



Horticultural Development Council

Working for Growers

Research Report

FV/16

Screening of insecticides for the
control of Lettuce Root Aphids on
lettuce - 1987

AGRICULTURAL DEVELOPMENT AND ADVISORY SERVICE

Report to: D J Brauhnoltz
The Horticultural Development Council
18 Lavant Street,
Petersfield,
Hants GU32 3EW

ADAS Contract manager: Dr M Saynor
Agricultural Development and Advisory Service
Entomology Dept
Government Buildings
Coley Park
Reading
Berks. RG1 6DT Tel: 0734-58122 Ext. 3321

Period of investigation: June - September 1987

Date of issue of report: 18 May 1988

No. of pages in report: 10

CONTRACT REPORT

No. C/87/0512

FV/16/87

Screening of insecticides for the
control of Lettuce Root Aphids on
lettuce - 1987.



PRINCIPAL WORKERS

Rachel Ayres BSc Entomologist, Leeds
Lesley Baker Entomologist, Leeds
Paul Harris MSc Entomologist, Wye
Martin Roberts BSc Entomologist, Cambridge (Author of Report)

AUTHENTICATION

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

.....
Signature

M Saynor PhD
Contract Manager

Date *18 July 1988*

Report authorised by:
Signature

Jaw Cermak

J P Cermak BSc, C Eng, MIAgrE
Regional Manager (R + D and
Laboratory Services)
Government Buildings
Coley Park
Reading
Berkshire
RG1 6DT

Date...*15 July 1988*.....



CONTENTS

	Page
Title Page	
Authentication	
Summary	1
Introduction	2
Materials and Methods	2
Site Details	2
Design	3
Treatments	3
Assessments	4
Phytotoxicity	4
Aphid numbers	5
Marketability	6
Results	6
Phytotoxicity	6
Aphid numbers	6
Marketability	9
Discussion	9
Conclusions	9
Acknowledgements	10
Storage of data	10

SCREENING OF INSECTICIDES FOR THE CONTROL OF LETTUCE ROOT APHID ON LETTUCE -
1987

Summary

A range of insecticides was tested for their ability to control Lettuce Root Aphid (Pemphigus bursarius) in 3 direct drilled crops and in a transplanted (cell-raised) crop.

In a very wet season, generally unfavourable to the pest, moderate infestations developed on all 4 trials.

In the transplanted crop and in one of the direct drilled crops no significant differences were observed between any of the insecticide treatments. However, in the other 2 direct drilled crops, phorate granules (2.0 kg ai/ha) applied by bow wave at drilling and a diazinon spray (997 g ai/ha) incorporated by rotavator before drilling, gave consistently good control of the aphids (P=0.01)

In these same two trials, fonofos MS (1.24 kg ai/ha), fonofos 10 G (1.4 kg ai/ha), fonofos FS (2.47 kg ai/ha), HCH (2.12 kg ai/ha) and tefluthrin (100 g ai/ha) also gave similar though less consistent control.

No differences in yield of marketable lettuces were detected from any of the 4 trials, probably due to the absence of water stress on the plants in a very wet season.

In view of the fact that a number of the chemicals tested have shown considerable promise for the control of this difficult pest, this work should be repeated next season.

Introduction

Lettuce root aphid, Pemphigus bursarius (L.) is a widespread and common pest of lettuces throughout East and South East England from Yorkshire to Hampshire. The severity of attack varies from year to year, but they are commonly severe and occasionally devastating. Existing pesticides do not control this pest effectively and better and reliable measures are urgently needed.

The main objective of this work was to assess, under contract to the HDC, the effectiveness of a range of soil insecticides for the control of this pest on cell-raised and direct drilled lettuce crops on mineral and on organic soils. These trials would complement government funded R & D being done by ADAS on the biology and control of lettuce root aphid.

Materials and methods

Site details

This work was carried out at three ADAS centres. At Leeds, two trials were done on direct drilled crops on mineral soil. At Cambridge, a single trial using a direct drilled crop was done on organic soil and at Wye, in Kent a single trial on mineral soil was done using cell-raised plants.

All four trials were carried out on iceberg lettuce, cv. Saladin, a cultivar known to be very susceptible to lettuce root aphid attack.

The trials at Leeds were drilled on 29 May and 30 June respectively and the one at Cambridge was drilled on 17 June. At Wye, the cells (approximate volume 20cm^3) were sown on 21-22 May and planted out on the field on 17 June.

The three drilled trials were hand singled to give a plant spacing of 30 cm (12"). At Wye, the cells were planted out on 43cm (17") spacing.

Design

All four trials were of randomised block design, replicated three times. Plot size was four rows wide by either 8 or 10 metres long.

