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CONTRACT REPORT

No. C001/110
Protected crops: Monitoring the
incidence, survival and natural
parasitism of the South American
leaf miner Liriomyza huidobrensis,
1991. Undertaken jointly for the
HDC and for MAFF

PRINCIPAL WORKERS

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AUTHENTICATION

I declare that this work was done under my supervision according to the procedures described herein and that this report represents a time and accurate record of the results obtained.

Signature *J.A. Bennison*

J A Bennison Bsc
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Date *.7.1.92*

Report authorised by: *M Hancock*

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Summary

Studies were done at three nurseries in the Lee Valley area, to try to establish whether the pest had overwintered outside glasshouses which had been severely infested during 1990. The work was done by ADAS Entomologists in close co-operation with MAFF Plant Health and Seeds Inspectors (PHSI) and Entomologists at the MAFF Central Science Laboratory, Harpenden.

Adult leaf miner activity was monitored on yellow sticky traps by PHSI Inspectors. Leaf miner feeding punctures, larvae and pupae were monitored on "trap plants" placed outdoors near the sticky traps. Small numbers of L. huidobrensis adults were confirmed on sticky traps outdoors at all three sites. At one site, no flies were evident inside adjacent glasshouses and it is possible that the pest had overwintered outdoors here, although this could not be definitely concluded. At the other two sites, again there were no L. huidobrensis found inside the glasshouses adjacent to the traps, but on-going infestations were present in glasshouses within a few hundred metres and it is possible that these may have been the source.

No L. huidobrensis mines were confirmed on trap plants or weeds used for monitoring leaf miner activity, although other Liriomyza and other leaf miner species were found. Nor were any L. huidobrensis mines found on garden plants in the vicinity. Thus the source of the L. huidobrensis found on the sticky traps was not definitely identified.

From late July onwards, several of the leaf miners on the trap plants and weeds became parasitised; this usually occurs with native leaf miners outdoors from mid-summer. It is possible that some of these parasitised leaf miners included L. huidobrensis.

Introduction

The South American leafminer, L. huidobrensis, is still a notifiable, statutory pest subject to a full eradication programme. It is a serious pest that can cause severe damage to a wide range of crops grown under glass, including chrysanthemums, tomatoes, lettuce and celery. Until recently, most of the outbreaks have been in the Lee Valley area, with isolated cases spread across the rest of the country. However, recent outbreaks have occurred in the West Sussex area. Of the 175 outbreaks which have occurred since the first case in the UK in November 1989, the pest has been eradicated on around 100 nurseries.

As well as information about how to control the pest chemically and biologically, more information is needed about the pest's biology and behaviour. One of the most fundamental questions is whether or not the insect can survive British winters outdoors. During 1990 in the Lee Valley, there must have been some local spread between neighbouring glasshouses, as adult leaf miners and mines were found on garden plants and weeds around infested glasshouses. If these survived the 1990/91 winter, they would be a potential source of re-infestation or spread.

On an HDC-sponsored study tour to Holland in 1990, ADAS and HRI Entomologist observed Dutch work using "trap" plants to monitor L. huidobrensis activity, using host plants preferred by the pest. This method warranted trying in this survey

Objectives

- a) To monitor the activity of L. huidobrensis outside glasshouses infested in 1990.
- b) To assess the natural levels of parasitism in L. huidobrensis populations outside at different times of the year.
- c) To evaluate the potential risk of any outdoor populations of L. huidobrensis infesting glasshouses crops.

- i Numbers of L. huidobrensis adults.
- ii Numbers of other leaf miner species adults, not necessarily identified to species.
- iii Numbers of leaf miner parasites.

Results

(a) Sticky traps

At site 1, small numbers of L. huidobrensis adults were caught outdoors at the end of April and in May and June. None were caught in July but they were trapped again in low numbers in early August; at the end of August, 67 adults were caught. At sites 2 and 3, only seven L. huidobrensis were confirmed on traps throughout the monitoring period. Several other species of leaf miner adults were also found at all sites. Some of these species look very similar to L. huidobrensis and occasionally a positive identification was not possible; five such flies were caught at sites two and three.

