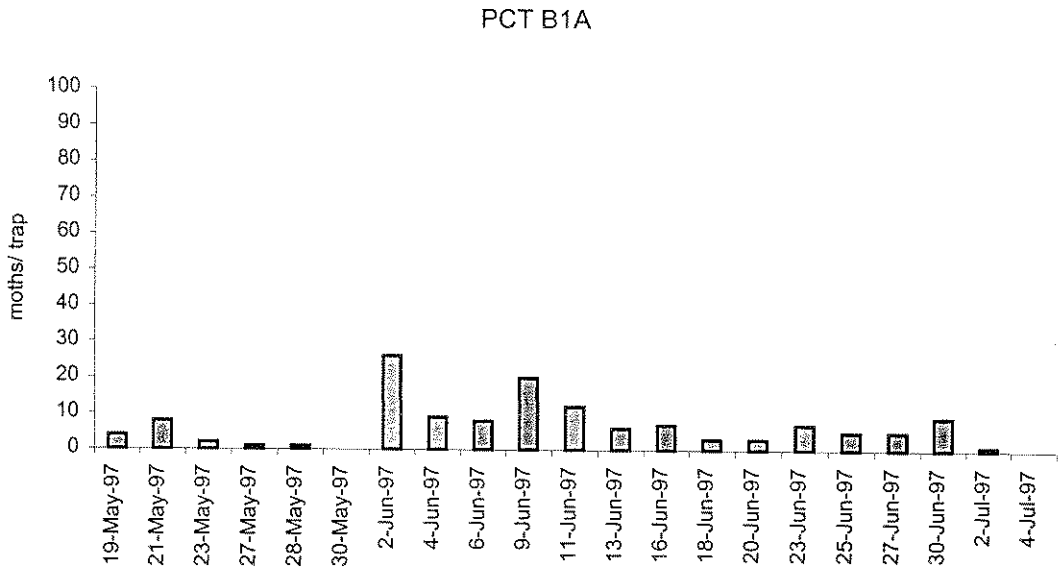


Figure 4. 1997 Site 2

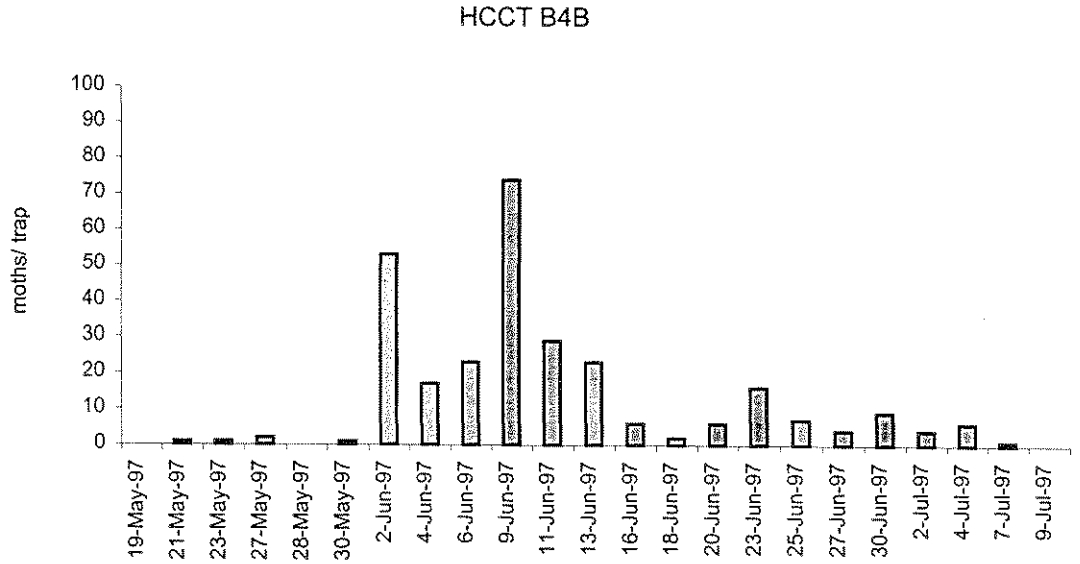


Figure 5. 1997 Site 3

