

SCEPTREPLUS

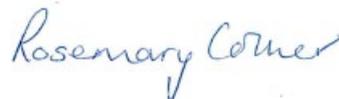
Final Trial Report

Trial code:	SP36 - W2019.011
Title:	Evaluating treatments for control of lettuce root aphid on lettuce
Crop	Group: Field vegetables - Lettuce
Target	Lettuce root aphid - <i>Pemphigus bursarius</i> -PEMPBU
Lead researcher:	Rosemary Collier
Organisation:	University of Warwick, School of Life Sciences, Wellesbourne, Warwick CV35 9EF
Period:	May 2019 – August 2019
Report date:	31 December 2019
Report author:	Andrew Jukes and Rosemary Collier
ORETO Number: (certificate should be attached)	381

I the undersigned, hereby declare that the work was performed according to the procedures herein described and that this report is an accurate and faithful record of the results obtained.

20 December 2019

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Date



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Authors signature

Trial Summary

Introduction

The quality and yield of lettuce crops can be reduced when roots are colonized by lettuce root aphid (*Pemphigus bursarius*). There are currently a limited number of control options and approval for the standard treatment (the neonicotinoid Thiamethoxam – Cruiser seed treatment) has been revoked. Treatment of seed with neonicotinoids also provides control of foliage-feeding aphids. This trial investigated future insecticidal options for control of lettuce root aphid.

Methods

Lettuce seed (cv Lobjoits Green Cos) was sown into peat blocks on 2 occasions, 1 week apart. Transplanting into field plots was timed to coincide with the predicted migration of winged lettuce-root aphid which was expected 3 weeks after sowing (9 June 2019). The two transplantings were done in separate locations to further maximize the chances of infestation. The trial was designed for four replicates of twelve treatments. Treatments (all conventional insecticides) were applied at sowing (“Phytodrip”), pre-planting (drench) or as post-planting sprays. Plants were dug up soon after they were commercially harvestable (77 days after sowing for both transplants). The roots were scored (0 – 4 scale) for levels of lettuce root aphid infestation, the plants were weighed after trimming and the heads were assessed for foliar pests.

Results

The results for both assessments were analysed separately and combined and the mean lettuce root aphid infestation score and percentage of plants per plot infested recorded. The results are given in Tables A and B. Levels of infestation were generally high. Statistical analyses were not significant for data from either transplanting nor for the two transplantings combined. There is no evidence that any treatment decreased numbers of aphids compared with the untreated control.

Table A. Mean infestation score

Treatment	Planting		
	First	Second	Both
Control	0.95	0.75	0.85
AHDB9933 ¹	0.525	0.35	0.4375
Movento x 1 ²	0.875	0.675	0.775
Movento x 2 ²	0.65	0.575	0.6125
AHDB9966 ²	0.675	0.85	0.7625
AHDB9951 ²	0.425	0.55	0.4875
AHDB9948 ²	0.525	0.825	0.675
AHDB9948 ¹	0.5	0.275	0.3875
AHDB9943 ¹	0.65	0.7	0.675
AHDB9966 ¹	0.575	0.725	0.65
AHDB9951 ¹	0.5	0.275	0.3875
AHDB9948 ³	0.65	0.525	0.5875
F value	0.549	0.969	1.215
P value	0.855	0.491	0.29
s.e.d.	0.297	0.29	0.198
l.s.d.	0.602	0.588	0.394
d.f.	36	36	84

¹ “Phytodrip” at sowing; ² In-field spray; ³ Pre-planting drench

Table B. Percent plants infested

Treatment	First planting		Second planting		Both plantings	
	Ang	Back trans	Ang	Back trans	Ang	Back trans
Control	51.70	61.6	42.12	45.0	46.91	53.3
AHDB9933 ¹	33.75	30.9	38.36	38.5	36.05	34.6
Movento x 1 ²	51.11	60.6	41.90	44.6	46.51	52.6
Movento x 2 ²	46.44	52.5	30.87	26.3	38.65	39.0
AHDB9966 ²	43.62	47.6	49.61	58.0	46.61	52.8
AHDB9951 ²	27.11	20.8	42.05	44.9	34.58	32.2
AHDB9948 ²	35.26	33.3	47.25	53.9	41.25	43.5
AHDB9948 ¹	33.69	30.8	21.91	13.9	27.80	21.7
AHDB9943 ¹	40.39	42.0	45.00	50.0	42.70	46.0
AHDB9966 ¹	42.05	44.9	50.14	58.9	46.09	51.9
AHDB9951 ¹	38.36	38.5	25.67	18.8	32.01	28.1
AHDB9948 ³	47.25	53.9	40.61	42.4	43.93	48.1
F value	0.667		1.16		1.10	
P -value	0.759		0.35		0.37	
s.e.d.	13.13		11.87		8.65	
l.s.d.	26.63		24.08		17.19	
d.f.	36		36		84	

In all cases plot means were used and percentage data was angular transformed (ang) before analysis

¹ "Phytodrip" at sowing; ² In-field spray; ³ Pre-planting drench

Caterpillar frass was observed on a number of plants but no caterpillars were seen. Currant lettuce aphid was not observed at all. The only insect seen in relatively large numbers was the nymph of the common green capsid bug but there was no evidence of any treatment effects.

Conclusion

There was no indication of lettuce root aphid control from any of the test treatments.

Take home message:

Alternative approaches to managing lettuce root aphid infestations need to be explored.

Objectives

1. To evaluate the effectiveness of conventional insecticides applied against lettuce root aphid on lettuce as measured by the level of infestation.
2. To monitor the treated crop for phytotoxicity

Trial conduct

UK regulatory guidelines were followed but EPPO guidelines took precedence. The following EPPO guidelines were followed:

Relevant EPPO guideline(s)		Variation from EPPO
PP 1/152(3)	Design and analysis of efficacy evaluation trials	None
PP 1/135(3)	Phytotoxicity assessment	None
PP 1/181(3)	Conduct and reporting of efficacy evaluation trials including GEP	None

There were no deviations from EPPO guidance:

Test site

Item	Details
Location address	University of Warwick Wellesbourne Campus Wellesbourne Warwick CV35 9EF
Crop	Lettuce
Cultivar	Lobjoits Green Cos
Soil or substrate type	Sandy loam
Agronomic practice	See Appendix A
Prior history of site	See Appendix A

Trial design

Item	Details
Trial design:	(4x4)/3 Trojan Square
Number of replicates:	4
Row spacing:	35 cm
Plot size: (w x l)	1.83 x 2.45 m
Plot size: (m ²)	4.5
Number of plants per plot:	28
<i>Leaf Wall Area calculations</i>	n/a

Treatment details

AHDB Code	Active substance	Product name/ manufacturer code	Formulation batch number	Content of active substance in product	Formulation type	Adjuvant
Untreated						
Authorized	Spirotetramat	Movento	EM4L021718	150 g/l	OD	None
AHDB9933	N/D	N/D	N/D	N/D	N/D	None
AHDB9966	N/D	N/D	N/D	N/D	N/D	None
AHDB9951	N/D	N/D	N/D	N/D	N/D	None
AHDB9948	N/D	N/D	N/D	N/D	N/D	None
AHDB9948	N/D	N/D	N/D	N/D	N/D	None
AHDB9943	N/D	N/D	N/D	N/D	N/D	None

