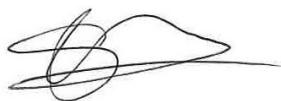


SCEPTREPLUS

Final Trial Report

Trial code:	SP52
Title:	AHDB SCEPTREplus apple contact herbicide screen
Crop	Apple, <i>Malus</i>
Target	General broadleaf weeds and grasses, 3WEEDT
Lead researcher:	Dr Sonia Newman
Organisation:	RSK ADAS Ltd, ADAS Boxworth, Cambridgeshire, CB23 4NN
Period:	April 2020 to Oct 2020
Report date:	20/12/2020
Report author:	Dr Sonia Newman
ORETO Number: (certificate should be attached)	409

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



.....20/12/2020.....
Date

.....
Authors signature

Trial Summary

Introduction

Tree fruit plantations cover approximately 24,449 ha in the UK, apples and pears forming a large percentage of this area. Dessert apples alone are worth £104.9m a year to the UK economy. Tree fruit crops are weak competitors against weeds and weed infestation can result in a yield penalty of between 10 to 20%. This equates to a loss of at least £10m per year for growers.

Gaps exist in contact herbicides for young tree fruit plantations of two years old. Second year trees are more sensitive to herbicides than established trees, which can make weed control difficult. Control of weeds at this stage is important to ensure good establishment of the crop. In addition, with few actives available for young cropping trees there is a risk of herbicide resistance developing.

The objective of this trial was to identify crop safe and effective contact herbicides for weed control in young apple trees, aiming to expand the options available to growers.

Methods

A trial was sited at a commercial apple grower in Kent. Treatments were applied to the weeds in the herbicide strip after the trees had broken bud. The apple variety used in this trial was Braeburn and was planted in 2019. All treatments were applied on 7th May with a single nozzle hooded lance and an Oxford Precision Sprayer knapsack at 300 L/ha water volume with plots 1.5 m wide by 6 m long.

A randomised block design was used with four replicates of six treatments, including an untreated control for comparison, totaling 24 plots. Plots were assessed for weed control on four occasions, recording the percentage of weed ground cover and species present. Crop damage was also assessed; recorded first at two weeks after the first treatment application, and on two subsequent occasions (four and ten weeks after treatment).

Results

All of the treatments applied to the trial appeared to be crop safe with no phytotoxic effects seen at any assessment. The conditions were generally dry during the trial, which will have increased the safety of the herbicides. Based on these results all treatments would be suitable for further investigation in young apple trees.

Weed cover was low in the trial due to an extremely dry period at the trial site from late April to the middle of June (**Table 1**). The trees were irrigated with trickle irrigation during this period, but this did not affect the weed growth. The main weed species noted in the trials plots were creeping thistle, knot grass and annual meadow grass.

There were no statistically significant differences between the weed cover in the different treatment plots at any of the assessment dates. Only the grower standard (Roundup Powermax) showed a reduction in the percentage cover of weeds two weeks after treatment application, however this was not significantly different to the untreated control. All of the other treatments were comparable to the untreated control throughout the trial.

Table 1. Mean total plot weed cover (%) at application and two, four and ten weeks after contact herbicide application to apple herbicide strip.

Date	13-May	27-May	09-Jun	22-Jul
Treatment				
Untreated	4.5	7.9	17.8	56.5
Roundup Powermax	3.5	1.3	2.5	16.5
AHDB9868	5.0	7.3	19.0	57.5
AHDB9897	2.0	6.9	14.5	57.5
AHDB9921	7.8	11.8	19.0	66.8
AHDB9859	4.3	11.6	22.6	46.0
P value	0.777	0.584	0.552	0.094
d.f.	5	5	5	5
s.e.d.	1.70	6.20	11.00	16.46
l.s.d.	3.63	13.22	23.45	35.08
	Not significantly different from untreated control ($p>0.05$)			
	Significantly less than untreated control ($p<0.05$)			
	Significantly more than untreated control ($p<0.05$)			

Conclusions

- All coded products were deemed to be crop safe in this trial and no phytotoxic effects were seen during the trial
- Further trials are needed under less atypical climactic conditions to determine the efficacy of the tested coded products.