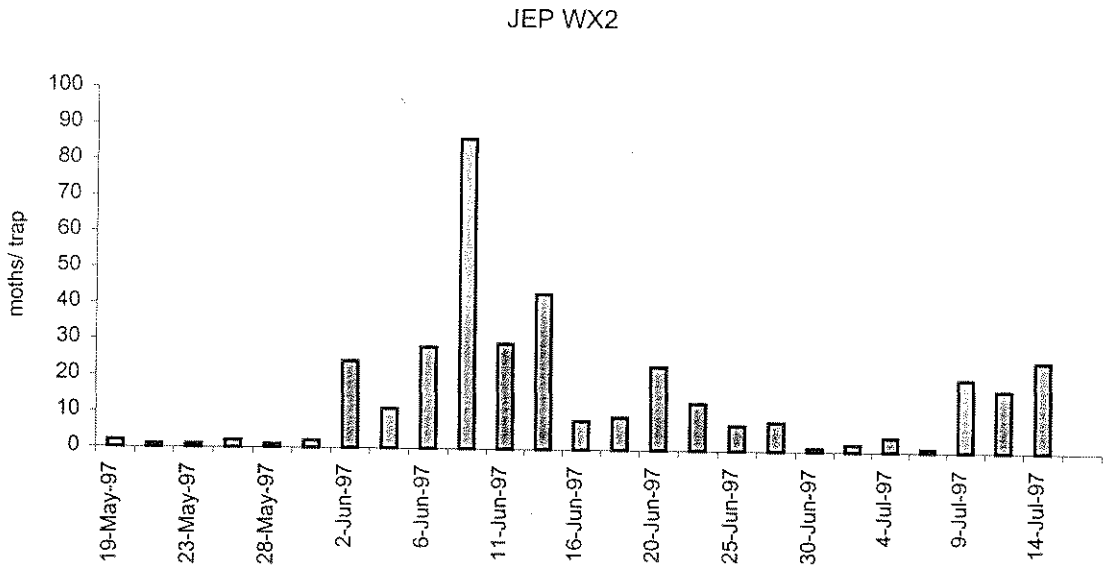


Figure 6. 1997 site 4

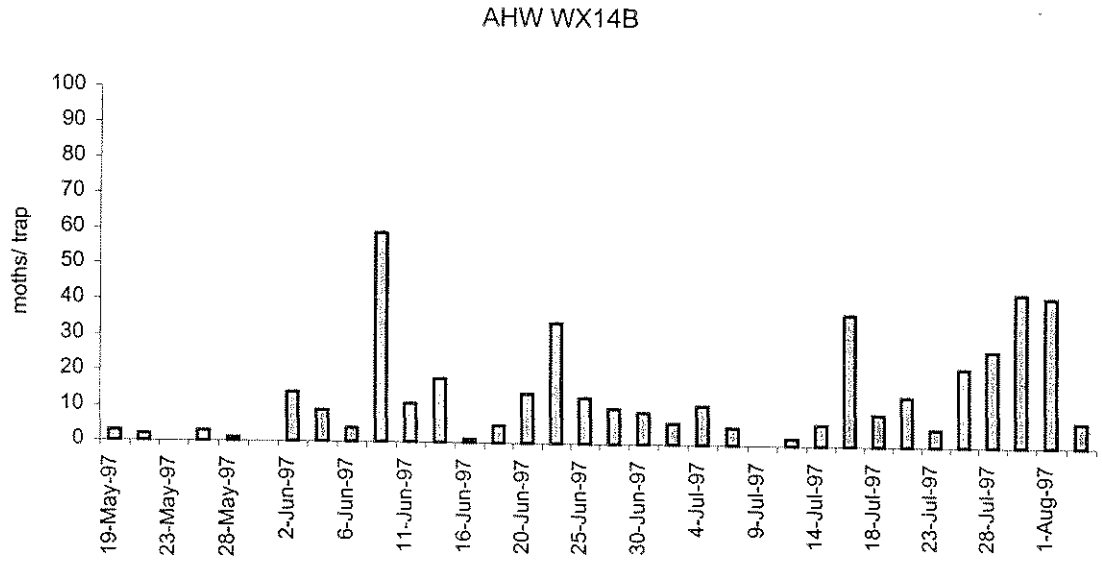


Figure 7. 1998 Site 1