Application schedule

Treatment number	Treatment: product name or AHDB code	Rate of active substance (ml or g a.s./ha)	Rate of product (l or kg/ha)	Application code
1	Control			
2	AHDB9933	0.75 g/1000 plants	1.875 g/1000 plants ¹	A1 A2
3	Movento x 1	75 g	0.5 l	C1 C2
4	Movento x 2	75 g	0.5 l	C1 D1 C2 D2
5	AHDB9966	24 g	0.2 l	C1 C2
6	AHDB9951	125 g	0.625 l	C1 C2
7	AHDB9948	75 g	0.75 l	C1 C2
8	AHDB9948	0.75 g/1000 plants	3.75 ml/1000 plants ¹	B1 B2
9	AHDB9943	1 g/1000 plants	2 g/1000 plants ²	A1 A2
10	AHDB9966	0.24 g/1000 plants	2 ml/1000 plants ¹	A1 A2
11	AHDB9951	1.25 g/1000 plants	6.25 ml/1000 plants ¹	A1 A2
12	AHDB9948	0.75 g/1000 plants	3.75 ml/1000 plants ¹	A1 A2
13	AHDB9951	Not specified		Seed treatment

¹ Calculated from spray rate assuming 100,000 plants/ha

² Manufacturer recommendation

Application details

	Application A1	Application B1	Application C1	Application D1
Application date	15/5/19	4/6/19	6/6/19	20/6/18
Time of day	11.00	9.00	10.00	10.00
Crop growth stage (Max, min average BBCH)	Seed	14	14	18
Crop height (cm)	N/A	6	6	9
Crop coverage (%)	N/A	N/A	10	20
Application Method	"Phytodrip"	Drench	Spray	Spray
Application Placement	Block	Block	Foliar	Foliar
Application equipment	Pipette	Pipette	Berthoud Vermorel 2000HP	
Nozzle pressure	N/A	N/A	2 bar	2 bar
Nozzle type	N/A	N/A	02F110	02F110
Nozzle size	N/A	N/A	02	02
Application water volume/ha	0.2 ml/block	1 ml/block	300	300
Temperature of air - shade (°C)	N/A	N/A	17	18
Relative humidity (%)	N/A	N/A	60	72
Wind speed range (m/s)	N/A	N/A	Moderate	Light
Dew presence (Y/N)	N/A	N/A	N	N
Temperature of soil - 2-5 cm (°C)	N/A	N/A	Not recorded	Not recorded
Wetness of soil - 2-5 cm	N/A	N/A	Damp	Damp
Cloud cover (%)	N/A	N/A	Not recorded	Not recorded

	Application A2	Application B2	Application C2	Application D2
Application date	22/5/19	12/6/19	14/6/19	28/6/19
Time of day	11.00	9.00	10.00	10.00
Crop growth stage (Max, min average BBCH)	Seed	14	14	18
Crop height (cm)	N/A	5	5	9
Crop coverage (%)	N/A	N/A	10	20
Application Method	"Phytodrip"	Drench	Spray	Spray
Application Placement	Block	Block	Foliar	Foliar
Application equipment	Pipette	Pipette	Berthoud Vermorel 2000HP	
Nozzle pressure	N/A	N/A	2 bar	2 bar
Nozzle type	N/A	N/A	02F110	02F110
Nozzle size	N/A	N/A	02	02
Application water volume/ha	0.2 ml/block	1 ml/block	300	300
Temperature of air - shade (°C)	N/A	N/A	15	20
Relative humidity (%)	N/A	N/A	95	77
Wind speed range (m/s)	N/A	N/A	Light	Light
Dew presence (Y/N)	N/A	N/A	N	N
Temperature of soil - 2-5 cm (°C)	N/A	N/A	Not recorded	Not recorded
Wetness of soil - 2-5 cm	N/A	N/A	Damp	Damp
Cloud cover (%)	N/A	N/A	Not recorded	Not recorded

Untreated levels of pests/pathogens at application and through the assessment period

Common name	Scientific Name	EPO Code	Infestation level pre-application	Infestation level at start of assessment period	Infestation level at end of assessment period
Lettuce root aphid	<i>Pemphigus bursarius</i>	PEMPBU	0	45 - 62 % plants infested (untreated control)	
Currant lettuce aphid ¹	<i>Nasonovia ribisnigri</i>	NASORN	0	Nil	
Silver-y ¹	<i>Autographa gamma</i>	PYTOGA	0	0 – 29 % plants with caterpillar frass (untreated control)	

¹ Non-target pests

Method

Two sequential sowings (1 week interval) of lettuce (cv Lobjoits Green Cos – known to be relatively susceptible to lettuce root aphid) were made on 15 and 22 May to provide plants for 2 sequential transplantings (to maximise the chances of catching the lettuce root aphid migration and determine the impact of aphid arrival at different stages of crop development). The trial consisted of 12 treatments and each replicate consisted of 28 plants. The two transplantings were carried out in different locations within the Warwick Crop Centre site at Wellesbourne (also to maximize the chances of lettuce root aphid infestation). The plots were 2.45 m x 1 bed (1.83 m each) in size. The transplanting dates were 5 June (First transplanting – Sheep Pens) and 12 June (Second transplanting – Long Meadow West). Plants were transplanted at a spacing of 35 cm within rows and 35 cm between rows. Treatments were applied at sowing (“Phytodrip”), pre-planting (drench) or as post-planting sprays. The “Phytodrip” treatments were applied directly to the seed after sowing in a small volume of water (0.2 ml) and the drench treatment was applied before planting in 1 ml of water (which equates to a similar volume to that applied to brassica transplants). Due to the compaction of the blocks at this stage the 1 ml had to be applied in 2 x 0.5 ml portions with the first 0.5 ml being allowed to soak in before the second was added.

An additional treatment (seed treatment – Treatment 13) became available after the trial had been set up. Treated and untreated seed (cv Rumours – iceberg type) was supplied by Elsoms seeds and was sown into peat blocks on 22 May (with second sowing of main trial). Plants were transplanted into a bed adjacent to the main trials on 11 June (Sheep Pens) and 12 June (Long Meadow West). Plants were transplanted at a spacing of 35 cm within rows and 35 cm between rows. Alternate plots of 20 treated and untreated plants were planted to give four plots of each treatment.

Transplanting and spraying was timed to coincide with the forecasted arrival of winged lettuce root aphid (day-degree forecast on AHDB Pest Bulletin). The migration was predicted to start after 672 day-degrees >4.4°C which was 9 June at Wellesbourne. Application dates are detailed above.

Assessment details

The plots were assessed for infestation by lettuce root aphid on 31 July (first transplanting) and 7 August (second transplanting).

This was done by digging up 10 plants per plot and scoring the roots for damage using the following scale:

Score	Description
0	None
1	<10 aphids
2	11 – 100 aphids
3	101 – 1000 aphids
4	>1000 aphids

The plants were also assessed for the presence of currant lettuce aphid (*Nasonovia ribisnigri*), silver-y moth (*Autographa gamma*) caterpillars and common green capsid bug (*Lygocoris pabulinus*) nymphs. The head weights of lettuce plants harvested were recorded after trimming. Some plants in the second transplanting had started to bolt so head weights were not recorded.

