

# SCEPTREPLUS

## Final Trial Report

<b>Trial code:</b>	SP 36 (W2018.012)
<b>Title:</b>	Evaluating treatments for control of lettuce root aphid on lettuce
<b>Crop</b>	Group: Field vegetables - Lettuce
<b>Target</b>	Lettuce root aphid - <i>Pemphigus bursarius</i> -PEMPBU
<b>Lead researcher:</b>	Dr Rosemary Collier
<b>Organisation:</b>	University of Warwick, School of Life Sciences, Wellesbourne, Warwick CV35 9EF
<b>Period:</b>	May 2018 – October 2018
<b>Report date:</b>	12/2/19
<b>Report author:</b>	Andrew Jukes and Dr Rosemary Collier
<b>ORETO Number: (certificate should be attached)</b>	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.

29 February 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control options and approval for the standard treatment (the neonicotinoid Thiamethoxam – Cruiser seed treatment) has been revoked.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.

### Methods

Lettuce seed (cv Challenge) was sown into peat blocks on 2 occasions, 1 week apart. Transplanting into a field plot was timed to coincide with the predicted migration of winged lettuce-root aphid (11 June 2018) (3 weeks after sowing). The trial was designed for four replicates of twelve treatments. Treatments (all conventional insecticides) were applied at sowing (seed treatment or “Phytodrip”), pre-planting (drench) or as post-planting sprays. Plants were dug-up when they were commercially harvestable (64 and 68 days after sowing for the first and second transplants respectively). The roots were scored (0 – 4 scale, 0 = no aphids, 1 = <10, 2 = 11-100, 3= 101-100 and 4 = >1000 aphids) for levels of lettuce root aphid infestation, the plants were weighed after trimming and the heads were assessed for foliar pests. As low levels of lettuce root aphid were seen, the remaining plants in each plot were also dug-up (92 and 85 days after sowing for the first and second transplants respectively) and the roots were assessed as before.

### Results

The results for both assessments were combined and the mean lettuce root aphid infestation score and numbers of plants per plot infested with lettuce root aphid (20 plants per plot per transplant in total) are presented in the table below. Levels of infestation were generally low. Statistical analyses were not significant for data from either transplanting or the two transplantings combined. There is no evidence that any treatment decreased numbers of aphids compared with the untreated control but numbers in the control were particularly low.

Treatment	Mean infestation score			Mean number of plants infested		
	First planting	Second planting	Both plantings	First planting	Second planting	Both plantings
Control	0.00	0.08	0.04	0.00	0.75	0.75
Cruiser <sup>1</sup>	0.05	0.11	0.08	0.75	1.75	2.50
Movento x 1 <sup>4</sup>	0.06	0.01	0.04	0.50	0.25	0.75
Movento x 2 <sup>4</sup>	0.04	0.00	0.02	0.75	0.00	0.75
AHDB9966 <sup>4</sup>	0.08	0.14	0.11	0.75	1.50	2.25
AHDB9951 <sup>4</sup>	0.15	0.11	0.13	1.75	1.50	3.25
AHDB9948 <sup>3</sup>	0.25	0.00	0.13	2.25	0.00	2.25
AHDB9948 <sup>2</sup>	0.05	0.06	0.06	0.75	0.75	1.50
AHDB9943 <sup>2</sup>	0.04	0.00	0.02	0.50	0.00	0.50
AHDB9966 <sup>2</sup>	0.11	0.14	0.13	1.50	1.25	2.75
AHDB9951 <sup>2</sup>	0.06	0.04	0.05	0.50	0.50	1.00
AHDB9948 <sup>2</sup>	0.06	0.03	0.04	0.50	0.25	0.75
F value	0.925	1.157	0.755	0.976	1.325	0.905
P -value	0.528	0.350	0.680	0.485	0.251	0.545
d.f.	36	36	36	36	36	36
s.e.d.	0.097	0.072	0.069	0.909	0.795	1.429
l.s.d.	0.196	0.145	0.140	1.844	1.612	2.898

<sup>1</sup> Seed treatment; <sup>2</sup> “Phytodrip” at sowing; <sup>3</sup> Pre-planting drench; <sup>4</sup> In-field spray

Small numbers of silver Y moth caterpillars were observed but they were insufficient for any statistical analysis. Currant lettuce aphid was seen only on a very small number of plants. 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.

### **Conclusions**

There was no indication of lettuce root aphid control from any of the test treatments including the standard (approved) products, but levels of infestation on control plots were very low. Colonisation by lettuce root aphids may have been adversely affected by the very hot, dry weather during the trial period and it is possible that the cultivar of lettuce tested may have had some (unspecified) resistance to lettuce root aphid. None of the treatments appeared to control either silver Y moth caterpillars or the common green capsid bug.

### **Take home message:**

Because of the low level of pest infestation overall there is no information that can be taken from this trial.

## 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	Challenge
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 3.5 m (split over 2 transplants)
Plot size: (m <sup>2</sup> )	6
Number of plants per plot:	40 (20 in each transplant)
<i>Leaf Wall Area calculations</i>	n/a

## Treatment details

AHDB Code	Active substance	Product name/ manufacturers code	Formulation batch number	Content of active substance in product	Formulation type	Adjuvant
Untreated						
Authorized (2018)	Thiamethoxam	Cruiser 70WS	Not known	70%	WS	None
Authorized	Spirotetramat	Movento	ECE4101299	150 g/l	OD	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	Cruiser	80 g/100,000 seeds	114 g/100,000 seeds	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 <sup>1</sup>	B1 B2
9	AHDB9943	1 g/1000 plants	2 g/1000 plants <sup>2</sup>	A1 A2
10	AHDB9966	0.24 g/1000 plants	2 ml/1000 plants <sup>1</sup>	A1 A2
11	AHDB9951	1.25 g/1000 plants	6.25 ml/1000 plants <sup>1</sup>	A1 A2
12	AHDB9948	0.75 g/1000 plants	3.75 ml/1000 plants <sup>1</sup>	A1 A2