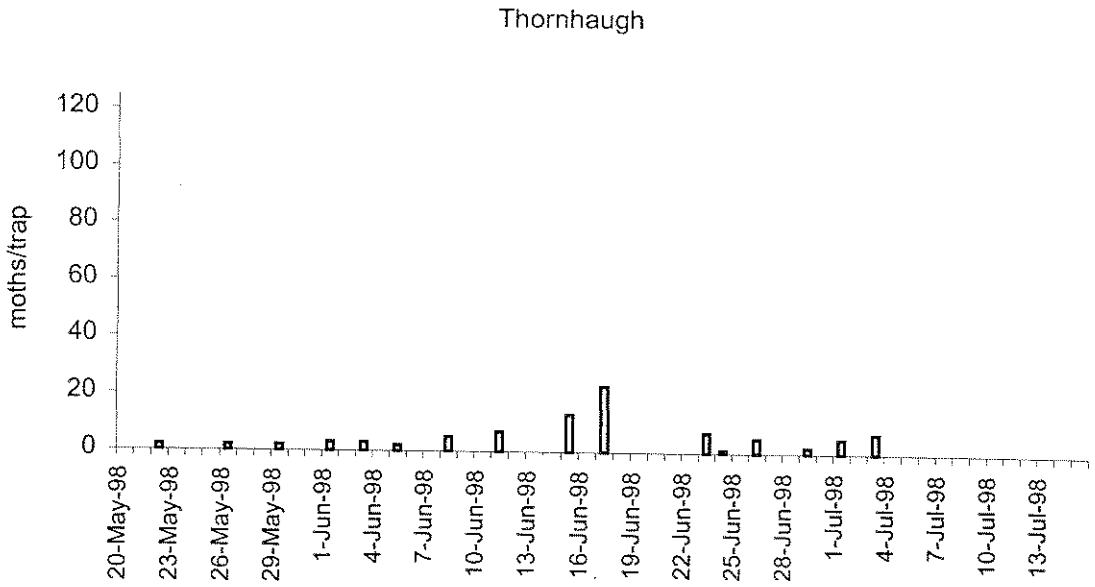


Figure 8. 1998 Site 2

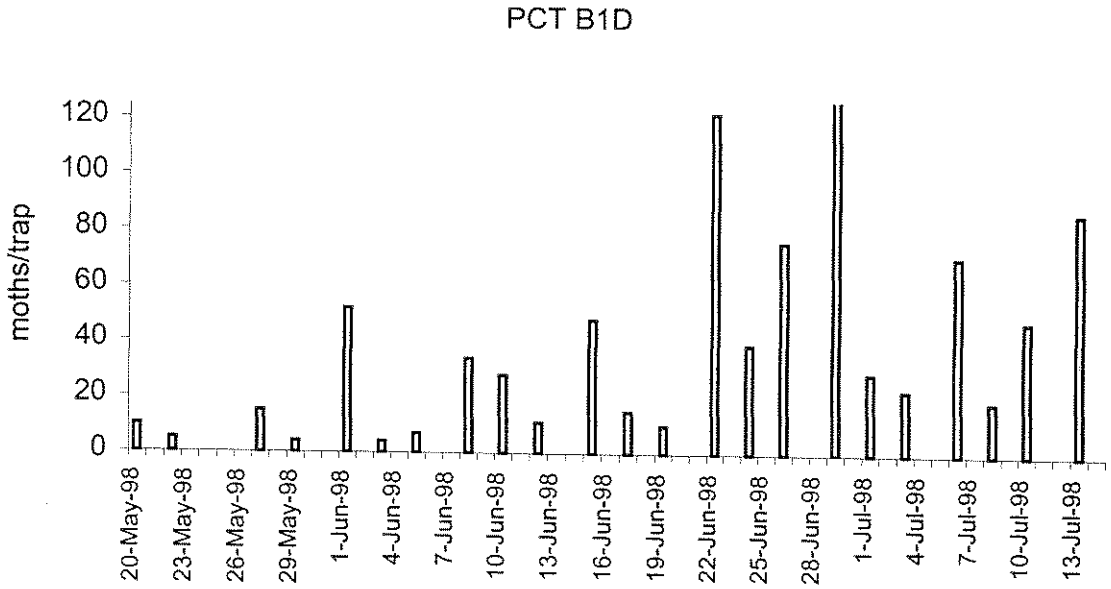


Figure 9. 1998 Site 3