Treatments

Direct drilled crops at Leeds and Cambridge.

	Insecticide	Product	Rate	
			(ai/ha)	(product/ha)
1.	Untreated			
2.	Diazinon	Diazinon 17.8%	977 g	5.6 l
3.	Fonofos	Dyfonate MS 49.7%	1.24 kg	2.5 l
4.	Fonofos	Dyfonate 10G	1.4 kg	14 kg
5.	Fonofos	Cudgel	2.47 kg	5.7 l
6.	gamma HCH	Gammacol	1.12 kg	1.4 l
7.	Phorate	Phorate	2.0 kg	20 kg
8.	Tefluthrin	Tefluthrin	100 g	20 kg
9.	Triazophos	Hostathion	1.05 kg	2.5 l
10.	Triazophos	Hostathion	1.05 kg	2.5 l

Treatments 2-6 and 8 were applied pre-drilling, either as an over-all spray or broadcast, followed by incorporation by rotavator to 8cm depth.

Treatment 7 was applied by the bow-wave method at drilling with incorporation by drill coulter.

Treatment 9 was applied as a spray immediately post drilling.

Treatment 10 was applied as a spray on 13 July (Cambridge) and 30 June (Leeds 1st drilling) and 23 July (Leeds 2nd drilling) when the aphid migration from Lombardy poplars to lettuce crops had finished and further infestation was unlikely.



Cell-raised crop at Wye.

1. Untreated.

Module incorporation treatments:-

2. Fonofos FS liquid (Cudgel), 100ml in 40 litres water per cubic metre plus pre-planting drench of 25ml in 100 litres water per 10 square metres of trays.
3. Diazinon wettable powder (Basudin 40 WP), 37g in 100 litres water per cubic metre.
4. Tefluthrin granules to give 0.5 mg/kg active ingredient in compost.

Field treatments:-

Insecticide	Product	Rate	
		(ai/ha)	(product/ha)
5. Diazinon	Diazinon 17.8%	997 g	5.6 l
6. Fonofos	Dyfonate MS 49.7%	1.24 kg	2.5 l
7. Fonofos	Dyfonate 10 G	1.4 kg	14 kg
8. HCH	Gammacol	1.12 kg	1.4 l
9. Tefluthrin	Tefluthrin	100 g	20 kg
10. Triazophos	Hostathion	1.05 kg	2.5 l

Treatments 2-4 applied on 18 May, 3 days prior to seeding.

Treatments 5-9 applied pre-drilling, either as an overall spray or broadcast, followed by incorporation to 8cm depth.

Treatment 10 applied as a spray immediately post drilling.

Assessments

Phytotoxicity

The plants in cells at Wye were assessed for phytotoxicity 14 days after sowing. The trials at Leeds and Cambridge were assessed 3-4 weeks after drilling.



Aphid numbers

The levels of lettuce root aphid were assessed twice on each trial, (mid-season and at harvest), on the following dates:-

Leeds, Early drilling	6 Aug and 25 Aug
Leeds, Late drilling	28 Aug and 28 Sept
Cambridge	19 Aug and 8 Sept
Wye	28 July and 12 Aug

In the first assessments, 10 plants per plot were chosen at random and on the second assessment 25 plants were chosen (10 at Wye).

The roots were examined for root aphids and each plant was assigned a score based on the system developed at the National Vegetable Research Station (now the Institute for Horticultural Research, Wellesbourne) as follows:-

No of aphids per root	Score
0	0
1-4	1
5-11	2
12-33	3
34-100	4
101-300	5
301-900	6
901-2700	7

Following assessment of aphid numbers, a grade score for each plot was calculated by multiplying the number of plants in each category by the appropriate score value, totalling up the values and dividing by the total number of plants examined. The resulting score thus has a possible range from 0 (no aphids at all) to 7 (every plant with over 900 aphids).

The scores were statistically analysed by Analysis of Variance (ANOVA) followed by separation of the treatment means using Duncans Multiple Range Test.



Marketability

At crop maturity, all trials were assessed for marketability of the lettuces.

At Leeds and Cambridge this consisted of a subjective visual assessment of the number of marketable plants per plot carried out by a Horticultural Advisory Officer. At Wye, all plants from each plot were harvested and individually weighed.

Results

Phytotoxicity

No evidence of phytotoxicity was observed with any of the treatments in the three direct-drilled trials.

In the trial using cell-raised plants at Wye there was some evidence of phytotoxicity with the module incorporation treatments where some seeds failed to germinate. However, with all treatments there was over 90% germination and none of the germinated plants showed any phytotoxicity symptoms.

Aphid numbers

The mean grade scores for each treatment for the three drilled trials are listed in Table 1 and for the module-raised in Table 2.