Germination and phytotoxicity were assessed on sowing-time treatments on 25 May and 2 June (10 days after first and second sowings respectively) and phytotoxicity on transplants was assessed 7 days after the first sprays were applied.

Evaluation date	Evaluation Timing (DA)*		Crop Growth Stage (BBCH)	Evaluation type (efficacy, phytotox)	Assessment
	After sowing	After first sprays			
25/5/19	10	n/a	12	Phytotoxicity	Germination and leaf damage
2/6/19	10	n/a	12	Phytotoxicity	Germination and leaf damage
13/6/19	29	7	15	Phytotoxicity	Leaf damage
19/6/19	28	7	15	Phytotoxicity	Leaf damage
31/7/19	77	55	49	Efficacy	Root infestation, foliar pests and head weight
7/8/19	77	56	49	Efficacy	Root infestation and foliar pests

* DA – days after application

Statistical analysis

This trial was designed as a Trojan square for 12 treatments in a (4*4)/3 design. The lettuce root aphid infestation score, the percentage plants infested with lettuce root aphids, the plant head weight, the percentage of plants with caterpillar frass and the percentage of plants with capsid nymphs were analysed by ANOVA using the Excel data package. In all cases plot means were used and percentage data was angular transformed before analysis.

Results

Phytotoxicity

The number of seedlings which had germinated 20 days after sowing on two occasions is shown in Table 1. No analysis was possible but it is clear that very few plants did not germinate with any of the treatments.

Table 1 The number of healthy, unhealthy and missing plants 20 days after sowing and treatment with “Phytodrip” treatments.

Treatment	Number of seedlings (1 st sowing)			Number of seedlings (2 nd sowing)		
	Healthy	Unhealthy	Missing	Healthy	Unhealthy	Missing
Control 1	138	2	7	142	1	4
Control 2	140	2	5	140	2	5
AHDB9933	143	1	3	140	1	6
AHDB9943	140	3	4	139	2	6
AHDB9966	141	2	4	138	2	7
AHDB9951	140	2	5	141	1	5
AHDB9948	139	1	7	142	1	4

Post-spraying in the field there was no evidence of phytotoxic effects with any treatment.

Lettuce root aphid

For the main trial, the results for the mean lettuce root aphid score and percentage of plants with lettuce root aphid infestation for the first transplanting, the second transplanting and both transplantings combined are presented in Table 2, Figures 1 and 2 and Table 3, Figures 3 and 4 respectively. Percentage infested plants data was Angular transformed before analysis. None of the analyses were significant at the 5% level using an F-test and no treatment is clearly more effective than the untreated control.

The results for the additional seed treatment are presented in Table 4. There was insufficient data for statistical analysis and no evidence of treatment effects.

Table 2 Mean lettuce root aphid infestation score per plot in plants transplanted on two dates and in both transplantings combined

Treatment	Planting		
	First	Second	Both
Control	0.95	0.75	0.85
AHDB9933 ¹	0.525	0.35	0.4375
Movento x 1 ²	0.875	0.675	0.775
Movento x 2 ²	0.65	0.575	0.6125
AHDB9966 ²	0.675	0.85	0.7625
AHDB9951 ²	0.425	0.55	0.4875
AHDB9948 ²	0.525	0.825	0.675
AHDB9948 ¹	0.5	0.275	0.3875
AHDB9943 ¹	0.65	0.7	0.675
AHDB9966 ¹	0.575	0.725	0.65
AHDB9951 ¹	0.5	0.275	0.3875
AHDB9948 ³	0.65	0.525	0.5875
F value	0.549	0.969	1.215
P -value	0.855	0.491	0.29
s.e.d.	0.297	0.29	0.198
l.s.d.	0.602	0.588	0.394
d.f.	36	36	84

¹“Phytodrip” at sowing

² In-field spray

³ Pre-planting drench

Table 3 Mean percentage of plants with lettuce root aphid in plants transplanted on two dates and in both transplantings combined

Treatment	First planting		Second planting		Both plantings	
	Ang	Back trans	Ang	Back trans	Ang	Back trans
Control	51.70	61.6	42.12	45.0	46.91	53.3
AHDB9933 ¹	33.75	30.9	38.36	38.5	36.05	34.6
Movento x 1 ²	51.11	60.6	41.90	44.6	46.51	52.6
Movento x 2 ²	46.44	52.5	30.87	26.3	38.65	39.0
AHDB9966 ²	43.62	47.6	49.61	58.0	46.61	52.8
AHDB9951 ²	27.11	20.8	42.05	44.9	34.58	32.2
AHDB9948 ²	35.26	33.3	47.25	53.9	41.25	43.5
AHDB9948 ¹	33.69	30.8	21.91	13.9	27.80	21.7
AHDB9943 ¹	40.39	42.0	45.00	50.0	42.70	46.0
AHDB9966 ¹	42.05	44.9	50.14	58.9	46.09	51.9
AHDB9951 ¹	38.36	38.5	25.67	18.8	32.01	28.1
AHDB9948 ³	47.25	53.9	40.61	42.4	43.93	48.1
F value	0.667		1.16		1.10	
P -value	0.759		0.35		0.37	
s.e.d.	13.13		11.87		8.65	
l.s.d.	26.63		24.08		17.19	
d.f.	36		36		84	