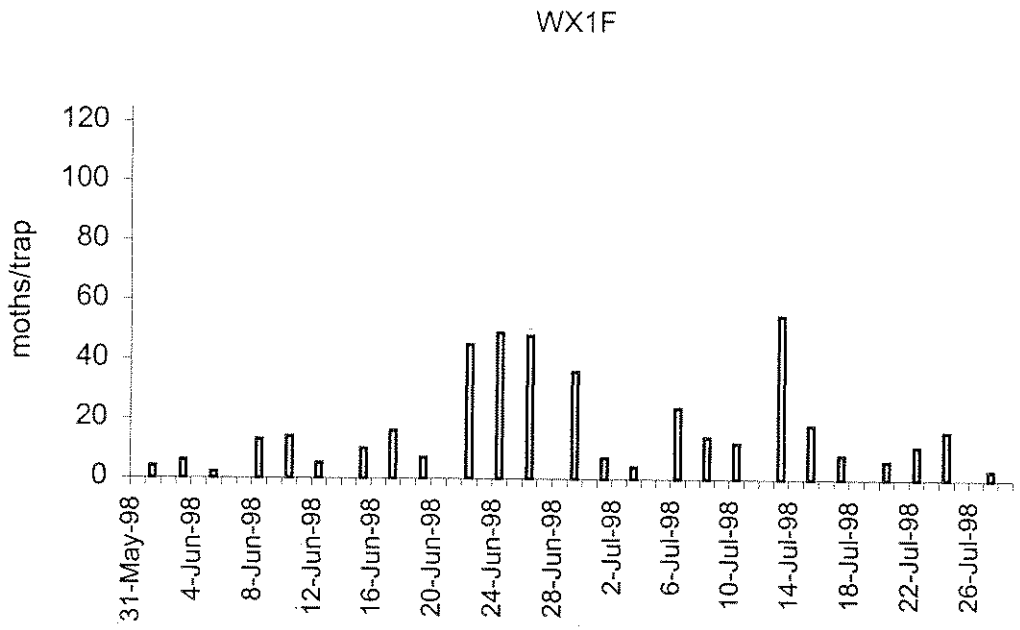


Figure 10. 1998 Site 4

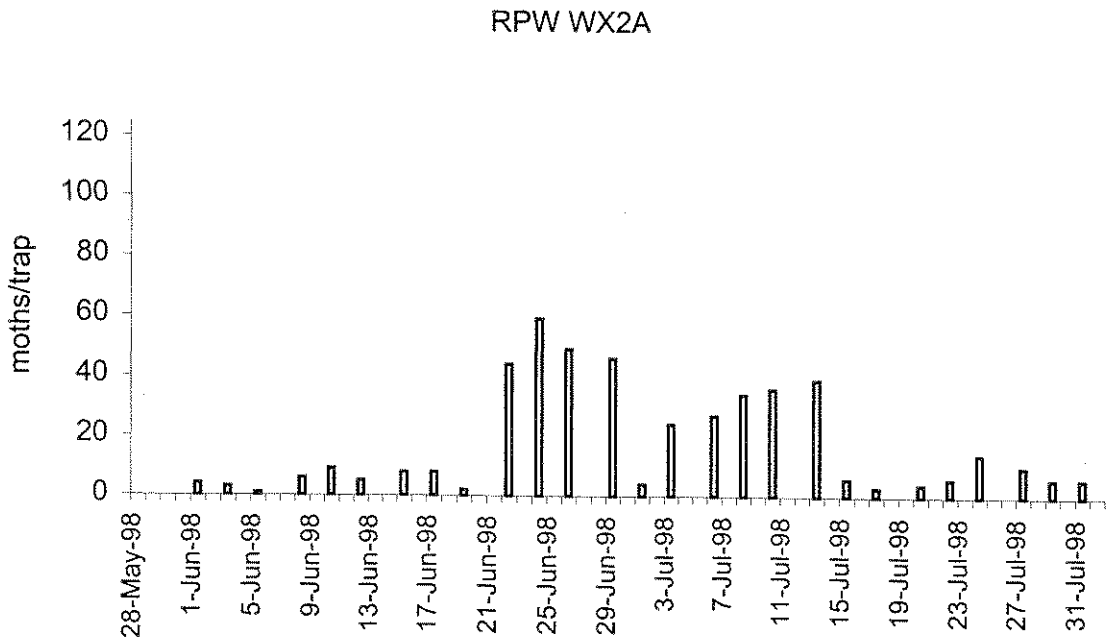
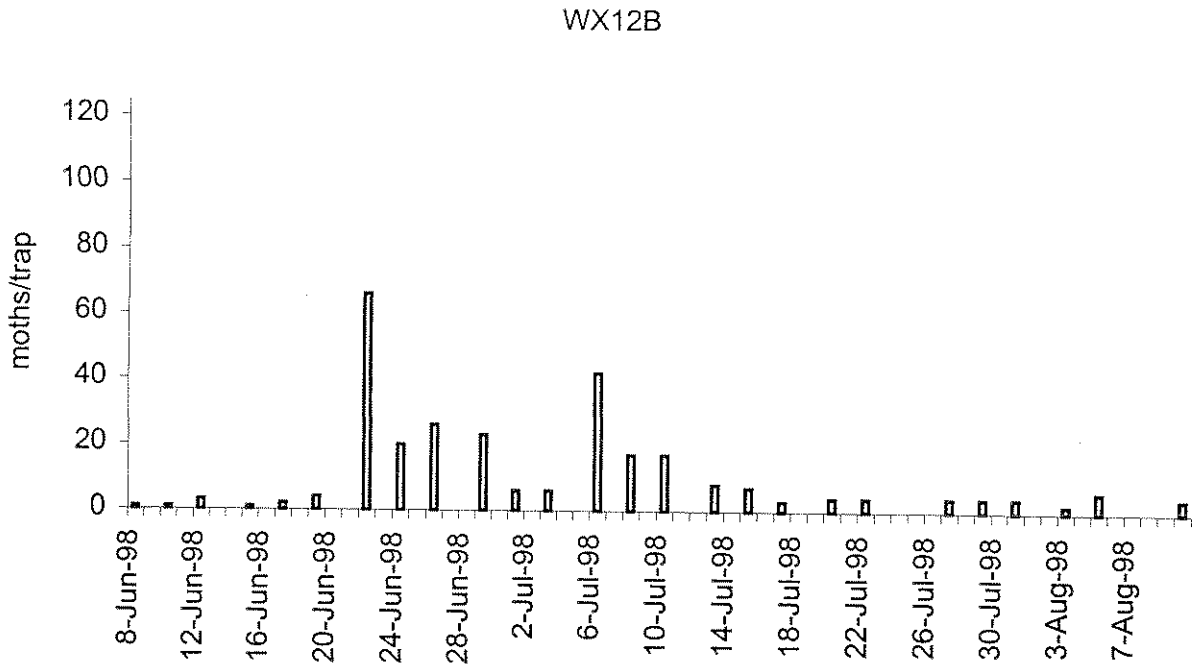