Take home message:

All coded products were crop safe and showed no phytotoxic effects in the young apple trees. Further work is necessary to determine the efficacy of the treatments.

Objectives

To evaluate the effectiveness of six contact herbicide treatments, applied to an actively growing crop, for the control of broadleaved weeds and grasses in young apples as measured by crop safety and weed control efficacy.

Methods

A trial was sited at a commercial apple grower in Kent. Treatments were applied to the weeds in the herbicide strip after the trees had broken bud. The apple variety used in this trial was Braeburn and was planted in 2019. All treatments were applied on 7th May with a single nozzle hooded lance and an Oxford Precision Sprayer knapsack at 300 L/ha water volume with plots 1.5 m wide by 6 m long.

A randomised block design was used with four replicates of six treatments, including an untreated control for comparison, totaling 24 plots. Plots were assessed for weed control on four occasions, recording the percentage of weed ground cover and species present. Crop damage was also assessed; recorded first at two weeks after the first treatment application, and on two subsequent occasions (four and ten weeks after treatment).

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(4)	Guideline on design and analysis of efficacy evaluation trials	None
PP 1/135(4)	Phytotoxicity assessment	None
PP 1/181(3)	Conduct and reporting of efficacy evaluation trials including good experimental practice	None
PP 1/090(3)	Weeds in orchards and other fruiting tree crops such as citrus and olives	None

There were no deviations from EPPO guidance:

Test site

Item	Details
Location address	Horsmonden, TN12 8DZ
Crop	Apple
Cultivar	Braeburn
Soil or substrate type	Clay loam
Agronomic practice	Standard other than no herbicides
Prior history of site	Apples

Trial design

Item	Details
Trial design:	Randomised block design
Number of replicates:	4
Row spacing:	1.5 m
Plot size: (w x l)	3 x 6 m
Plot size: (m ²)	18

Number of plants per plot:	6
Leaf Wall Area calculations	N/A

Treatment details

AHDB Code	Active substance	Product name/ manufacturers code	Formulation batch number	Content of active substance in product	Formulation type
Untreated	-	-	-	-	-
Standard	glyphosate	Roundup PowerMax	AXJ272910O	720 g/L	Water soluble granule
AHDB9868	N/D	N/D	N/D	N/D	N/D
AHDB9897	N/D	N/D	N/D	N/D	N/D
AHDB9921	N/D	N/D	N/D	N/D	N/D
AHDB9859	N/D	N/D	N/D	N/D	N/D

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	Untreated	-	-	A
2	Glyphosate	1440 g	2.0	A
3	AHDB9868	150 g	1.5	A
4	AHDB9897	53 g	2.0	A
5	AHDB9921	6.25 g + 5.0g	1.0	A
6	AHDB9859	48 g	0.8	A

Application details

	Application A
Application date	13/05/2020
Time of day	11:45-12:15
Crop growth stage (Max, min average BBCH)	31
Crop height (cm)	170
Crop coverage (%)	5
Application Method	Spray
Application Placement	Soil
Application equipment	Oxford Precision Sprayer (knapsack)
Nozzle pressure	2.5 Bar
Nozzle type	Flat fan
Nozzle size	02F110
Application water volume/ha	300
Temperature of air - shade (°C)	11.7

Relative humidity (%)	52.5
Wind speed range (m/s)	7.5-10.6
Dew presence (Y/N)	N
Temperature of soil - 2-5 cm (°C)	15.0
Wetness of soil - 2-5 cm	Dry
Cloud cover (%)	80