¹“Phytodrip” at sowing

² In-field spray

³ Pre-planting drench

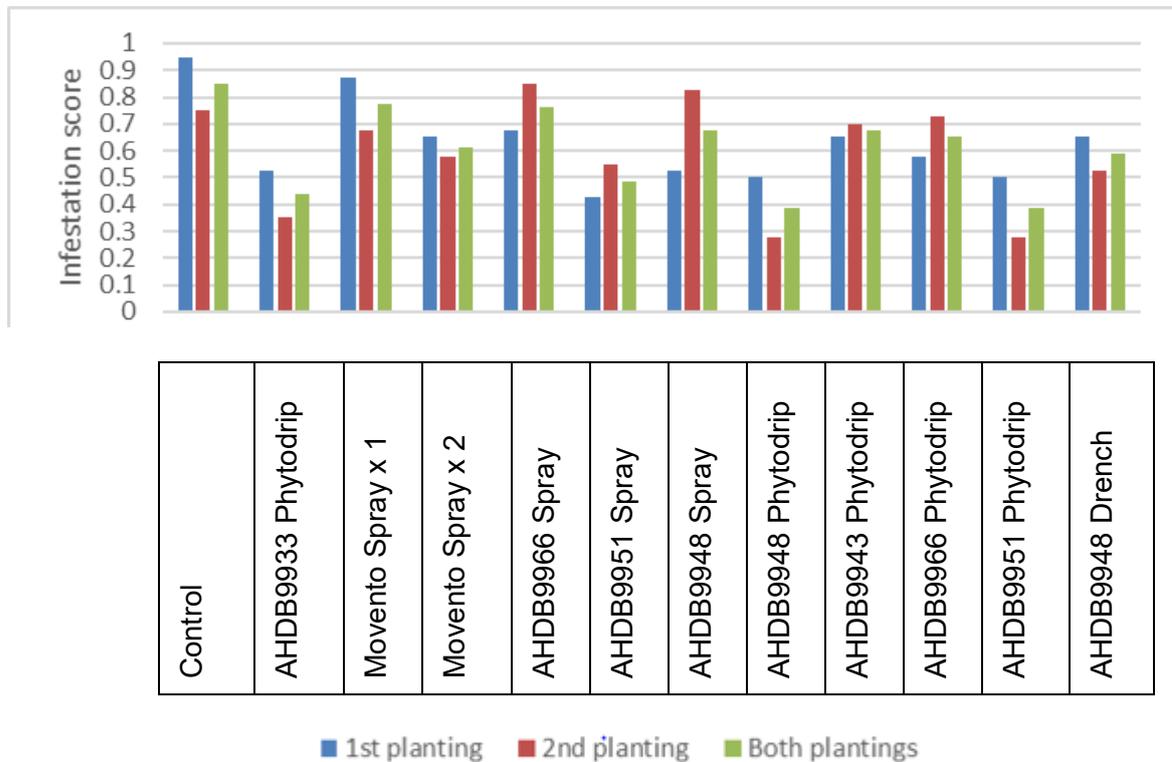


Figure 1 Mean lettuce root aphid infestation score for plants transplanted on two dates and for all plants combined

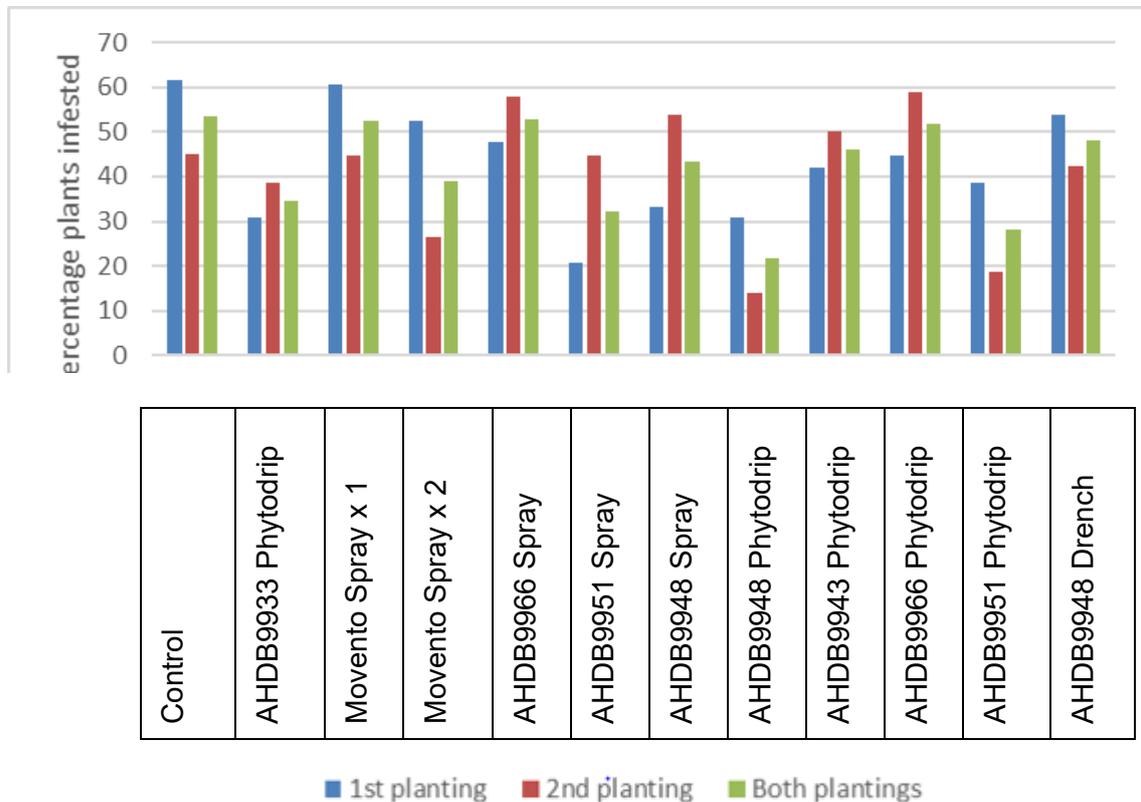


Figure 2 Mean percentage plants infested with lettuce root aphid for plants transplanted on two dates and for all plants combined

Table 4 Mean lettuce root aphid infestation score per plot and percentage of plants infested with lettuce root aphid in plants with seed treatment and untreated. Transplanted on two dates and in all plants combined

Treatment	Mean infestation score			Mean number of plants infested		
	First planting	Second planting	Both plantings	First planting	Second planting	Both plantings
Control	0.46	0.67	0.56	37.5	54.2	45.83
Seed Treatment	0.17	0.58	0.38	16.7	54.2	35.42

Currant lettuce aphid

No foliar aphids were observed. No results are presented.

Harvest weight

The results for the mean head weight in the first transplanting are presented in Table 5 and Figure 3. Weight was not recorded in the second transplanting as the plants

had started to bolt. The analysis is not significant at the 5% level using an F-test and no treatment is clearly different to the untreated control.

The results for the additional seed treatment are presented in Table 6. There was insufficient data for statistical analysis

Table 5 Mean lettuce head weight in plants transplanted on first planting date

Treatment	First planting
Control	831
Control	772
AHDB9933 ¹	824
Movento x 1 ²	765
Movento x 2 ²	794
AHDB9966 ²	825
AHDB9951 ²	793
AHDB9948 ²	837
AHDB9948 ¹	820
AHDB9943 ¹	840
AHDB9966 ¹	764
AHDB9951 ¹	803
F value	0.251
P -value	0.991
s.e.d.	78.97
l.s.d.	160.2
d.f.	36