Figure 11. 1998 Site 5



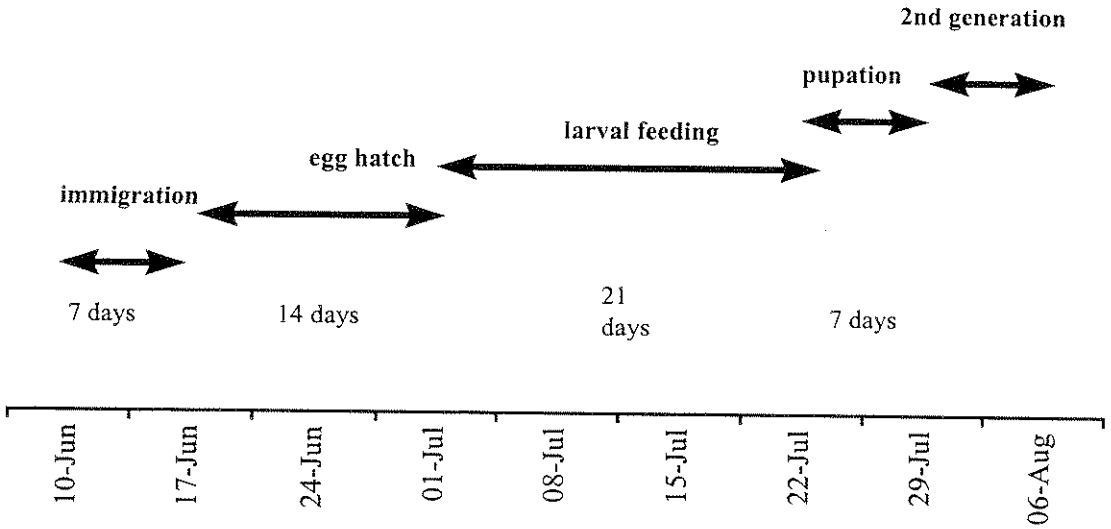
Insect development

During the 1996 season, the main flights of silver Y moths began on the 5th June, with the majority of moths caught by June 17th (Figures 1 & 2). The first egg was observed at the Holbeach Hurn site on June 12th and the first larvae recorded on June 20th. Pupae were found on July 15th and the new brood of adults began to emerge on July 22nd. The numbers of adults were exceptional and the reason for this were thought to be the combination of southerly air streams over the UK which coincided with the main adult emergence period in North Africa and Mediterranean countries.