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 mid-point of assessment period	Infestation level at end of assessment period
Broad leaved weeds and grasses	N/A	3WEEDT	4.5 % <i>(untreated average)</i>	17.8 % <i>(untreated average)</i>	56.5 % <i>(untreated average)</i>

Assessment details

Evaluation date	Evaluation Timing (DA)*	Crop Growth Stage (BBCH)	Evaluation type (efficacy, phytotox)	Assessment
13/05/2020	0	31	efficacy	Preliminary percentage of weed cover (whole plot score)
27/05/2020	14	64	efficacy, phytotox	Percentage of weed cover (whole plot score) Phytotox (scale 0-10, 0 = dead)
09/06/2020	27	69	efficacy, phytotox	Percentage of weed cover (whole plot score) Phytotox (scale 0-10, 0 = dead)
22/07/2020	70	71	efficacy, phytotox	Percentage of weed cover (whole plot score) Phytotox (scale 0-10, 0 = dead)

* DA – days after application

Statistical analysis

The trial was analysed as a randomised block design with four replicates of 6 treatments using ANOVA (Genstat 18th edition). The trial area had some trees of different ages within the row, so some of the blocks had gaps between plots to ensure that the correct age of tree was treated in the trial. No data transformation was required.

Results

Phytotoxicity

The results of phytotoxicity assessments from four dates are presented in **Table 1** and **Figure 1**. These were scored on a scale from 0 to 10, with 0 being 'no effect', and 10 being 'dead'. Plots scored 2 or less were deemed to have a commercially acceptable level of damage.

Phytotoxicity was recorded using the following scale:

Crop tolerance score	(% phytotoxicity) Equivalent to crop damage
0	(no damage) 0%
1	10%
*2	20%
3	30%
4	40%
5	50%
6	60%
7	70%
8	80%
9	90%
10	(complete crop kill) 100%

* ≤2 = acceptable damage, i.e. damage unlikely to reduce yield, and acceptable to the farmer.

There were no phytotoxic effects recorded in this trial and no significant differences between the treatments and the untreated trees.

Table 1. Mean crop phytotoxicity scores at two, four and ten weeks after contact herbicide treatment application in Braeburn apple.

Treatment	Mean crop damage scores		
	27-May	09-Jun	22-Jul
Untreated	0.0	0.0	0.0
Roundup Powermax	0.0	0.0	0.0
AHDB9868	0.0	0.0	0.0
AHDB9897	0.0	0.0	0.0
AHDB9921	0.0	0.0	0.0
AHDB9859	0.0	0.0	0.0
p-value	-	-	-
d.f.	-	-	-
L.S.D.	-	-	-

Efficacy

The results for the mean percentage weed cover per treatment are presented in **Table 2** and **Figure 2**. The percent reduction in weed cover compared to the untreated control was calculated from these figures (using Abbott's formula), and results for each treatment are listed in **Table 3**.

Weed cover was low in the trial due to an extremely dry period at the trial site from late April to the middle of June. The trees were irrigated with trickle irrigation during this period, but this did not affect the weed growth. The main weed species noted in the trials plots were creeping thistle, knot grass and annual meadow grass.

Table 2. Mean total plot weed cover (%) at application and two, four and ten weeks after contact herbicide application to apple herbicide strip.

Date	13-May	27-May	09-Jun	22-Jul
Untreated	4.5	7.9	17.8	56.5

Roundup Powermax	3.5	1.3	2.5	16.5
AHDB9868	5.0	7.3	19.0	57.5
AHDB9897	2.0	6.9	14.5	57.5
AHDB9921	7.8	11.8	19.0	66.8
AHDB9859	4.3	11.6	22.6	46.0
P value	0.777	0.584	0.552	0.094
d.f.	5	5	5	5
s.e.d.	1.70	6.20	11.00	16.46
l.s.d.	3.63	13.22	23.45	35.08
	Not significantly different from untreated control ($p>0.05$)			
	Significantly less than untreated control ($p<0.05$)			
	Significantly more than untreated control ($p<0.05$)			