¹ "Phytodrip" at sowing

² In-field spray

³ Pre-planting drench

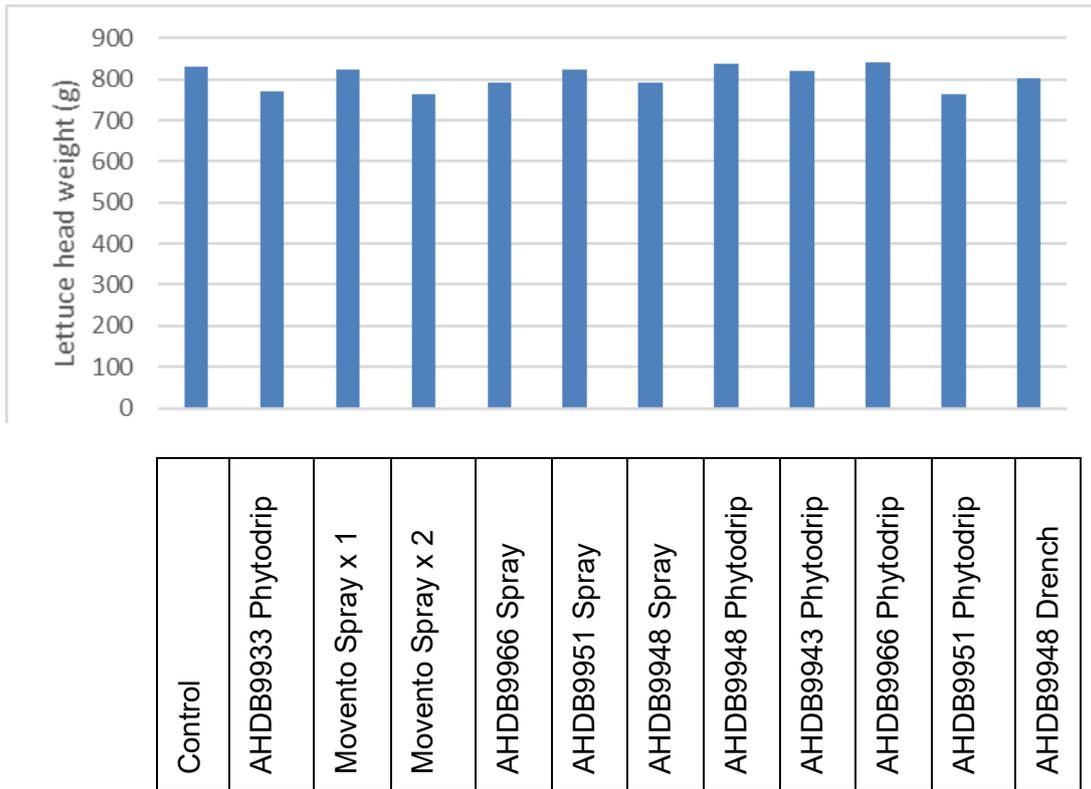


Figure 3 Mean head weight for lettuce plants from first transplanting (Sheep Pens)

Table 6 Mean lettuce head weight in plants with seed treatment and untreated. Transplanted on two dates and in all plants combined

Treatment	First planting	Second planting	Both plantings
Control	1101	1382	1242
Seed Treatment	1131	1382	1215

Silver-Y moth

The results for the mean percentage plants which had caterpillar frass (assumed to be due to silver-y moth caterpillars) in the first and second transplantings are presented in Table 7. The data from the first transplanting was angular transformed prior to analysis. The analysis is not significant at the 5% level using an F-test and no treatment is clearly different to the untreated control. There was insufficient data in the second transplanting for statistical analysis.

The results for the additional seed treatment are presented in Table 8. There was insufficient data for statistical analysis and no evidence of treatment effects.

Table 7 Mean percentage plants with caterpillar frass in lettuce transplanted on two dates

Treatment	Percentage plants with caterpillar frass		
	First planting		Second planting
	Ang	Back trans	
Control	32.31	28.57	0
AHDB9933 ¹	33.97	31.22	0
Movento x 1 ²	29.36	24.04	0
Movento x 2 ²	24.22	16.84	2.5
AHDB9966 ²	34.50	32.08	5
AHDB9951 ²	27.92	21.92	0
AHDB9948 ²	23.25	15.58	0
AHDB9948 ¹	24.91	17.74	0
AHDB9943 ¹	40.61	42.37	0
AHDB9966 ¹	27.86	21.83	7.5
AHDB9951 ¹	24.16	16.75	7.5
AHDB9948 ³	33.97	31.22	0
F value	0.431		
P -value	0.932		
s.e.d.	11.569		
l.s.d.	23.463		
d.f.	36		

¹ "Phytodrip" at sowing

² In-field spray

³ Pre-planting drench

Table 8 Mean percentage plants with caterpillar frass in lettuce with seed treatment and untreated. Transplanted on two dates.

Treatment	First planting	Second planting
Control	12.5	8.3
Seed Treatment	47.1	12.5

Common green capsid bug

The results for the mean percentage plants which had larvae of the common green capsid bug in the first and second transplantings are presented in Table 9. The data from the second transplanting was angular transformed prior to analysis. The analysis is not significant at the 5% level using an F-test and no treatment is clearly different to the untreated control. There was insufficient data in the first transplanting for statistical analysis.

The results for the additional seed treatment are presented in Table 10. There was insufficient data for statistical analysis and no evidence of treatment effects.

Table 9 Mean percentage plants with nymphs of the common green capsid bug in lettuce transplanted on two dates

Treatment	First planting	Second planting	
		Ang	Back trans
Control	2.5	11.25	3.8
AHDB9933 ¹	2.5	15.86	7.5
Movento x 1 ²	5	17.89	9.4
Movento x 2 ²	5	12.91	5.0
AHDB9966 ²	0	17.89	9.4
AHDB9951 ²	0	11.25	3.8
AHDB9948 ²	7.5	12.91	5.0
AHDB9948 ¹	2.5	15.86	7.5
AHDB9943 ¹	7.5	11.25	3.8
AHDB9966 ¹	0	11.25	3.8
AHDB9951 ¹	0	15.86	7.5
AHDB9948 ³	5	22.72	14.9
F value		0.279	
P -value		0.986	
s.e.d.		9.651	
l.s.d.		19.573	
d.f.		36	

¹ "Phytodrip" at sowing

² In-field spray

³ Pre-planting drench

Table 10 Mean percentage plants with nymphs of the common green capsid bug in lettuce with seed treatment and untreated. Transplanted on two dates.

Treatment	First planting	Second planting
Control	20.8	0
Seed Treatment	20.8	0

Discussion

A similar trial was conducted in 2018 but results were inconclusive due to low levels of colonization. A number of potential reasons for this were identified, including variety and weather (which was particularly hot and dry during the trial period).

As in 2018 establishment of the 2019 trial was planned to coincide with the migration of lettuce-root aphid from poplar (migration predicted to start after 672 day-degrees >4.4°C - on 9 June at Wellesbourne).

In contrast to the SCEPTREplus trial conducted in 2018 the numbers of plants infested with lettuce root aphid were relatively high and weather conditions were less extreme. However, there was no indication of lettuce root aphid control from any of the test treatments. Lettuce root aphid is a relatively difficult target and unless any suitable seed treatments become available in the future it may be necessary to consider other non-insecticidal approaches to manage this pest.

No currant lettuce aphids (*Nasonovia ribisnigri*) were observed so it was impossible to see treatment differences. However, most of the treatments were also evaluated for control of currant-lettuce aphid in a laboratory pot trial in 2018. The trial is described in the report for SP04 but the results are also shown in Figure 4. In contrast to the lettuce root aphid field trial, several of the foliar spray and phytodrip treatments were effective against the currant-lettuce aphid.