In 1997, the same weather conditions did not occur and very little migration of adults was reported. However, moth catches occurred in significant numbers and these were thought to have originated from an over wintering population. A similar trend occurred in 1998.

From the observations made in 1996, the following sequence of the life cycle was deduced (Figure 12)

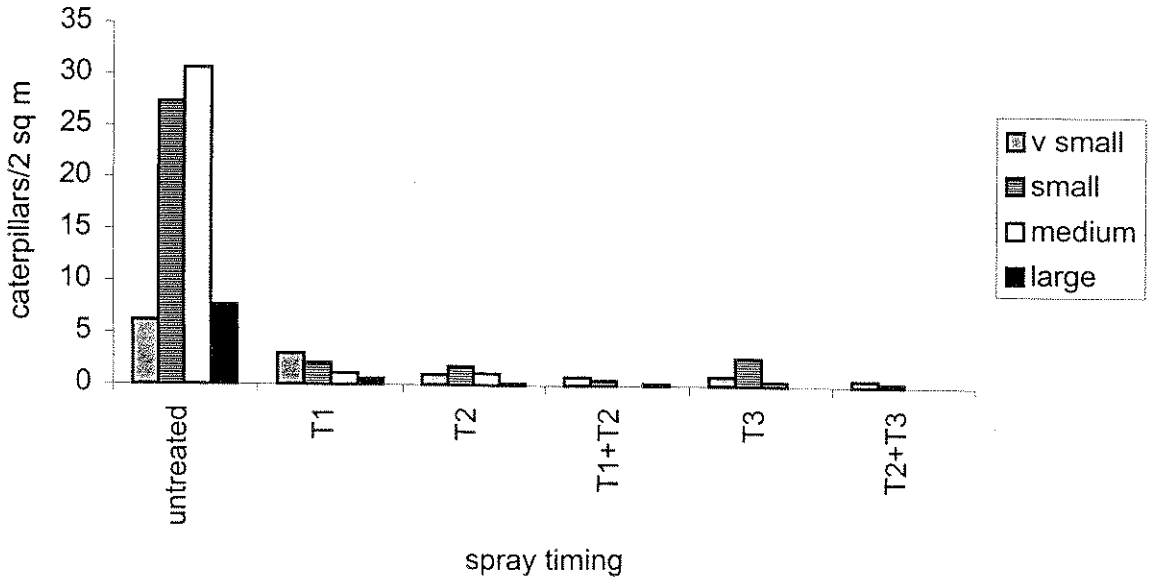
Figure 12



2. Chemical control

Caterpillar counts were made following the spray applications and numbers of each of the four size categories at of the three 1996 spray trial sites are shown in Appendices 3, 4 and 5 the results from the three sites are shown as mean values in Figure 13.

Figure 13. Caterpillar control - mean of 3 sites 1996



3. Caterpillar infestation and cumulative moth catches

In order to relate the moth catch data to caterpillar infestation, cumulative counts were calculated for all monitoring sites in 1997 and 1998. The rate of buildup of catch numbers for each season is shown in Figures 13 and 14.