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

<sup>2</sup> Manufacturer recommendation

## Application details

	Application A1	Application B1	Application C1	Application D1
Application date	22/5/18	12/6/18	15/6/18	28/6/18
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	8	8	10
Crop coverage (%)	N/A	N/A	15	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	20	20
Relative humidity (%)	N/A	N/A	63	72
Wind speed range (m/s)	N/A	N/A	Light	Moderate
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	29/5/18	20/6/18	21/6/18	4/7/18
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	8	8	10
Crop coverage (%)	N/A	N/A	15	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	19	20
Relative humidity (%)	N/A	N/A	53	64
Wind speed range (m/s)	N/A	N/A	Light	Nil
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	EPPO 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	28 – 35 % plants infested (all treatments)	
Currant lettuce aphid <sup>1</sup>	<i>Nasonovia ribisnigri</i>	NASORN	0	Very low	
Silver-y <sup>1</sup>	<i>Autographa gamma</i>	PYTOGA	0	3 – 4 % plants with caterpillars or frass	
Common green capsid bug <sup>1</sup>	<i>Lygocoris pabulinus</i>	LYGUPA	0	37 – 40 % plants infested (all treatments)	

<sup>1</sup> Non-target pests

## Method

Two sequential sowings (1 week intervals) of lettuce (cv Challenge) were made on 22 and 29 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 20 plants transplanted on each of 2 dates (40 plants/plot in total). The plots were 3.5 m x 1 bed (1.83 m each) in size. The transplanting dates were: 13 and 20 June. Plants were transplanted at a spacing of 35 cm within rows and 35 cm between rows. Treatments were applied at sowing (Seed treatment or “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.

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 11 June at Wellesbourne. Application dates are detailed above.

## Assessment details

The plots were initially assessed for infestation by lettuce root aphid on 26 July – 1 August (first transplant) and 6 – 7 August (second transplant).

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.

As low numbers of plants with lettuce root aphid infestations were found, the remaining plants from both transplants (10 per transplant) were dug-up and assessed for lettuce root aphid. No other assessments were made and the plants were not weighed.

Germination and phytotoxicity were assessed on sowing-time treatments 1 day before transplanting and phytotoxicity were 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			
12/6/18	20	n/a	14	Phytotoxicity	Germination and leaf damage
19/6/18	20	n/a	14	Phytotoxicity	Germination and leaf damage
22/6/18	30	7	15	Phytotoxicity	Leaf damage
28/6/18	29	7	15	Phytotoxicity	Leaf damage
26/7/18	64	41	49	Efficacy	Root infestation, foliar pests and head weight
6/8/18	68	46	49	Efficacy	Root infestation, foliar pests and head weight
23/8/18	92 (first) 85 (second)	69 (first) 63 (second)	51	Efficacy	Root infestation

\* DA – days after application

## Statistical analysis

This trial was designed as a Trojan square for 12 treatments in a (4\*4)/3 design. With low numbers of plants with lettuce root aphid infestations, particularly in the untreated control plots, no formal statistical analysis was conducted. However, mean lettuce root aphid scores, numbers of plants with lettuce root aphids, percentage plants with capsid nymphs (after angular transformation) and harvest weight were analysed by ANOVA using the Excel data package.

## 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 <sup>st</sup> sowing)			Number of seedlings (2 <sup>nd</sup> sowing)		
	Healthy	Unhealthy	Missing	Healthy	Unhealthy	Missing
Untreated	86	0	2	98	0	0
Cruiser	83	0	1	96	0	2
AHDB9943	86	0	3	105	0	0
AHDB9966	85	0	3	97	0	1
AHDB9951	87	0	2	95	0	3
AHDB9948	88	0	2	98	0	0

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

### Lettuce root aphid

The results for the mean lettuce root aphid score and the numbers of plants with lettuce root aphid for the first transplanting, the second transplanting and both transplantings combined are presented in Table 2 and Figures 1 and 2. The results presented are the sum of both assessments carried out, so represent 20 plants in each transplanting. 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.

Table 2 Mean lettuce root aphid infestation score and numbers of plants per plot (40 plants per plot total) infested with lettuce root aphid in plants 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	0.000	0.075	0.038	0.00	0.75	0.75
Cruiser <sup>1</sup>	0.050	0.113	0.081	0.75	1.75	2.50
Movento x 1 <sup>4</sup>	0.063	0.013	0.038	0.50	0.25	0.75
Movento x 2 <sup>4</sup>	0.038	0.000	0.019	0.75	0.00	0.75
AHDB9966 <sup>4</sup>	0.075	0.138	0.106	0.75	1.50	2.25
AHDB9951 <sup>4</sup>	0.150	0.113	0.131	1.75	1.50	3.25
AHDB9948 <sup>4</sup>	0.250	0.000	0.125	2.25	0.00	2.25
AHDB9948 <sup>3</sup>	0.050	0.063	0.056	0.75	0.75	1.50
AHDB9943 <sup>2</sup>	0.038	0.000	0.019	0.50	0.00	0.50
AHDB9966 <sup>2</sup>	0.113	0.138	0.125	1.50	1.25	2.75
AHDB9951 <sup>2</sup>	0.063	0.038	0.050	0.50	0.50	1.00
AHDB9948 <sup>2</sup>	0.063	0.025	0.044	0.50	0.25	0.75
F value	0.925	1.157	0.755	0.976	1.325	0.905
P -value	0.528	0.350	0.680	0.485	0.251	0.545
d.f.	36	36	36	36	36	36
s.e.d.	0.097	0.072	0.069	0.909	0.795	1.429
l.s.d.	0.196	0.145	0.140	1.844	1.612	2.898