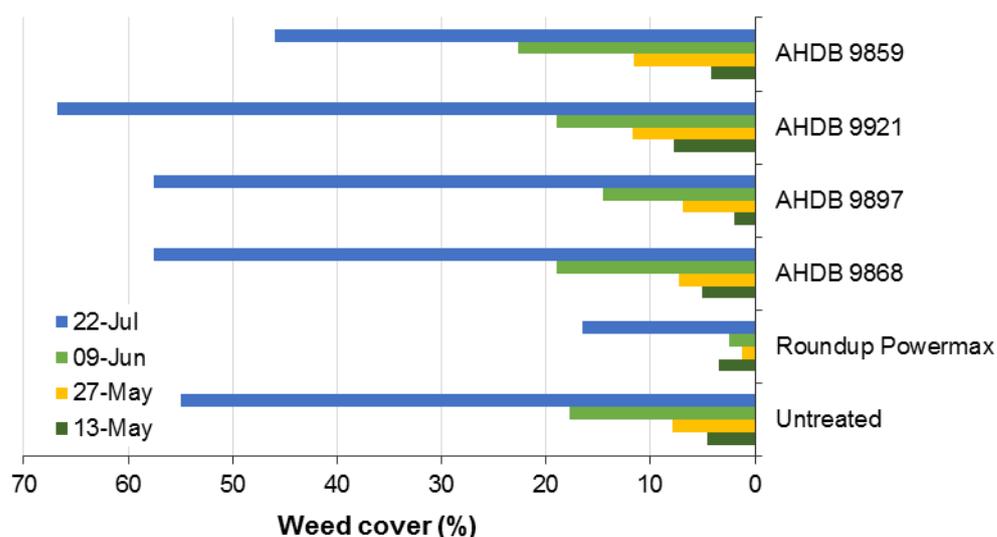


Figure 1. Mean weed cover (%) at application, and two, four, and ten weeks after contact herbicide application.

There were no statistically significant differences between the weed cover in the different treatment plots at any of the assessment dates. Only the grower standard (Roundup Powermax) showed a reduction in the percentage cover of weeds two weeks after treatment application, however this was not significantly different to the untreated control. All of the other treatments were comparable to the untreated control throughout the trial.

Table 3. Percentage reduction in weed cover compared to the untreated control at two, four and ten weeks after contact herbicide application to apple herbicide strip.

Treatment	Weed cover reduction (%)		
	27-May	09-Jun	22-Jul
Roundup Powermax	84.13	85.92	70.80
AHDB9868	7.94	-7.04	-1.77
AHDB9897	12.70	18.31	-1.77
AHDB9921	-49.21	-7.04	-18.14
AHDB9859	-47.62	-27.46	18.58

Discussion

All of the treatments applied to the trial appeared to be crop safe and no phytotoxic effects were seen at any assessment during the trial. The trees looked stressed during the trial, but this was across the whole trial and most likely due to drought rather than any herbicide

effects. Based on these results all treatments would be suitable for further investigation in young apple trees.

Climatic conditions had a substantial impact on trial, the extremely dry weather in Kent from April to mid-June resulted in low weed germination and growth in the trial area and limited the demonstrable efficacy of the treatments applied as this was a contact herbicide trial. The trees in the trial area were irrigated using trickle irrigation, however, this did not affect the weed cover in the plots. The only treatment to reduce the weed cover two weeks after application was the grower standard, Roundup. Although this did not significantly reduce the weed cover compared to the untreated control. At the final weed assessment weed cover had increased in all plots following rain and subsequent weed germination.

Caution should be used when interpreting the efficacy results of this trial. The coded products in this trial should be investigated further under less atypical climactic conditions to determine their efficacy.

Conclusions

- All coded products were deemed to be crop safe in this trial and no phytotoxic effects were seen during the trial
- Further trials are needed under less atypical climactic conditions to determine the efficacy of the tested coded products.