Figure 14. Cumulative moth catches - all sites - 1997

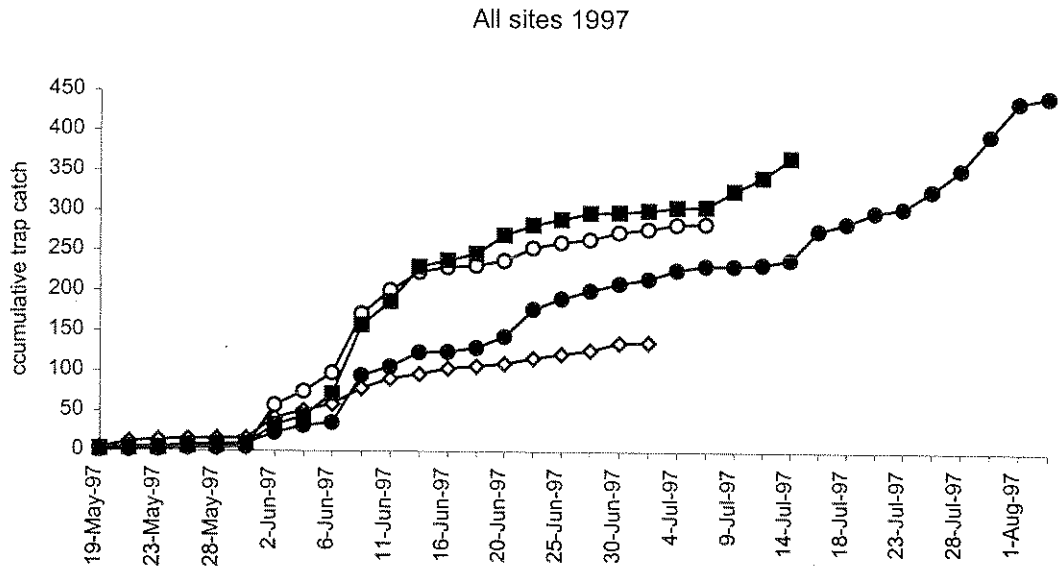
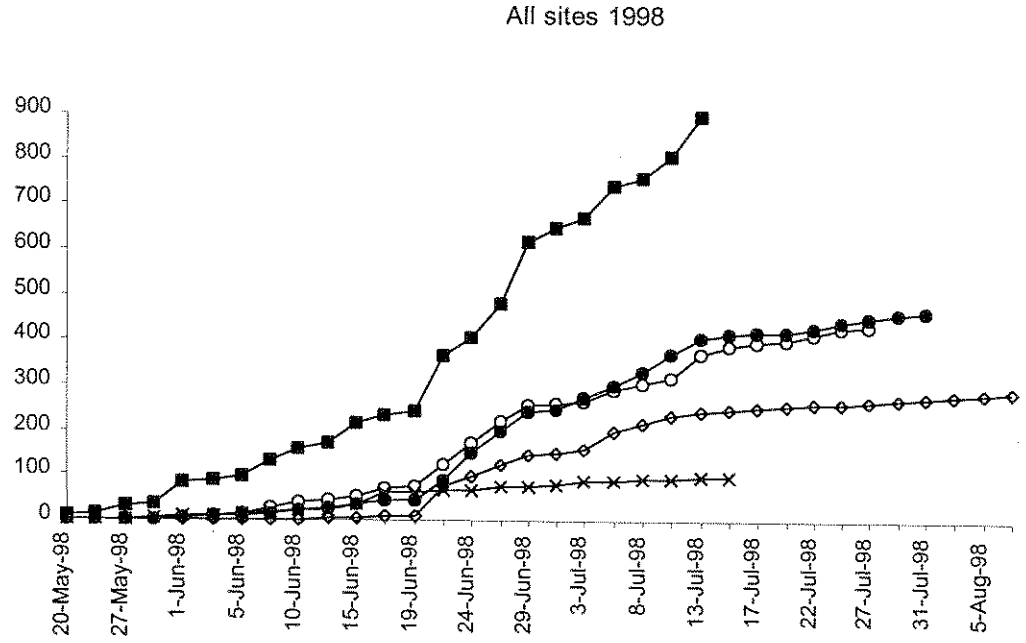


Figure 15. Cumulative moth catches - all sites - 1998



Caterpillar assessments were made in unsprayed areas of each of the monitoring sites and the results are shown in Table 3.

Table 3. Caterpillar and moth counts

Field reference	GS 204	Cumulative moth catches (by GS. 204)	Total for season	Caterpillars large	medium	small (pre harvest)	v small
PCT BIA	4 June 1997	51	137	0	0	0	0
HCCT B4B	11 June 1997	201	285	0	1	0	0
JEP WX2	17 June 1997	238	368	0	1	0	0
AHW 14B	6 July 1997	232	446	2	2	1	0
Thornhaugh	9 June 1998	19	89	0	0	0	0
BID	19 June 1998	243	895	2	6	4	5
WX1F	3 July 1998	266	430	5	6	5	1
WX2A	7 July 1998	299	463	3	11	21	12
WX12B	17 July 1998	255	287	4	7	8	4

CONCLUSIONS

The commercial silver Y moth pheromone trap based on the funnel type was successful in monitoring the activity of adult moths throughout the main flight period. Delta traps failed to trap many insects and there was no relationship between the number of trapped insects in the delta traps compared with the funnel trap.

Cypermethrin was very effective in controlling caterpillars in vining peas, although, the most effective treatments were those applied 14-21 days after the peak catches had been recorded. These sprays, made around 10 days after first pod and repeated 10 days later at first swollen pod (gs 206) were the most successful in controlling the medium and large sized caterpillars, which are the sizes most likely to be a contaminant problem in vined peas.

There was an indication that fewer moths were caught when temperatures were lower, but the relationship between egg development and temperature was not examined.