(b) Trap plants

Despite the L. huidobrensis catches on the sticky traps, no L. huidobrensis larvae or pupae were confirmed in any of the trap plants up until early August. Several other leaf miner species were found in the trap plants (see table 1 below).

Table 1 Adult leaf miners/parasites hatched from mines in trap plants

38	<u>Phytomyza</u> spp
1	<u>Liriomyza strigata/pisivora</u>
1	<u>Liriomyza</u> sp.
8	unidentified individuals (not <u>Liriomyza</u> spp.)
13	parasites

(c) Weeds

As the trap plants had been apparently unsuccessful in attracting any L. huidobrensis females to lay eggs on them, they were abandoned in early August. For the remainder of the monitoring period, any weeds showing leaf mines in the vicinity of the sticky traps at the three sites, were collected and assessed for leaf miner species or parasites as before. These yielded more leaf miners than the trap plants, although no definite identifications of L. huidobrensis were made (see table 2 overleaf).

Table 2 Adult leaf miners/parasites hatches from mines in weeds*

10	<u>Liriomyza pusilla</u>
9	<u>Liriomyza sonchi</u>
1	<u>Liriomyza strigata</u>
7	<u>Liriomyza</u> sp.
90	unidentified individuals (not <u>Liriomyza</u> spp.)
35	parasites

* Weeds included burdock, buttercup, daisy, dandelion, deadnettle, groundsel, hawksbeard, henbit, hogweed, nipplewort, prickly lettuce, sowthistle.

Discussion and Conclusions

At site 1, L. huidobrensis were found on sticky traps outdoors at a time when none were evident inside adjacent glasshouses. It is possible that the pest had overwintered outdoors, but we cannot definitely conclude this.

At sites 2 and 3, although no L. huidobrensis were evident inside glasshouses directly adjacent to the sticky traps, on-going infestations were present in glasshouses within a few hundred metres of the sticky traps and it is possible that these were the source of the few flies trapped here.

No L. huidobrensis mines were confirmed on trap plants or weeds used for monitoring leaf miner activity. In addition, no mines were observed on garden plants in the vicinity of the outdoor traps. Thus the source of the L. huidobrensis found on the sticky traps was not definitely identified. It is not known why L. huidobrensis mines failed to develop on any plants in the vicinity despite the abundance of known favoured host plants.

From late July onwards, parasites hatched from some leaf miner pupae rather than leaf miner adults. Of the 250 total leaf miner pupae collected from trap plants and weeds during the monitoring period, 47 (19%) produced parasites, including 8 from pupae suspected to be Liriomyza species. Native Liriomyza and other leaf miner species become increasingly parasitised outdoors during the summer and autumn by naturally occurring parasites. Leaf miner parasites are known to attack L. huidobrensis infesting various crops if introduced to glasshouses (van der Linden, 1990 and 1991). It is possible that any L. huidobrensis larvae developing outside were parasitised.



Recommendations

Further work is necessary on the chemical and biological control of L. huidobrensis, as well as on its biology and ability to overwinter outdoors in the UK. An experimental glasshouse at ADAS Trawsgoed, near Aberystwyth, is now licensed to work with this pest. Here, further development work will be done on chemical control, in collaboration with MAFF Central Science Laboratory at Harpenden.

Experiments on the biological control of L. huidobrensis will also be done at Trawsgoed. These will concentrate on assessing the merits of the commercially available parasites and working out how best to use them. This work will be funded by MAFF, but the HDC may wish to sponsor additional complementary work.

Acknowledgements

The co-operation of the growers who agreed to us including their nurseries in the survey is gratefully acknowledged. Thanks for assistance are also due to Entomology staff at ADAS Cambridge and CSL Harpenden, and to PHSI Inspectors in Eastern Region and PHSI staff at CSL Harpenden.