Acknowledgements

AHDB for funding the work, and the crop protection companies for their financial contributions and provision of samples for the trials. Thanks should also be given to the Nigel Jenner from Avalon Produce and grower Richard Edmed who provided the site and crops for the trials as well as technical input.

Appendix

- a. Crop diary – events related to growing crop

Crop	Cultivar	Planting date	Row width (m)
Apple	Braeburn	2019	3 m

No herbicides, fungicides or pesticides were applied to the trial rows during the trial.

- b. Table showing sequence of events by date – this relates to treatments and assessments.

Date	Event
13/05/2020	Trial set-up Treatment application Weed assessment 1
27/05/2020	Weed assessment 2 Crop safety assessment 1
09/06/2020	Weed assessment 3 Crop safety assessment 2
22/07/2020	Weed assessment 4 Crop safety assessment 3

c. Photos



Trial at set up – 07/05/2020



Untreated control – after 4 weeks



AHDB 9868 – after 4 weeks



AHDB 9897 – after 4 weeks



AHDB 9859 – after 4 weeks



AHDB 9921 – after 4 weeks

d. Climatological data during study period

Date	Max Temp (°C)	Average Temp (°C)	Min temp (°C)	Max R Humidity (%)	Average R Humidity (%)	Min R Humidity (%)	Rainfall (mm)
01/04/2020	11.8	4.5	-3.8	92	71	45	0.25
02/04/2020	14.0	8.7	4.2	84	71	51	0.00
03/04/2020	14.1	8.7	2.8	91	75	49	0.00
04/04/2020	16.4	8.1	-0.3	95	75	39	0.00
05/04/2020	21.4	12.5	2.4	88	62	33	0.00
06/04/2020	18.2	12.1	4.7	89	71	44	0.00
07/04/2020	19.3	10.5	0.9	93	70	33	0.00
08/04/2020	23.4	13.8	5.2	91	73	46	0.00
09/04/2020	23.6	13.5	3.9	92	70	42	0.00
10/04/2020	23.2	13.7	3.8	91	67	37	0.00
11/04/2020	25.4	14.3	4.3	91	67	34	0.00
12/04/2020	24.6	15.0	4.7	91	63	26	0.00
13/04/2020	13.0	8.3	5.5	82	67	52	0.00
14/04/2020	11.8	6.9	1.0	88	67	54	0.00
15/04/2020	17.6	8.0	-1.5	92	67	30	0.00
16/04/2020	20.2	10.3	-0.4	92	70	38	0.00
17/04/2020	13.2	9.8	7.6	92	82	70	1.02
18/04/2020	12.7	9.4	4.6	92	87	77	6.86
19/04/2020	16.1	9.7	2.6	94	78	49	1.27
20/04/2020	15.4	10.9	6.3	90	71	51	0.00
21/04/2020	16.2	11.1	4.1	87	69	51	0.00
22/04/2020	18.8	12.2	4.4	90	69	42	0.00
23/04/2020	24.2	13.4	4.2	91	69	41	0.00
24/04/2020	21.1	12.4	3.0	92	68	39	0.00
25/04/2020	16.4	9.4	3.1	91	77	56	0.00
26/04/2020	20.6	9.8	-0.4	92	71	39	0.00
27/04/2020	22.0	11.8	1.1	92	71	45	0.00
28/04/2020	9.8	8.6	7.8	95	92	81	14.4
29/04/2020	14.1	10.1	7.9	95	88	72	14.4
30/04/2020	14.0	9.2	5.0	93	83	66	7.11
01/05/2020	15.3	9.7	5.4	92	83	64	1.78
02/05/2020	17.5	10.6	4.6	91	73	43	3.05
03/05/2020	15.4	10.4	4.7	93	80	59	3.05
04/05/2020	16.7	11.8	8.3	89	76	53	1.27
05/05/2020	15.2	10.2	6.5	87	72	39	0.00
06/05/2020	18.5	11.0	2.8	92	72	39	0.00
07/05/2020	22.9	12.8	1.6	92	67	36	0.00
08/05/2020	23.8	14.5	4.9	92	67	37	0.00
09/05/2020	23.4	14.9	4.9	93	66	39	0.00
10/05/2020	20.5	12.2	6.9	87	77	58	0.00
11/05/2020	11.8	8.1	4.2	78	64	52	0.00
12/05/2020	15.5	7.9	-0.7	90	67	39	0.00
13/05/2020	12.5	8.0	2.6	89	73	53	0.00
14/05/2020	13.5	9.4	1.6	87	63	46	0.00
15/05/2020	19.3	9.6	-0.4	92	66	35	0.00
16/05/2020	18.2	10.9	2.2	91	68	41	0.00
17/05/2020	20.2	12.9	3.8	92	71	42	0.00
18/05/2020	23.0	16.9	7.3	91	62	33	0.00