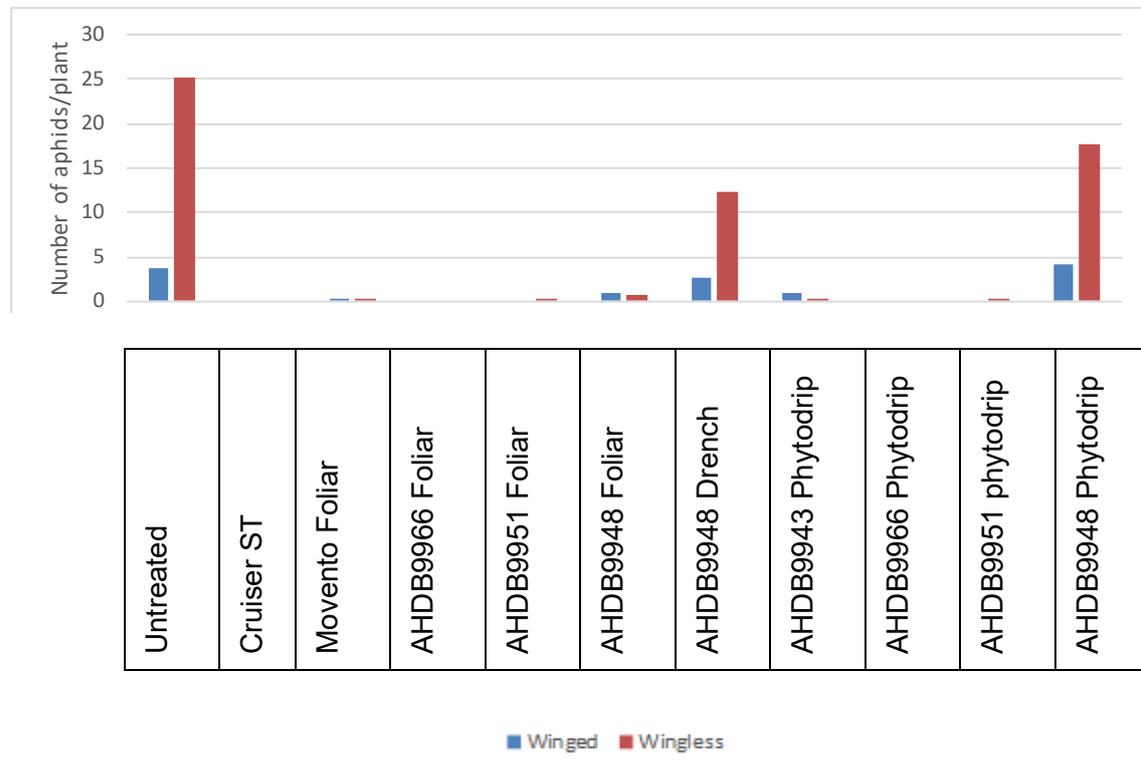


Figure 4 Currant-lettuce aphid (*Nasonovia ribisnigri*) – mean number of winged and wingless aphids per plant on lettuce plants treated 1) at sowing with seed or phytodrip treatments, with foliar sprays or with a pre-planting drench treatment (2 replicates only). Pot trial in SP04 – 2018.

Caterpillar frass was seen and assumed to be due to silver Y moth caterpillars. The data were limited but did not indicate any control from any of the treatments. The insect present on the foliage in the greatest numbers was the nymph of the common green capsid bug. Again the data were limited but none of the treatments appeared to offer any control.

All treatments mixed and sprayed well. No wetter was required. There were no phytotoxic effects.

Conclusions

- There was no indication of lettuce root aphid control from any of the test treatments.
- No treatments caused phytotoxic effects.

Acknowledgements

We would like to thank the AHDB for funding and supporting this project and for the financial and in kind contributions from the crop protection manufactures and distributors involved with the SCEPTREplus programme as listed below:
Agrii, Alpha Biocontrol Ltd, Andermatt, Arysta Lifescience, BASF, Bayer, Belchim, Bionema Limited, Certis Europe, Dow, DuPont, Eden Research, Fargro Limited, FMC, Gowan, Interfarm, Lallemand Plant Care, Novozymes, Oro Agri, Russell IPM, Sumitomo Chemicals, Syngenta, UPL and Elsoms Seeds for supplying treated seed.

Appendix

- a. Crop diary – events related to growing crop

Crop	Cultivar	Planting/sowing date	Row width (m)
Lettuce	Lobjoits Green Cos	5/6/19 (Sheep Pens)	0.35
Lettuce	Rumours	11/6/19 (Sheep Pens)	0.35
Lettuce	Lobjoits Green Cos	12/6/19 (Long Meadow West)	0.35
Lettuce	Rumours	12/6/19 (Long Meadow West)	0.35

Previous cropping

Year	Crop
2017	Winter Barley
2018	Winter Wheat

Cultivations

Date	Description	Depth
15/2/19	Ploughing (Long Meadow West)	25cm
15/3/19	Ploughing (Sheep Pens)	25cm
4/6/19	Bed forming (Sheep Pens)	15cm
12/6/19	Bed forming (Long Meadow West)	15cm

Active ingredient(s) / fertiliser(s) applied to the trial area

Date	Product	Rate	Unit
30/8/18	0:20:20 NPK (Long Meadow West)	333	Kg/ha
30/8/18	0:20:20 NPK (Sheep Pens)	666	Kg/ha
4/6/19	Nitram (Sheep Pens)	100	Kg N/ha
12/6/19	Nitram (Long Meadow West)	100	Kg N/ha

Pesticides applied to the trial area

Date	Product	Rate	Unit
6/6/19	Kerb Flo (Sheep Pens)	3.5	l/ha
18/6/19	Kerb Flo (Long Meadow West)	3.5	l/ha
4/7/19	Laser (Long Meadow West)	2.25	l/ha
4/7/19	Activator 90	1	ml/l

Details of irrigation regime

Date	Type, rate and duration	Amount applied (mm)
3/7/19	Wright Rain, 1 hour (both plots)	5
5/7/19	Wright Rain, 1 hour (both plots)	5
16/7/19	Wright Rain, 1 hour (both plots)	5
26/7/19	Wright Rain, 1 hour (both plots)	5

Other actions

Date	Action
5/6/19	Trial area (Sheep Pens) fenced to exclude rabbits
12/6/19	Trial area (Long Meadow West) fenced to exclude rabbits

b. Trial diary

Experimental Diary	
Date	Event
15/05/19	Seed sown (First sowing)
15/05/19	Phytodrip treatments applied
22/05/19	Seed sown (Second sowing)
22/05/19	Phytodrip treatments applied
22/05/19	Treated seed from Elsoms sown
23/05/19	Germination assessment (first sowing)
04/06/19	Drench treatment (T12) applied to first sowing
05/06/19	First sowing transplanted (Sheep Pens)
06/06/19	Spray treatments applied to first transplants
11/06/19	Treated seed plants transplanted (Sheep Pens)
12/06/19	Drench treatment (T12) applied to second sowing
12/06/19	Second sowing transplanted (Long Meadow West)
14/06/19	Spray treatments applied to second transplants
20/06/19	Second spray applied to T4 (first planting)
28/06/19	Second spray applied to T4 (second planting)
31/07/19	First transplant harvest
7/08/19	Second transplant harvest