Although the aphid infestation levels at all four sites were only moderate, there were appreciably more aphids at the two sites in Leeds than there were at Cambridge. Numbers at Wye were intermediate between those at Leeds and Cambridge but in contrast to the other trials, numbers were higher at Wye at the first assessment than they were at the second.

Statistically significant differences between treatments occurred only in the trials at Leeds. At both of these sites the numbers of aphids present at harvest on the roots of plants tested with phorate, diazinon or fonofos 10G were appreciably lower than those on the untreated plants. HCH, fonofos MS or fonofos FS also controlled aphids effectively in at least one of these trials.



Table 1 Results of lettuce root aphid assessments on drilled crops during the season and at harvest.

	Lettuce root aphid scores (0-7) §						
	Mid-season assessment			Harvest assessment			
	Leeds	Leeds	Cambridge	Leeds	Leeds	Cambridge	
	early drilling	late drilling		early drilling	late drilling		
1. Untreated	1.60	1.07	0.77	4.30	3.07	2.31	
2. Diazinon	0.40 *	0.07 **	0.37	1.40 **	0.73 **	1.69	
3. Fonofos MS	1.37	0.10 **	0.67	2.23 **	2.21	1.60	
4. Fonofos 10 G	1.00	0.17 **	0.13	2.63 *	0.96 **	1.29	
5. Fonofos FS	0.53 *	0.47	0.90	1.27 **	1.49 **	2.24	
6. gamma - HCH	0.67 *	0.13 **	1.13	3.37	1.01**	2.61	
7. Phorate	0.00 **	0.00 **	1.03	1.33 **	0.33 **	1.93	
8. Tefluthrin	1.30	0.23 *	0.47	3.40	1.43 **	1.07	
9. Triazophos (at drilling)	1.23	0.70	1.00	4.13	2.25	2.37	
10. Triazophos (foliar spray)	1.57	1.10	1.03	3.90	3.32	2.43	
	SED ±	0.368	0.280	NS	0.553	0.560	NS
	CV%	46.7	84.6	46.3	24.2	40.8	64.4
	P	*	=	0.05			
		**	=	0.01			

§ No of aphids per root	Score
0	0
1-4	1
5-11	2
12-33	3
34-100	4
101-300	5
301-900	6
901-2700	7



Table 2 Results of lettuce root aphid assessments on the module - raised crops during the season and at harvest

Lettuce root aphid scores (0-7) §

		Assessments	
		1st	2nd
1.	Untreated	3.0	2.7
2.	Fonofos + Fonofos in module	3.3	3.0
3.	Diazinon in module	2.8	2.1
4.	Tefluthrin in module	3.2	3.0
5.	Diazinon in field	2.3	2.1
6.	Fonofos MS "	3.0	3.5
7.	Fonofos 10G "	2.7	2.7
8.	gamma - HCH "	2.6	2.4
9.	Tefluthrin "	3.3	3.1
10.	Triazophos "	2.1	2.4
		NS	NS
SED ±		0.548	0.393
CV%		23.6	17.8

§ No of aphids per root	Score
0	0
1-4	1
5-11	2
12-33	3
34-100	4
101-300	5
301-900	6
901-2700	7



Marketability

Only at Leeds were the plants considered good enough to be assessed for sale as iceberg lettuce. At Cambridge and Wye the plants were assessed for sale as crisp lettuce.

None of the treatments in any of the trials improved the yields of saleable lettuce.

Discussion

Attacks of lettuce root aphid on commercial crops of lettuce were generally much less severe in 1987 than they were in 1986.

Nevertheless, moderate attacks developed on all four trials, the highest being at Leeds, particularly on the early-drilled trial. Here four treatments appreciably reduced the numbers of aphids present at the end of the trial, although two of them, diazinon and phorate are already recommended for the control of lettuce root aphid.

None of the treatments increased the yield or quality of the crops.

Disappointingly, none of the treatments used at Cambridge or Wye reduced the number of lettuce root aphids significantly. However at Cambridge, plots treated with insecticides that were effective at Leeds, also had fewer aphids.

Conclusions

In a year in which lettuce root aphid did not generally pose a serious problem, encouraging results were obtained from a number of the treatments tested.

Further screening of the best treatments, possibly applied in different ways, will be undertaken in 1988.

Acknowledgements

The help and cooperation of the farmers and growers who provided the land for the trials is gratefully acknowledged. Thanks are also due to staff at Arthur Rickwood Experimental Husbandry Farm and to colleagues in the Entomology department at Leeds, Wye and Cambridge.

Storage of data

The raw data for each trial will be stored by the department responsible for that trial for a period of 5 years.