<sup>1</sup> Seed treatment

<sup>2</sup> "Phytodrip" at sowing

<sup>3</sup> Pre-planting drench

<sup>4</sup> In-field spray

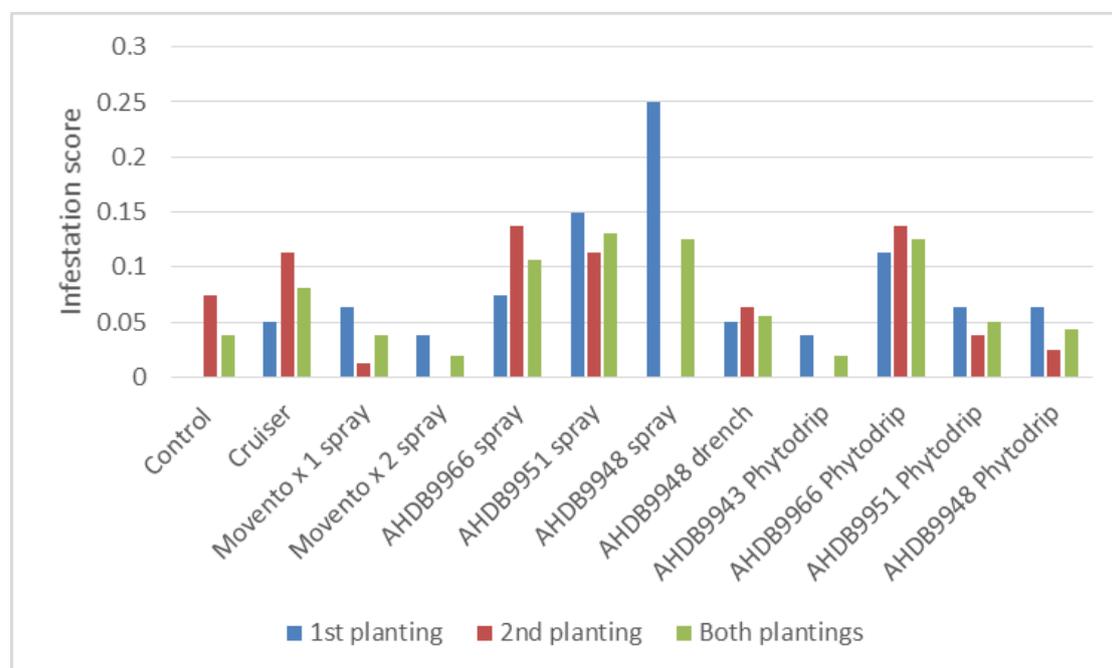


Figure 1 Mean lettuce root aphid infestation score for plants transplanted on two dates and for all plants combined

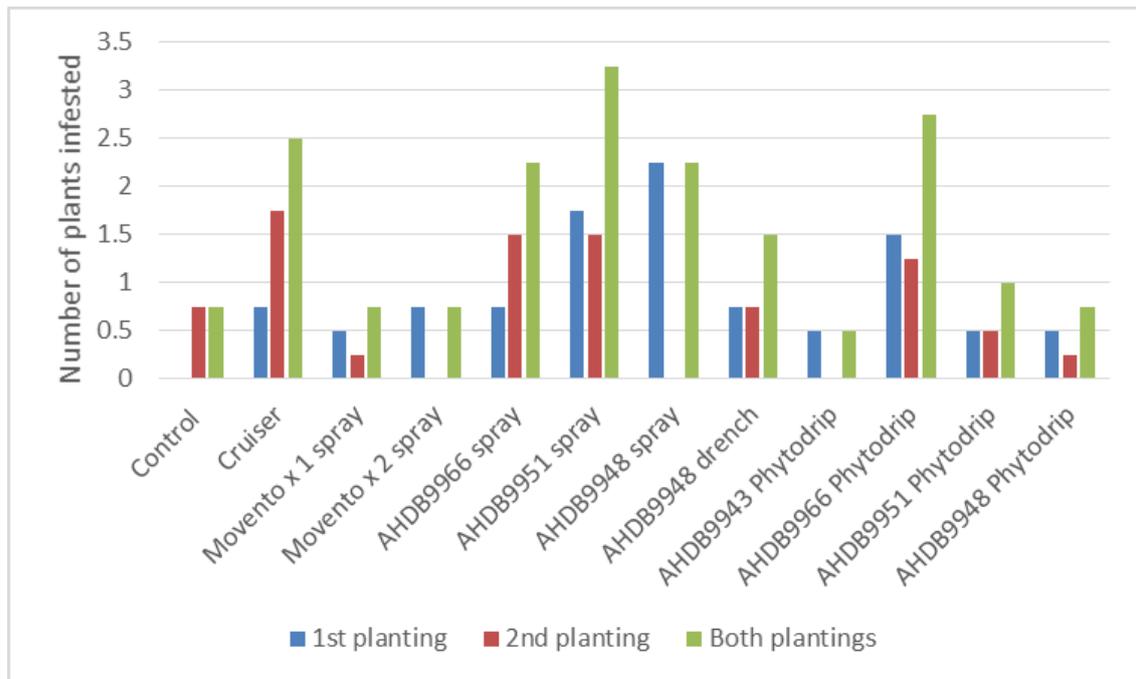


Figure 2 Mean number of plants per plot infested with lettuce root aphid for plants transplanted on two dates and for all plants combined

### Currant lettuce aphid

Very few foliar aphids were observed. No results are presented.

### Harvest weight

The results for the mean head weight in the first and second transplantings are presented in Table 3 and Figure 3. The results presented are from the first assessments carried out only, so represent 10 plants in each transplanting. None of the analyses were significant at the 5% level using an F-test and no treatment is clearly different to the untreated control.