This work was jointly funded by the Horticultural Development Council and the Ministry of Agriculture, Fisheries and Food, both of whom are gratefully acknowledged.

References

1. van der Linden, A., 1990. "Prospects for the biological control of Liriomyza huidobrensis, a new leafminer for Europe". SROP/WPRS Bull. XIII/5, 100-103.
2. van der Linden, A., 1991. "Biological control of the leafminer Liriomyza huidobrensis in Dutch glasshouse tomatoes". Med. Fac. Landbouww. Rijksuniv. Gent, 56/2a, 265-271.

Storage of Data

The raw data will be stored by the ADAS Regional Entomologist, Block C, Government Buildings, Brooklands Avenue, Cambridge, CB2 2DR for a period of 10 years. The HDC will be consulted before disposal.

Min Beunson

Contract between ADAS (hereinafter called the "Contractor") and the Horticultural Development Council (hereinafter called the "Council") for a research/development project.

PROPOSAL

1. TITLE OF PROJECT

Contract No: PC 22a

PROTECTED CROPS: MONITORING THE INCIDENCE, SURVIVAL AND NATURAL PARASITISM OF LIRIOMYZA HUIDOBRENSIS AROUND INFESTED GLASSHOUSES

2. BACKGROUND AND COMMERCIAL OBJECTIVES

L. huidobrensis, the South American leafminer, was first introduced to the UK in November 1989 and since then it has been confirmed on over 100 nurseries on various vegetable and ornamental crops. L. huidobrensis is still a notifiable, statutory pest currently subject to a full eradication programme. One of the main areas of infestation has been the Lee Valley, where the most severe outbreaks have occurred on lettuce. It has not been possible to confirm the origin of all the infestations. In the Lee Valley, there must have been some local spread between neighbouring glasshouses, as adult leafminers and mines were observed on domestic garden plants and weeds around infested glasshouses. It is not known how far the pest has spread outside, nor how well it has survived over the winter. Leaf miner parasites are known to attack L. huidobrensis if introduced to infested glasshouses but it is not known how naturally occurring parasites would control the pest outdoors. However, native Liriomyza and other minor species become increasingly parasitised outdoors during the summer and autumn.

The objectives of this survey are:-

- a) To monitor the activity of L. huidobrensis outside glasshouses infested in 1990.
- b) To assess the natural levels of parasitism in L. huidobrensis populations outside at different times of the year.
- c) To assess the levels of natural parasitism in glasshouses found to be infested with L. huidobrensis before and after insecticide treatments applied under statutory notice.

3. POTENTIAL FINANCIAL BENEFIT TO THE INDUSTRY

This pest can cause major crop losses and more information on its biology and incidence is of the utmost importance to the horticultural industry. Even if eradicated in infested glasshouses by the statutory control programme, it is necessary to evaluate the risk of re-infestation from

outdoors. In addition, monitoring incidence and survival of the pest outdoors will evaluate the risk to field-grown crops.

4. SCIENTIFIC/TECHNICAL TARGET OF THE WORK

To monitor the activity and survival of L. huidobrensis outdoors, in order to evaluate the potential risk of infesting glasshouse crops.

5. CLOSELY RELATED WORK - COMPLETED OR IN PROGRESS

Entomologists at Naaldwijk and Koppert BV in Holland are both working on the biological control of L. huidobrensis. Visits were made by M Saynor (ADAS, Reading) and N Helyer (HRI, Littlehampton) to Holland in November 1990 to see and discuss this work: this visit formed part of the current HDC project.

Experiments, in which pupae of L. huidobrensis are being kept in boxes of soil outdoors are being done at Harpenden Laboratory and ADAS Reading to see whether this species can survive outdoors in the UK. The work in this proposal complements, but does not duplicate this experiment.

Other experiments are planned, under the government funded project for work on alien pests and diseases, to compare the efficacy and crop safety of insecticides on lettuce on commercial crop infested with L. huidobrensis. The insecticides used will be those that appeared most promising in laboratory tests also done at Harpenden. In these experiments, it would be possible to assess levels of natural parasitism of L. huidobrensis inside the glasshouse, before and after insecticide treatments.