19/05/2020	27.4	16.9	7.9	92	72	37	0.00
20/05/2020	25.8	18.2	9.3	92	70	34	0.00
21/05/2020	28.5	19.1	10.2	91	68	35	0.00
22/05/2020	20.4	16.3	12.3	82	69	41	0.00
23/05/2020	18.0	13.7	9.5	87	75	51	5.33
24/05/2020	23.1	15.4	9.5	89	69	44	5.33
25/05/2020	23.8	16.3	7.1	93	71	47	0.00
26/05/2020	27.0	17.5	7.1	92	66	35	0.00
27/05/2020	24.4	16.7	8.0	91	70	48	0.00
28/05/2020	21.2	15.2	9.4	91	66	37	0.00
29/05/2020	22.2	14.5	6.0	90	67	39	0.00
30/05/2020	23.4	16.0	7.0	91	66	37	0.00
31/05/2020	23.6	16.3	8.1	90	64	35	0.00
01/06/2020	24.1	16.9	8.4	91	67	39	0.00
02/06/2020	27.3	18.2	9.6	90	63	34	0.00
03/06/2020	21.6	14.9	8.1	92	76	47	0.00
04/06/2020	18.1	13.1	10.5	89	72	45	0.00
05/06/2020	17.7	12.7	7.8	87	68	41	0.00
06/06/2020	14.8	10.8	7.2	93	72	50	7.87
07/06/2020	20.0	12.6	5.4	95	80	49	7.87
08/06/2020	17.0	12.1	7.9	89	77	56	0.25
09/06/2020	19.6	12.7	4.4	92	69	45	0.00
10/06/2020	14.6	12.2	10.6	91	87	78	4.57
11/06/2020	19.0	14.0	10.5	94	86	72	4.57
12/06/2020	19.6	15.7	12.0	93	85	70	2.79
13/06/2020	24.1	17.8	11.1	94	73	50	2.79
14/06/2020	22.6	16.9	10.3	93	77	59	0.00
15/06/2020	23.9	19.7	12.7	91	69	54	0.00
16/06/2020	24.9	17.5	12.4	93	77	47	0.00
17/06/2020	22.3	16.8	10.4	93	79	63	0.25
18/06/2020	20.5	15.9	12.0	94	85	64	10.1
19/06/2020	19.2	14.9	10.4	94	83	64	10.1
20/06/2020	22.3	16.0	9.8	94	78	54	0.76
21/06/2020	22.4	16.9	11.9	92	78	59	1.02
22/06/2020	21.2	13.0	6.8	92	79	54	1.02
23/06/2020	27.3	23.0	14.6	87	59	42	0.00
24/06/2020	31.2	22.2	10.8	92	63	32	0.00
25/06/2020	31.5	23.2	13.1	90	61	33	0.00
26/06/2020	29.0	21.1	14.7	92	75	45	3.56
27/06/2020	19.1	16.3	14.5	91	83	72	3.56
28/06/2020	19.4	15.6	10.8	90	73	57	3.05
29/06/2020	19.2	15.5	11.6	82	70	52	1.52
30/06/2020	17.8	15.2	12.5	92	88	81	4.06
01/07/2020	21.6	17.3	13.9	91	79	65	4.06
02/07/2020	21.0	16.5	11.2	91	79	61	0.51
03/07/2020	20.2	15.7	11.7	93	77	61	0.51
04/07/2020	19.1	16.6	14.7	91	88	81	0.25
05/07/2020	22.6	18.1	13.8	91	71	47	0.25
06/07/2020	21.5	15.5	10.8	87	67	48	0.00
07/07/2020	20.8	15.3	7.8	91	71	46	0.25
08/07/2020	19.7	16.6	14.0	94	90	82	8.64
09/07/2020	18.3	17.0	15.5	92	88	82	0.51