Table 3 Mean lettuce head weight in plants transplanted on two dates

Treatment	Mean head weight (g)	
	First planting	Second planting
Control	1233.4	956.8
Cruiser <sup>1</sup>	1240.6	1043.6
Movento x 1 <sup>2</sup>	1185.1	992.0
Movento x 2 <sup>2</sup>	1183.9	982.8
AHDB9966 <sup>2</sup>	1131.5	949.1
AHDB9951 <sup>2</sup>	1200.4	1033.9
AHDB9948 <sup>3</sup>	1242.5	995.9
AHDB9948 <sup>4</sup>	1182.1	1045.9
AHDB9943 <sup>4</sup>	1147.1	999.1
AHDB9966 <sup>4</sup>	1264.9	1018.3
AHDB9951 <sup>4</sup>	1216.3	1279.6
AHDB9948 <sup>4</sup>	1208.4	1013.9
F value	0.182	0.859
P -value	0.998	0.586
d.f.	36	36
s.e.d.	131.3	130.7
l.s.d.	266.4	265.0

<sup>1</sup> Seed treatment

<sup>2</sup> "Phytodrip" at sowing

<sup>3</sup> Pre-planting drench

<sup>4</sup> In-field spray

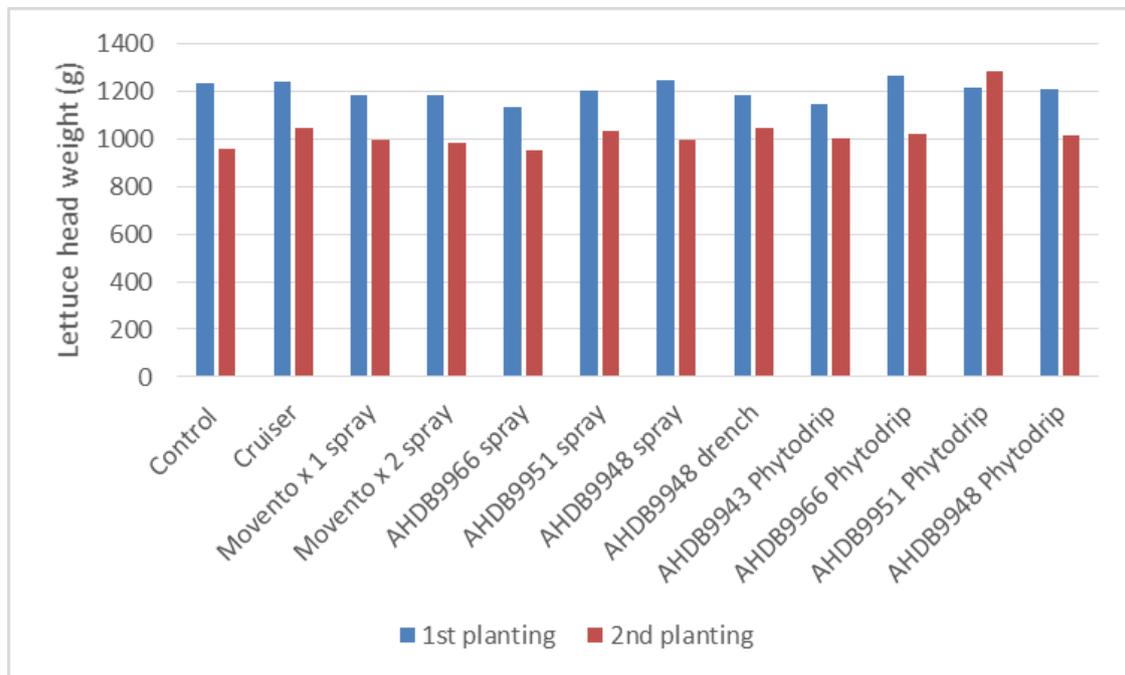


Figure 3 Mean head weight for lettuce plants transplanted on two dates

## Common green capsid bug

The results for the percentage of plants with common green capsid bug nymphs in the first and second transplantings are presented in Table 4 and Figure 4. The results presented are from the first assessments carried out only, so represent 10 plants in each transplanting. The analyses for the first transplanting were not significant at the 5% level using an F-test but the analysis for the second transplanting was. However, no treatment reduced numbers of nymphs. Cruiser seed treatment, AHDB9948 spray, AHDB9951 Phytodrip and AHDB9948 Phytodrip all appeared to have increased the numbers of plants with capsid nymphs.

Table 4 Mean percentage plants with nymphs of the common green capsid bug

Treatment	Percentage plants with capsid nymphs			
	First planting		Second planting	
	Ang	Back trans	Ang	Back trans
Control	33.91	31.1	26.2	19.5
Cruiser <sup>1</sup>	40.61	42.4	45.0	50.0
Movento x 1 <sup>2</sup>	39.11	39.8	27.9	21.8
Movento x 2 <sup>2</sup>	38.95	39.5	28.7	23.1
AHDB9966 <sup>2</sup>	40.55	42.3	28.8	23.3
AHDB9951 <sup>2</sup>	46.66	52.9	34.6	32.2
AHDB9948 <sup>3</sup>	40.61	42.4	41.3	43.5
AHDB9948 <sup>4</sup>	45.00	50.0	29.5	24.3
AHDB9943 <sup>4</sup>	40.39	42.0	19.9	11.6
AHDB9966 <sup>4</sup>	34.50	32.1	33.1	29.8
AHDB9951 <sup>4</sup>	36.70	35.7	39.6	40.7
AHDB9948 <sup>4</sup>	27.64	21.5	38.9	39.5
F value	0.535		2.763	
P -value	0.867		0.011	
d.f.	36		36	
s.e.d.	9.828		6.203	
l.s.d.	19.931		12.580	