c. Climatological data during study period

Date	Temperature		Rainfall (mm)
	Max 09-09	Min 09-09	Total 09-09
01/05/2019	16.68	5.46	0.00
02/05/2019	13.58	4.40	2.40
03/05/2019	14.46	5.51	2.20
04/05/2019	12.02	3.04	0.00
05/05/2019	11.83	-0.37	0.00
06/05/2019	12.18	0.32	0.00
07/05/2019	15.64	5.12	7.20
08/05/2019	13.41	7.33	6.60
09/05/2019	10.49	8.17	0.80
10/05/2019	14.29	5.36	2.40
11/05/2019	15.58	3.97	0.60
12/05/2019	17.14	-0.60	0.00
13/05/2019	17.36	2.79	0.00
14/05/2019	18.40	1.84	0.00
15/05/2019	18.91	2.74	0.00
16/05/2019	17.49	2.38	0.00
17/05/2019	17.10	7.00	0.20
18/05/2019	15.00	9.68	0.00
19/05/2019	17.52	3.93	0.00
20/05/2019	19.01	6.93	0.00
21/05/2019	19.17	4.33	0.00
22/05/2019	20.43	4.06	0.00
23/05/2019		4.30	
24/05/2019	20.94		0.00
25/05/2019	22.27	9.05	0.00
26/05/2019	20.32	13.80	0.20
27/05/2019	17.89	6.62	0.00
28/05/2019	17.44	6.92	0.00
29/05/2019	15.12	3.81	1.20
30/05/2019	22.85	10.21	0.00
01/06/2019	25.59	9.00	0.00
02/06/2019	23.40	16.33	1.80
03/06/2019	19.01	9.53	0.80
04/06/2019	18.38	9.15	2.60
05/06/2019	18.14	9.82	0.00
06/06/2019	18.40	6.88	0.80
07/06/2019	15.24	6.74	20.60
08/06/2019	16.38	10.01	2.20
09/06/2019	18.51	4.88	0.00
10/06/2019	13.67	5.26	24.40

11/06/2019	11.27	9.25	4.60
12/06/2019	14.16	8.88	25.40
13/06/2019	14.61	10.11	8.00
14/06/2019	15.68	10.67	1.60
15/06/2019	17.25	8.39	6.00
16/06/2019	20.18	8.85	0.60
17/06/2019	19.51	13.02	0.00
18/06/2019	18.44	10.19	2.40
19/06/2019	18.85	12.63	0.00
20/06/2019	18.57	7.66	0.00
21/06/2019	19.84	6.74	0.00
22/06/2019	22.21	5.37	0.00
23/06/2019	22.91	11.17	0.00
24/06/2019	23.53	13.85	21.00
25/06/2019	17.40	15.90	9.20
26/06/2019	16.88	13.39	0.00
27/06/2019	21.29	11.05	0.00
28/06/2019	23.88	11.28	0.00
29/06/2019	31.53	12.79	0.00
30/06/2019	22.34	12.23	0.00
01/07/2019	20.73	12.56	0.00
02/07/2019	19.21	7.48	0.00
03/07/2019	22.05	5.56	0.00
04/07/2019	24.49	7.59	0.00
05/07/2019	25.18	11.44	0.00
06/07/2019	18.56	10.76	0.20
07/07/2019	22.25	11.13	0.00
08/07/2019	21.80	10.65	0.00
09/07/2019	22.23	14.47	0.00
10/07/2019	22.51	14.92	0.00
11/07/2019	24.00	14.16	0.00
12/07/2019	22.36	13.53	0.00
13/07/2019	20.13	10.76	0.00
14/07/2019	21.11	11.83	0.00
15/07/2019	21.96	6.61	0.00
16/07/2019	25.83	9.37	0.00
17/07/2019	24.53	11.23	0.00
18/07/2019	23.23	14.71	1.20
19/07/2019	19.44	9.84	14.60
20/07/2019	22.28	14.26	0.00
21/07/2019	23.07	11.04	0.00
22/07/2019	26.27	16.51	0.00
23/07/2019	32.79	13.07	6.40
24/07/2019	29.02	18.13	0.00

25/07/2019	36.17	14.98	0.00
26/07/2019	25.52	17.01	6.40
27/07/2019	18.10	15.88	3.00
28/07/2019	20.40	14.12	0.20
29/07/2019	26.69	10.03	1.20
30/07/2019	20.54	14.10	22.20
31/07/2019	20.78	14.51	0.00
01/08/2019	24.59	14.44	1.00
02/08/2019	24.81	12.49	0.00
03/08/2019	24.78	11.59	0.00
04/08/2019	26.01	13.48	0.20
05/08/2019	24.05	15.60	0.00
06/08/2019	23.51	12.86	1.60
07/08/2019	22.89	12.86	0.00
08/08/2019	25.25	11.79	12.60
09/08/2019	24.35	17.31	4.00
10/08/2019	21.89	15.78	0.40
11/08/2019	20.38	13.94	3.80
12/08/2019	19.32	11.14	0.00
13/08/2019	21.28	9.69	2.80
14/08/2019	18.74	12.69	5.40
15/08/2019	21.72	13.86	0.00
16/08/2019	17.70	10.14	10.80
17/08/2019	22.38	12.28	0.20
18/08/2019	21.90	12.54	0.40
19/08/2019	21.10	11.60	1.60
20/08/2019	20.60	8.60	0.00
21/08/2019	23.30	9.80	0.00
22/08/2019	23.80	12.60	0.00
23/08/2019	26.50	11.30	0.00
24/08/2019	29.70	8.40	0.00
25/08/2019	32.50	12.60	0.00
26/08/2019	29.50	12.30	0.00
27/08/2019	28.90	14.00	2.20
28/08/2019	23.20	13.40	3.60
29/08/2019	22.00	8.20	0.00
30/08/2019	23.90	14.10	0.00
31/08/2019	21.20	13.80	0.00

d. Raw data from assessments

Lettuce root aphid score and percentage plants with lettuce root aphid (plot means)

Date	Field	Plot	Treatment	LRA score	% Plants with LRA
31/7/19	Sheep Pens	1	12	1.3	90
		2	3	1.3	80
		3	5	0.6	40
		4	6	0	0
		5	4	0.5	30
		6	11	0.7	50
		7	10	0.4	30
		8	1	1	70
		9	7	0.3	20
		10	2	0	0
		11	8	0.5	30
		12	9	0.2	20
		13	9	1.3	80
		14	4	0.6	60
		15	7	0.2	10
		16	10	0.1	10
		17	8	0.8	60
		18	3	0.4	40
		19	5	0.5	40
		20	2	0.2	20
		21	11	0.2	20
		22	1	0.8	40
		23	12	0.5	40
		24	6	0.1	10
		25	1	1.5	90
		26	8	0.7	60
		27	11	0.1	10
		28	12	0.3	30
		29	2	0.7	50
		30	7	0.7	40
		31	3	0.6	50
		32	9	0.3	20
		33	6	0.6	40
		34	5	0.4	40
		35	4	0.5	50
		36	10	0.7	50
		37	10	1.1	90
		38	2	1.2	80
		39	6	1	60
		40	9	0.8	50
		41	5	1.2	70
		42	1	0.5	40
		43	4	1	70
		44	8	0	0
		45	12	0.5	50
		46	3	1.2	70
		47	7	0.9	70