In 1997, because of the apparent absence of moths migrating from the continent, it was assumed that the UK population were newly emerged moths which had over-wintered as cocoons and had pupated locally. In 1998, this was again apparent, particularly at the site PCT B1D where there was a very high local population, presumably built up as a result of the diverse range of vegetable crops grown on that particular farm.

Moth numbers in 1997 were much lower than 1996, and caterpillar infestations were correspondingly small, however, higher numbers were recorded in 1997 and caterpillar numbers were also higher.

The presence of caterpillars in any crop represents a risk of contamination of the produce during harvesting. Only two crops in the two years were found to be free of caterpillars and these were both relatively early sown crops, where moth populations had not built up to high numbers before harvest. The cumulative catches in these crops had reached 51 and 19, respectively by the time of first pod development (gs 204). This being well before the time that the first of the two spray programme is applied. In the other crops, all of which had caterpillars present by harvest, much higher numbers of moths had been reached (201 - 299) by gs 204.

This gives a reasonably clear indication that these crops where moth catches have not reached more than about 50 moths by gs 204 will not be at risk of contamination.

Acknowledgements.

The moth trapping data was supplied by technical staff of Holbeach Marsh Co-operative, who also allowed the siting of the chemical control experiment in their vining pea crops.

Publications

Silver Y moth (*Autographa gamma*) FV 192 HDC Fact Sheet - 22/97.

Monitoring and control of silver Y moth HDC Project News August 1998.

APPENDICES

APPENDIX 1

Site details for trap comparisons - 1996.

Site	Address	Variety	Trials
1	Holbeach Hurn, Spalding, Lincolnshire	Winner	Trapping and spray trial
2	Manor Farm Fleet, Spalding, Lincolnshire	Winner	Trapping and spray trial
3	Gedney Drove End Spalding, Lincolnshire	Waverex	Spray trial

APPENDIX 2

Site details for moth monitoring and caterpillar assessments 1997-1998.

Site	Address	Variety	Sowing date	Caterpillar assessment	Harvest date
1. PCT B1A	Moulton-Seas-End Lincolnshire	Bikini	6.3.97	3.7.97	5.7.97
2. HCCT B4B	Holbeach St Matthews Lincolnshire	Bikini	18.3.97	3.7.97	11.7.97
3. JEP WX2	Gedney Drove End Lincolnshire	Waverex	12.4.97	15.7.97	17.7.97
4. AHW 14B	Holbeach St Marks Lincolnshire	Waverex	14.5.97	30.7.97	5.8.97
5. PCT B1D	Holbeach Horn Lincolnshire	Waverex	27.3.98	1.7.98	15.7.98
6. WX1F	Fleet, Spalding Lincolnshire	Waverex	30.4.98	23.7.98	29.7.98
7. WX2A	Holbeach St Marks Lincolnshire	Waverex	3.5.98	23.7.98	3.8.98
8. WX12B	Terrington St Clement Norfolk	Waverex	25.5.98	7.8.98	10.8.98
9. Trial Ground	Thornhaugh Cambridgeshire	Scout	24.2.98	26.6.98	4.7.98

APPENDIX 3

Site 1 - Holbeach Hurn

Treatment No.	Timing	Date	Caterpillars/2 m^2 (2.7.96) Very small	Small	Medium	Large	Total
1	Untreated		8.75	28.8	8.25	0	45.7
2	T_1	9.6.96	4.75	1.5	0	0	6.2
3	T_2	20.6.96	2.00	0.8	0	0	2.7
4	T_1 & T_2		1.50	1.0	0	0	2.5
5	T_3	27.6.96	0.25	0.3	0.25	0	0.8
6	T_2 & T_3		0.25	0.3	0	0	0.5
SED @ p = 0.05			(nsd) 2.84	3.49	1.69		7.1
cv %			137.8	91.0	169.0		102.2

APPENDIX 5

Site 3 - Gedney Drove End

Treatment No.	Timing	Date	Caterpillars/2 m^2 (2.7.96) Very small	Small	Medium	Large	Total
1	Untreated		3.75	24.0	80.2	23.2	131.3
2	T_1	24.6.96	3.50	4.2	3.5	1.8	13.0
3	T_2	2.7.96	1.0	3.0	3.2	0	7.2
4	T_1 & T_2		0.5	0.2	0	0.5	1.2
5	T_3	9.7.96	2.25	10.5	7.0	1.3	21.0
6	T_2 & T_3		0.75	0.5	0.2	0	1.5
SED @ p = 0.05			(nsd) 1.28	5.44	11.98	5.41	20.8
cv %			92.1	108.6	107.9	171.6	100.6