<sup>1</sup> Seed treatment

<sup>2</sup> "Phytodrip" at sowing

<sup>3</sup> Pre-planting drench

<sup>4</sup> In-field spray

Significantly different from untreated control ( $p < 0.05$ )

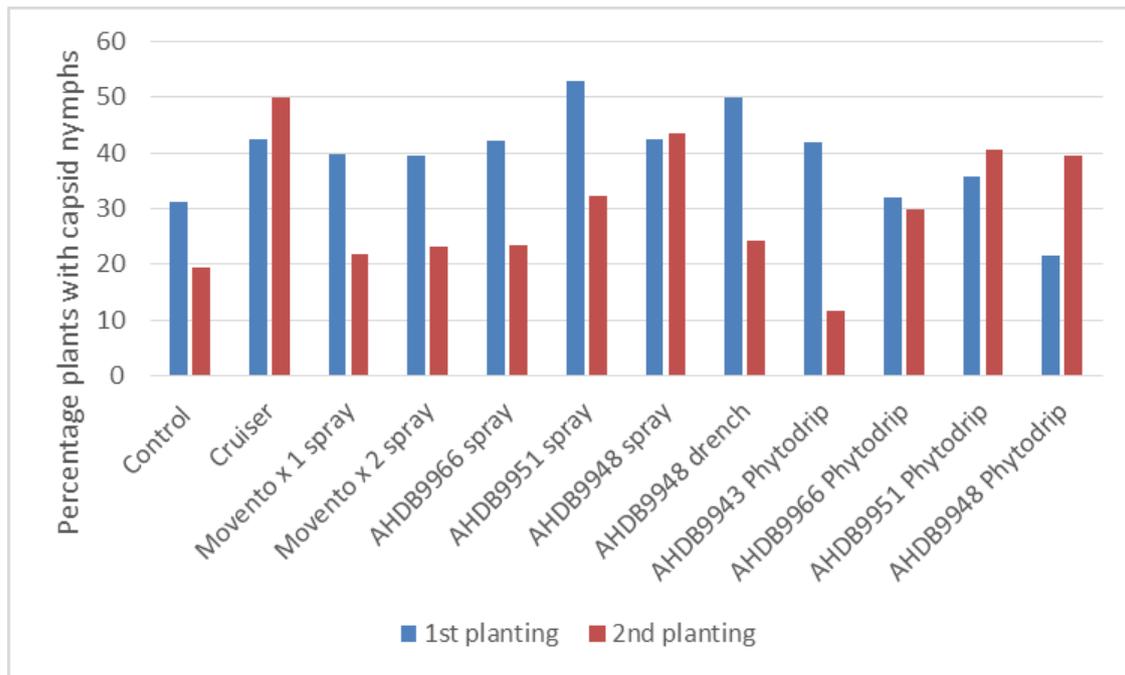


Figure 4 Mean percentage plants with nymphs of the common green capsid bug for lettuce transplanted on two dates

### Silver Y moth

The results for the mean percentage plants which had silver Y moth caterpillars and/or caterpillar frass in the first and second transplantings are presented in Table 5. The results presented are from the first assessments carried out only, so represent 10 plants in each transplanting. There were too few plants affected to conduct a statistical analysis.

Table 5 Mean percentage plants with silver Y moth caterpillars or frass in lettuce transplanted on two dates

Treatment	Percentage plants with caterpillars or frass	
	First planting	Second planting
Control	0.00	0.00
Cruiser <sup>1</sup>	2.50	2.50
Movento x 1 <sup>2</sup>	5.00	0.00
Movento x 2 <sup>2</sup>	7.50	2.78
AHDB9966 <sup>2</sup>	2.50	0.00
AHDB9951 <sup>2</sup>	5.00	2.50
AHDB9948 <sup>3</sup>	0.00	5.28
AHDB9948 <sup>4</sup>	2.50	0.00
AHDB9943 <sup>4</sup>	5.00	0.00
AHDB9966 <sup>4</sup>	7.50	2.50
AHDB9951 <sup>4</sup>	2.50	2.50
AHDB9948 <sup>4</sup>	0.00	7.50

<sup>1</sup> Seed treatment

<sup>2</sup> "Phytodrip" at sowing

<sup>3</sup> Pre-planting drench

<sup>4</sup> In-field spray

## Discussion

Although establishment of the 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 11 June at Wellesbourne), the level of lettuce root aphid infestation was low throughout the trial. However, 28 of the 48 plots had at least one infested plant and no treatment provided complete control of lettuce root aphid. Since numbers remained particularly low and there was a high level of variability between plots statistical analysis did not indicate any differences between treatments or any level of control compared with the untreated plants.

There are a number of possible reasons why lettuce root aphid establishment was lower than would have been expected. The most obvious of these was the prolonged period of hot dry weather that accompanied the trial together with the extensive irrigation required to keep the lettuce plants growing. Also, there could have been an element of resistance (unspecified) to lettuce root aphid within the cultivar which was tested. It should also be noted that colony establishment in plants grown in peat blocks will be more difficult than in direct sown crops. Incidence of the currant lettuce aphid was even lower and it was impossible to see treatment differences. Small numbers of silver Y moth caterpillars were seen but insufficient to indicate any control from any of the treatments. The insect present in greatest numbers was the nymph of the common green capsid bug 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, including the standard (approved) products, but levels of infestation on control plots were very low.
- Lettuce root aphid colonization may have been adversely affected by the very hot, dry weather during the trial period.
- The cultivar of lettuce tested may have had some (unspecified) resistance to lettuce root aphid.
- Similarly, no treatments appeared to control either silver Y moth caterpillars or the common green capsid bug.
- 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. We would also like to thank G's for providing the lettuce seed and for their technical advice.