		48	11	1	80
31/7/19	Sheep Pens	1	Untreated	0.3	16.7
	(Seed Treatment)	2	Treated	0.3	33.3
		3	Untreated	0.7	66.7
		4	Treated	0.3	33.3
		5	Untreated	0.3	16.7
		6	Treated	0.0	0.0
		7	Untreated	0.5	50.0
		8	Treated	0.0	0.0
7/8/19	Long Meadow West	1	10	1.7	100
		2	1	1.6	80
		3	7	1.6	90
		4	12	0.9	50
		5	5	1.3	80
		6	3	0.6	50
		7	2	0.4	40
		8	9	0.4	30
		9	8	0.2	10
		10	4	0.2	20
		11	11	0.5	40
		12	6	0.6	50
		13	2	0.8	60
		14	5	1.3	80
		15	11	0.2	10
		16	4	0.9	10
		17	7	0.6	40
		18	9	0.7	50
		19	1	0.3	30
		20	12	0.6	40
		21	6	0.4	40
		22	8	0.4	40
		23	10	0.1	10
		24	3	0.6	60
		25	4	1.1	70
		26	8	0.6	40
		27	12	0	0
		28	2	0.3	30
		29	10	0	0
		30	6	0.2	20
		31	3	0.3	30
		32	11	0.3	20
		33	7	0.3	20
		34	5	0.7	50
		35	1	0.6	50
		36	9	0.5	40
		37	9	0.9	70
		38	3	0.8	50
		39	6	0.7	40
		40	1	0.9	60
		41	8	0.3	20

		42	11	0.8	60
		43	10	0.1	10
		44	4	0.4	30
		45	5	0.6	40
		46	7	0.2	20
		47	2	0.4	30
		48	12	0.2	80
7/8/19	Long Meadow West	1	Untreated	0.5	50
		2	Treated	0.3	33.3
		3	Untreated	0.8	66.7
		4	Treated	0.7	50
		5	Untreated	0.8	50
		6	Treated	0.7	66.7
		7	Untreated	0.5	50
		8	Treated	0.7	66.7

Lettuce head weight and foliar pests

Date	Field	Plot	Treatment	Weight	% plants with	
					Caterpillar frass	Common Green Capsid
31/7/19	Sheep Pens	1	12	968	80	0
		2	3	742	30	0
		3	5	722	30	0
		4	6	779	0	0
		5	4	756	10	0
		6	11	607	0	0
		7	10	820	20	0
		8	1	717	20	0
		9	7	737	30	10
		10	2	757	30	0
		11	8	693	30	0
		12	9	731	30	20
		13	9	983	70	10
		14	4	689	40	0
		15	7	810	20	10
		16	10	819	10	0
		17	8	970	30	0
		18	3	868	40	10
		19	5	851	50	0
		20	2	832	40	0
		21	11	760	50	0
		22	1	698	10	0
		23	12	678	30	0
		24	6	805	40	0
		25	1	917	40	10
		26	8	809	30	0
		27	11	818	30	0
		28	12	831	40	20

		29	2	816	50	10
		30	7	919	30	10
		31	3	974	50	10
		32	9	787	30	0
		33	6	804	30	0
		34	5	631	20	0
		35	4	657	40	10
		36	10	873	30	0
		37	10	850	30	0
		38	2	683	10	0
		39	6	914	40	0
		40	9	779	40	0
		41	5	972	30	0
		42	1	994	50	0
		43	4	958	0	10
		44	8	875	0	10
		45	12	735	0	0
		46	3	714	0	0
		47	7	704	0	0
		48	11	873	10	0
31/7/19	Sheep Pens	1	Untreated	1108	16.7	66.7
	(Seed Treatment)	2	Treated	1162	66.7	50.0
		3	Untreated	1248	16.7	0.0
		4	Treated	1108	33.3	0.0
		5	Untreated	981	16.7	16.7
		6	Treated	1116	33.3	16.7
		7	Untreated	1067	0.0	0.0
		8	Treated	1141	33.3	16.7
7/8/19	Long Meadow West	1	10		20	10
		2	1		0	0
		3	7		0	0
		4	12		0	10
		5	5		0	20
		6	3		0	20
		7	2		0	10
		8	9		0	0
		9	8		0	0
		10	4		0	0
		11	11		10	0
		12	6		0	0
		13	2		0	10
		14	5		0	0
		15	11		10	20
		16	4		10	30
		17	7		0	0
		18	9		0	10
		19	1		0	10
		20	12		0	10
		21	6		0	40
		22	8		0	0

		23	10		0	10
		24	3		10	0
		25	4		0	10
		26	8		0	10
		27	12		0	20
		28	2		0	30
		29	10		0	20
		30	6		0	0
		31	3		0	10
		32	11		0	20
		33	7		10	10
		34	5		0	30
		35	1		20	10
		36	9		0	20
		37	9		0	0
		38	3		0	20
		39	6		0	0
		40	1		0	20
		41	8		0	0
		42	11		0	10
		43	10		0	10
		44	4		0	20
		45	5		0	0
		46	7		0	20
		47	2		0	10
		48	12		0	0
7/8/19	Long Meadow West	1	10	1413	0	0
		2	1	1263	0	0
		3	7	1431	0	0
		4	12	1393	0	0
		5	5	1397	0	0
		6	3	1274	33.3	0
		7	2	1286	33.3	0
		8	9	1272	16.7	0

e. Photographs of the trial



Trial on 6 June 2019 (First planting – Sheep Pens)



Trial on 27 June 2019 (First planting (Sheep Pens)



Harvesting the trial on 31 July 2019 (First planting – Sheep Pens)

f. Field plans

First planting – Sheep Pens

12	3	5	6	4	11	10	1	7	2	8	9
1	2	3	4	5	6	7	8	9	10	11	12
9	4	7	10	8	3	5	2	11	1	12	6
13	14	15	16	17	18	19	20	21	22	23	24
1	8	11	12	2	7	3	9	6	5	4	10
25	26	27	28	29	30	31	32	33	34	35	36
10	2	6	9	5	1	4	8	12	3	7	11
37	38	39	40	41	42	43	44	45	46	47	48

Second planting – Long Meadow West

10	1	7	12	5	3	2	9	8	4	11	6
1	2	3	4	5	6	7	8	9	10	11	12
2	5	11	4	7	9	1	12	6	8	10	3
13	14	15	16	17	18	19	20	21	22	23	24
4	8	12	2	10	6	3	11	7	5	1	9
25	26	27	28	29	30	31	32	33	34	35	36
9	3	6	1	8	11	10	4	5	7	2	12
37	38	39	40	41	42	43	44	45	46	47	48



Certificate of

Official Recognition of Efficacy Testing Facilities or Organisations in the United Kingdom

This certifies that

Warwick Crop Centre, School of Life Sciences

complies with the minimum standards laid down in
Regulation (EC) 1107/2009 for efficacy testing.

The above Facility/Organisation has been officially
recognised as being competent to carry out efficacy trials/tests
in the United Kingdom in the following categories:

**Agriculture/Horticulture
Biologicals and Semiochemicals**

Date of issue: **6 October 2017**

Effective date: **20 March 2017**

Expiry date: **19 March 2022**

Signature

Aislin Richardson
Authorised signatory

Certification Number

ORETO 381



Chemicals Regulation Division



Department of
**Agriculture and
Rural Development**