6. DESCRIPTION OF THE WORK

Sites

One of two nurseries in the Lee Valley/ other pockets of infestation in East or South East Regions of ADAS, where L. huidobrensis was confirmed in 1990 or early 1991. Sites will be identified by PHSI. Criteria for site selection will be positive identification of L. huidobrensis adults on sticky traps outdoors in spring 1991, and willingness of grower to co-operate.

Methods

Host plants will be placed outside the nursery in four-inch pots placed on damp capillary-matting in seed trays. The matting will be covered with white polythene, with holes cut to fit the pots. A maximum of 100 pots to be used for the experiment, thus if two sites are used, a maximum of 50 pots per site.

Host plants to be a mixture of peas, beans (Vicia faba) and the host plant grown on the nursery eg. lettuce. One plant per pot to be used, these to be raised either by ADAS or a commercial producer (eg. for lettuce) and to be free from pesticide residues.

The position of the pots will be identified by PHSI according to outdoor sticky trap monitoring of L. huidobrensis and by agreement with the grower.

Assessments

Each site to be visited once per week and all pots removed and replaced. A record should be made as to whether the crop in the glasshouse is infested with L. huidobrensis at the time. Each pot to be examined and the following assessments made by FCS staff:-

- (i) Number of pots and leaves with adult leaf miner feeding marks
- (ii) Number of pots and leaves with empty mines
- (iii) Number of pupae on polythene covering capillary matting

All pots to be placed into individual plastic bags and tied. Any pupae on polythene to be put into screw-topped jars. Pots and pupae in jars to be taken to Harpenden Laboratory. Fresh pots of plants to be placed in seed trays and capillary matting dampened if necessary.

At Harpenden Laboratory pots to be placed in quarantine controlled temperature room and kept until any adult leaf miners and parasites hatch.

The following records to be made at Harpenden:-

- i Number of L. huidobrensis adults
- ii Number of other leaf miner species adults (these need not be identified to species)
- iii Number of leaf miner parasites. These to be placed in preserving fluid and sent to ADAS for identification if appropriate.

Additional site assessments

At each site, geographical records to be made by FCS staff for each pot position as follows:-

- Geographical position in relation to glasshouse ie. North/South/East/West
- Sheltered or open position

- Brief description of local flora eg. grass/nettles/thistles etc. These plants also to be examined for obvious signs of leaf mines. Any infested leaves to be sent to Harpenden as above.

7. COMMENCEMENT DATE AND DURATION

The survey will commence as soon as a site(s) is identified and continue until the end of August 1991.

8. STAFF RESPONSIBILITIES

Project Leader: Dr M Saynor, Regional Entomologist,
ADAS, Reading RO

Other Staff: J A Bennison and other staff in the
department of Entomology, Cambridge RO

P Seymour, O MacDonald and other staff,
MAFF Harpenden Laboratory

P Bartlett, MAFF, Harpenden Laboratory,
and C Morgan, PHSI, Chelmsford, to be
kept fully informed of all results of
the trial as it is in progress.

9. LOCATION

One or two sites as outlined in Section 6.

10. COSTS

HDC will contribute £10,000 towards the total cost of the project, MAFF will contribute the remainder.

11. PAYMENT

On each quarter day the Council will pay to the Contractor in accordance with the following schedule:

ADAS:

Quarter/Year	1991
1	-
2	1870
3	2805
4	-

CSL:

Quarter/Year	1991
1	-
2	2130
3	3195
4	-

TERMS AND CONDITIONS

The Council's standard terms and conditions of contract shall apply.

Signed for the Contractor (s)

Signature.....

M. J. Griffin

Position.....

RD Manager

Date.....

7/5/91

Signed for the Contractor (s)

Signature.....

Position.....

Date.....

Signed for the Council

Signature.....

[Signature]

Position.....

CHIEF EXECUTIVE

Date.....

26-4-91