## Appendix

### a. Crop diary – events related to growing crop

Crop	Cultivar	Planting/sowing date	Row width (m)
Lettuce	Challenge	13 and 20 June 2018	0.35

### Previous cropping

Year	Crop
2016	Field beans
2017	Barley

### Cultivations

Date	Description	Depth
26/2/18	Ploughing	25cm
12/6/18	Bed forming	15cm

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

Date	Product	Rate	Unit
2/11/17	0:20:20	500	Kg/ha
12/6/18	Nitram	100	Kg N/ha

### Pesticides applied to the trial area

Date	Product	Rate	Unit
15/6/18	Kerb Flo	3.5	l/ha
21/6/18	Kerb Flo	3.5	l/ha

### Details of irrigation regime

Date	Type, rate and duration	Amount applied (mm)
13/6/18	Wright Rain, 1 hour	5
18/6/18	Wright Rain, 1 hour	5
20/6/18	Wright Rain, 1 hour	5
22/6/18	Wright Rain, 1 hour	5
25/6/18	Wright Rain, 1 hour	5
26/6/18	Wright Rain, 1 hour	5
28/6/18	Wright Rain, 1 hour	5
29/6/18	Wright Rain, 1 hour	5
3/7/18	Wright Rain, 1 hour	5

9/7/18	Wright Rain, 1 hour	5
13/7/18	Wright Rain, 1 hour	5
16/7/18	Wright Rain, 1 hour	5
20/7/18	Wright Rain, 1 hour	5
23/7/18	Wright Rain, 1 hour	5
27/7/18	Wright Rain, 1 hour	5
9/8/18	Wright Rain, 1 hour	5

#### Other actions

Date	Action
16/7/18	
13/6/18	Trial area fenced to exclude rabbits

#### b. Trial diary

Date	Event
22/05/18	Seed sown (First sowing)
22/05/18	Phytodrip treatments applied
29/05/18	Seed sown (Second sowing)
29/05/18	Phytodrip treatments applied
12/06/18	Germination assessment
12/06/18	Drench treatment (T8) applied to first sowing
13/06/18	First sowing transplanted
15/06/18	Spray treatments applied to first transplants
19/06/18	Germination assessment
20/06/18	Drench treatment (T8) applied to second sowing
20/06/18	Second sowing transplanted
21/06/18	Spray treatments applied to second transplants
28/06/18	In-field phytotoxicity assessment
28/06/18	Second Movento spray applied to T4 first planting
04/07/18	In-field phytotoxicity assessment
04/07/18	Second Movento spray applied to T4 second planting
26/07/18	First transplant harvest
31/07/18	First transplant harvest
01/08/18	First transplant harvest
06/08/18	Second transplant harvest
07/08/18	Second transplant harvest
23/08/18	All remaining plants harvested

c. Climatological data during study period

Date	Temperature		Rainfall (mm)
	Max 09-09	Min 09-09	Total 09-09
01/05/18	14.61	0.42	6.40
02/05/18	12.87	8.18	5.60
03/05/18	15.69	2.19	0.00
04/05/18	17.68	9.56	0.00
05/05/18	22.17	5.01	0.00
06/05/18	23.35	6.37	0.00
07/05/18	26.05	7.00	0.00
08/05/18	20.58	9.02	0.00
09/05/18	17.09	5.70	1.20
10/05/18	16.16	6.70	0.00
11/05/18	15.64	4.32	0.20
12/05/18	15.12	7.02	0.80
13/05/18	18.27	6.41	0.00
14/05/18	20.35	3.71	0.00
15/05/18	22.31	5.65	0.00
16/05/18	15.01	12.14	0.00
17/05/18	16.36	2.94	0.00
18/05/18	17.68	1.25	0.00
19/05/18	21.15	3.20	0.00
20/05/18	22.52	5.59	0.00
21/05/18	23.65	4.94	0.00
22/05/18	21.43	10.66	0.00
23/05/18	19.18	10.03	0.40
24/05/18	21.22	9.36	12.40
25/05/18	15.78	10.16	3.00
26/05/18	22.47	11.66	15.80
27/05/18	24.91	11.55	0.00
28/05/18	22.97	12.45	0.00
29/05/18	19.59	12.98	9.40
30/05/18	18.35	13.15	0.20
31/05/18	23.00	13.94	3.80
01/06/18	22.96	16.60	0.00
02/06/18	23.08	14.64	0.00
03/06/18	24.98	10.37	0.00
04/06/18	17.95	15.13	0.00
05/06/18	17.02	11.08	0.00
06/06/18	19.81	6.91	0.00
07/06/18	18.68	7.84	0.00
08/06/18	18.87	12.92	0.00
09/06/18	19.10	10.48	0.00

10/06/18	21.17	8.73	0.00
11/06/18	24.20	8.49	0.00
12/06/18	20.01	12.55	0.00
13/06/18	22.22	7.58	0.20
14/06/18	20.94	13.63	0.00
15/06/18	20.13	6.02	0.20
16/06/18	20.69	11.02	0.00
17/06/18	18.08	10.51	0.00
18/06/18	22.82	12.72	0.00
19/06/18	24.25	16.10	0.00
20/06/18	23.83	14.26	0.00
21/06/18	18.96	7.73	0.00
22/06/18	22.30	5.41	0.00
23/06/18	22.21	5.76	0.00
24/06/18	24.63	6.08	0.00
25/06/18	28.27	7.57	0.00
26/06/18	27.75	9.36	0.00
27/06/18	26.34	10.03	0.00
28/06/18	26.81	10.76	0.00
29/06/18	26.60	11.31	0.00
30/06/18	27.70	11.89	0.00
01/07/18	29.50	11.89	0.00
02/07/18	27.56	13.79	0.00
03/07/18	25.17	11.32	0.00
04/07/18	26.41	10.79	0.00
05/07/18	29.10	16.80	0.00
06/07/18	29.29	12.89	0.00
07/07/18	28.05	13.51	0.00
08/07/18	29.96	12.68	0.00
09/07/18	27.74	14.27	0.00
10/07/18	23.14	13.93	0.00
11/07/18	25.11	10.46	0.00
12/07/18	24.39	12.65	0.00
13/07/18	26.19	13.90	0.00
14/07/18	27.47	12.12	0.00
15/07/18	27.58	10.79	0.00
16/07/18	26.82	12.07	0.20
17/07/18	22.86	10.36	0.00
18/07/18	24.34	10.47	0.00
19/07/18	27.05	12.23	0.00
20/07/18	27.55	11.97	0.00
21/07/18	25.41	11.91	0.00
22/07/18	28.96	16.36	0.00
23/07/18	30.04	15.99	0.00