10/07/2020	20.5	15.8	9.0	93	73	44	0.76
11/07/2020	21.8	14.2	6.3	93	71	41	0.76
12/07/2020	23.2	15.2	5.4	93	68	40	0.00
13/07/2020	26.4	17.4	6.4	93	64	28	0.00
14/07/2020	22.2	17.2	14.3	94	81	56	4.32
15/07/2020	20.5	16.6	12.5	93	74	57	4.32
16/07/2020	23.7	18.1	15.2	87	77	58	0.00
17/07/2020	27.9	21.0	15.0	91	73	50	0.00
18/07/2020	26.3	18.6	11.2	93	74	47	0.00
19/07/2020	20.6	15.8	11.2	93	88	73	1.27
20/07/2020	24.3	15.9	8.3	95	73	36	1.27
21/07/2020	23.5	15.3	6.0	93	69	36	0.00
22/07/2020	24.3	16.6	7.9	92	69	44	0.00
23/07/2020	25.1	17.3	8.8	92	67	39	0.00
24/07/2020	24.4	18.9	15.5	88	78	59	0.00
25/07/2020	19.1	17.1	15.2	93	90	85	9.40
26/07/2020	22.4	17.0	12.3	94	80	59	9.40
27/07/2020	20.8	17.2	15.0	92	87	74	2.03
28/07/2020	22.3	16.9	10.3	89	70	45	2.03
29/07/2020	24.5	16.0	6.2	93	69	44	0.00
30/07/2020	28.9	19.2	9.3	93	64	27	0.00
31/07/2020	35.4	23.0	11.4	91	63	31	0.00

e. Trial design

Treatment	4	6	2	3	5	Gap of 24 trees	1
Block	4	4	4	4	4		4
Plot	401	402	403	404	405		406

57.5m

Treatment	2	Gap of 6 trees	5	Gap of 11 trees	1	6	3	4
Block	3		3		3	3	3	3
Plot	301		302		303	304	305	306

48.5m

Treatment	1	3	6	2	4	5
Block	2	2	2	2	2	2
Plot	201	202	203	204	205	206

36 m

Treatment Name	
1	Untreated
2	Roundup Powermax
3	AHDB9868
4	AHDB9897
5	AHDB9921
6	AHDB9859

Treatment	6	4	3	Gap of 9 trees	5	1	2
Block	1	1	1		1	1	1
Plot	101	102	103		104	105	106

42.5 m

f. ORETO certificate

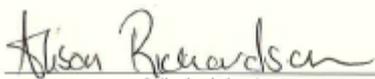


Certificate of
**Official Recognition of Efficacy Testing Facilities
or Organisations in the United Kingdom**

This certifies that
RSK ADAS Ltd
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
Stored Crops
Biologicals and Semiochemicals**

Date of issue: 1 June 2018
Effective date: 18 March 2018
Expiry date: 17 March 2023

Signature 
Authorised signatory

Certification Number ORETO 409
--


HSE
Chemicals Regulation Division

 Department of
Agriculture and
Rural Development