24/07/18	28.46	14.59	0.00
25/07/18	28.46	14.95	0.00
26/07/18	32.59	12.54	0.00
27/07/18	28.61	16.72	0.20
28/07/18	21.82	12.56	6.00
29/07/18	22.27	13.34	6.60
30/07/18	24.33	13.92	0.00
01/08/18	24.03	10.71	0.00
02/08/18	27.11	13.87	0.00
03/08/18	26.50	14.41	0.00
04/08/18	26.15	15.89	0.00
05/08/18	29.57	11.97	0.00
06/08/18	28.30	13.02	0.00
07/08/18	27.52	14.52	0.00
08/08/18	23.17	12.60	0.00
09/08/18	20.68	13.36	0.40
10/08/18	18.20	7.83	7.20
11/08/18	20.83	5.82	10.20
12/08/18	18.79	15.68	0.20
13/08/18	24.08	14.80	0.00
14/08/18	23.41	11.44	0.00
15/08/18	23.35	15.76	13.60
16/08/18	20.52	15.93	0.00
17/08/18	20.46	10.40	0.00
18/08/18	22.40	15.55	0.00
19/08/18	24.89	16.98	0.00
20/08/18	22.52	14.81	0.00
21/08/18	24.74	15.17	0.00
22/08/18	24.33	13.88	7.60
23/08/18	20.12	12.65	0.00
24/08/18	17.77	9.10	2.80
25/08/18	17.77	6.58	0.40
26/08/18	18.94	8.65	12.60
27/08/18	18.23	11.76	0.00
28/08/18	18.49	10.03	3.00
29/08/18	19.18	11.82	0.00
30/08/18	19.00	5.90	0.00
31/08/18	20.92	5.52	0.00

d. Raw data from assessments

Percentage leaf area damaged by onion thrips (plot means)

Date	Plot	Treatment	First planting		Second planting	
			LRA score	Plants with LRA	LRA score	Plants with LRA
26/7/18	1	8	0	0		
	2	11	0	0		
	3	1	0	0		
	4	2	0	0		
	5	12	0	0		
	6	7	0	0		
	7	9	0	0		
	8	3	0	0		
	9	6	0.1	1		
	10	4	0	0		
	11	10	0	0		
	12	5	0	0		
	13	12	0.2	1		
	14	5	0	0		
	15	3	0	0		
	16	4	0.1	1		
	17	6	0	0		
	18	11	0	0		
	19	7	0	0		
	20	10	0	0		
	21	1	0	0		
	22	2	0	0		
	23	9	0	0		
	24	8	0	0		
	25	7	0	0		
	26	4	0	0		
	27	9	0	0		
	28	10	0	0		
	29	3	0	0		
	30	8	0	0		
	31	2	0	0		
	32	5	0	0		
	33	11	0	0		
	34	12	0	0		
	35	6	0	0		
	36	1	0	0		
	37	6	0	0		
	38	2	0	0		
	39	10	0	0		
	40	1	0	0		
	41	9	0	0		
	42	5	0	0		
	43	4	0	0		
	44	8	0	0		
	45	12	0	0		
	46	3	0	0		

	47	7	0	0		
	48	11	0	0		
6/8/18	1	8			0	0
	2	11			0	0
	3	1			0	0
	4	2			0	0
	5	12			0	0
	6	7			0	0
	7	9			0	0
	8	3			0	0
	9	6			0	0
	10	4			0	0
	11	10			0	0
	12	5			0	0
	13	12			0.2	1
	14	5			0	0
	15	3			0	0
	16	4			0	0
	17	6			0.1	1
	18	11			0	0
	19	7			0	0
	20	10			0	0
	21	1			0	0
	22	2			0	0
	23	9			0	0
	24	8			0	0
	25	7			0	0
	26	4			0	0
	27	9			0	0
	28	10			0	0
	29	3			0	0
	30	8			0	0
	31	2			0.3	3
	32	5			0	0
	33	11			0	0
	34	12			0	0
	35	6			0	0
	36	1			0	0
	37	6			0	0
	38	2			0	0
	39	10			0	0
	40	1			0	0
	41	9			0	0
	42	5			0	0
	43	4			0	0
	44	8			0	0
	45	12			0	0
	46	3			0.1	1
	47	7			0	0
	48	11			0	0

23/8/18	1	8	0.1	1	0.2	1
	2	11	0	0	0	0
	3	1	0	0	0.3	2
	4	2	0	0	0	0
	5	12	0	0	0	0
	6	7	0.1	1	0	0
	7	9	0	0	0	0
	8	3	0	0	0	0
	9	6	0	0	0.1	1
	10	4	0.1	1	0	0
	11	10	0.6	4	0.8	4
	12	5	0.4	2	1	5
	13	12	0	0	0	0
	14	5	0.2	1	0.1	1
	15	3	0.5	2	0	0
	16	4	0.1	1	0	0
	17	6	0	0	0	0
	18	11	0	0	0	0
	19	7	0.4	2	0	0
	20	10	0.3	2	0.2	1
	21	1	0	0	0	0
	22	2	0.2	1	0.2	1
	23	9	0	0	0	0
	24	8	0.3	2	0.2	1
	25	7	0	0	0	0
	26	4	0	0	0	0
	27	9	0	0	0	0
	28	10	0	0	0.1	0
	29	3	0	0	0	0
	30	8	0	0	0	0
	31	2	0.1	1	0.1	1
	32	5	0	0	0	0
	33	11	0	0	0.3	2
	34	12	0	0	0	0
	35	6	0.4	2	0.4	2
	36	1	0	0	0.3	1
	37	6	0.7	4	0.3	2
	38	2	0.1	1	0.3	2
	39	10	0	0	0	0
	40	1	0	0	0	0
	41	9	0.3	2	0	0
	42	5	0	0	0	0
	43	4	0	0	0	0
	44	8	0	0	0.1	1
	45	12	0.3	1	0	0
	46	3	0	0	0	0
	47	7	1.5	6	0	0
	48	11	0.5	2	0	0

Lettuce head weight and foliar pests

Date	Plot	Treatment	Weight	Percentage plants with		
				Currant lettuce aphid	Common green capsid	Silver -y caterpillar or frass
First planting						
26/7/18	1	8	1194	0	70	10
	2	11	1333.5	0	50	0
	3	1	1494.5	0	60	20
	4	2	1363.5	0	50	0
	5	12	1417	0	60	0
	6	7	1379	0	60	10
	7	9	1382.5	0	50	0
	8	3	1403	0	90	0
	9	6	1463	0	80	0
	10	4	1280	0	40	0
	11	10	1261	0	20	0
	12	5	1126	0	30	0
	13	12	1220	0	30	10
	14	5	1088	0	60	0
	15	3	1282.5	0	30	0
	16	4	1247.5	0	50	10
	17	6	1244.5	0	60	0
	18	11	1353	10	70	0
	19	7	1482.5	0	40	10
	20	10	1588.5	0	50	0
	21	1	1456.5	0	30	0
	22	2	1456.5	0	50	0
	23	9	1185	0	80	10
	24	8	1196.5	0	50	0
	25	7	1111	0	40	20
	26	4	1055.5	0	20	0
	27	9	1008	0	20	10
	28	10	1100.5	0	30	10
	29	3	1109	0	10	10
	30	8	1152.5	0	50	0
	31	2	1074	0	40	0
	32	5	1193.5	0	50	0
	33	11	1243	0	20	0
	34	12	1146.5	10	0	0
	35	6	1143.7	0	40	0
	36	1	941.5	0	10	0
	37	6	950.5	0	30	0
	38	2	1068.5	10	30	10
	39	10	1109.5	0	30	0
	40	1	1041	0	30	0
	41	9	1013	0	20	0
	42	5	1118.5	0	30	0
	43	4	1152.5	0	50	0
	44	8	1185.5	10	30	0
	45	12	1050	10	20	20

	46	3	946	0	30	0
	47	7	997.5	0	30	0
	48	11	935.5	0	10	0
Second planting						
6/8/18	1	8	969.0	0	10	0
	2	11	929.5	0	50	0
	3	1	704.0	0	20	0
	4	2	992.0	0	60	0
	5	12	1027.0	0	70	0
	6	7	968.5	0	40	10
	7	9	944.5	0	20	0
	8	3	1138.0	0	30	0
	9	6	1055.5	0	40	0
	10	4	1049.4	0	22	0
	11	10	935.5	0	40	0
	12	5	764.8	0	40	0
	13	12	778.0	0	40	10
	14	5	689.5	0	10	0
	15	3	978.5	0	10	0
	16	4	944.4	0	44	11
	17	6	980.5	0	40	0
	18	11	1923.0	0	50	10
	19	7	1074.0	0	60	0
	20	10	1111.5	0	30	10
	21	1	1004.5	0	30	0
	22	2	942.0	0	60	0
	23	9	1013.0	0	0	0
	24	8	825.5	0	30	0
	25	7	926.1	0	44	11
	26	4	883.0	0	10	0
	27	9	1001.0	0	20	0
	28	10	990.0	0	20	0
	29	3	911.5	0	30	0
	30	8	1104.5	0	30	0
	31	2	1069.5	0	40	0
	32	5	1266.5	0	10	0
	33	11	1242.5	0	30	0
	34	12	1106.5	0	30	0
	35	6	1100.0	0	30	10
	36	1	1044.5	0	20	0
	37	6	999.5	0	20	0
	38	2	1171.0	0	40	10
	39	10	1036.0	0	30	0
	40	1	1074.0	0	10	0
	41	9	1038.0	0	20	0
	42	5	1075.5	0	40	0
	43	4	1054.5	0	20	0
	44	8	1284.5	0	30	0
	45	12	1144.0	0	20	20
	46	3	940.0	0	20	0
	47	7	1015.0	0	30	0
	48	11	1023.3	0	33	0

e. Photographs of the trial



Trial on 27 June 2018



Trial on 10 July 2018

Trial number

W2018.012

Sponsor

SCEPTREPlus

Crop

lettuce

Location

Sheep Pens

8	11	1	2	12	7	9	3	6	4	10	5
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1 2 3 4 5 6 7 8 9 10 11 12

12	5	3	4	6	11	7	10	1	2	9	8
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13 14 15 16 17 18 19 20 21 22 23 24

7	4	9	10	3	8	2	5	11	12	6	1
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25 26 27 28 29 30 31 32 33 34 35 36

6	2	10	1	9	5	4	8	12	3	7	11
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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

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*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

