

SCEPTREPLUS

Final Trial Report

Trial code:	SP67
Title:	Control of downy mildew in blackberry
Crop	Group: Cane fruit - blackberries
Target	Downy mildew (<i>Peronospora sparsa</i>)
Lead researcher:	Guy Johnson
Organisation:	RSK ADAS UK Ltd. Boxworth, CB23 4NN
Period:	June 2020 - November 2020
Report date:	December 2020
Report author:	Guy Johnson Sonia Newman
ORETO Number: (certificate should be attached)	ORETO 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

23rd December 2020
Date


Authors signature

Trial Summary

Introduction

Downy mildew caused by *Peronospora sparsa* is an economically important disease of blackberry in the UK. Crop loss of up to 50% can occur costing the grower in the region of £35,000/ha. During the early part of the growing season, *P. sparsa* can be managed with plant protection products. However, long harvest intervals on many fungicides mean that control during harvest is not possible. Furthermore, environmental conditions for *P. sparsa* development and growth can promote infection just before and during harvest time.

Objectives

1. To evaluate the effectiveness of fungicides against downy mildew (*Peronospora sparsa*) on blackberry as measured by disease incidence, severity and % efficacy.
2. To monitor the treated crop for phytotoxicity.

Methods

The commercial blackberry variety Loch Ness was chosen because of known susceptibility to downy mildew infection. The crop was planted the week beginning 18th May 2020 at a grower site located in Oxfordshire. The trial was placed in this crop and laid out as a randomised complete block design, replicated four times relying on natural infection sources. Eight treatments (**Table 1**) were applied four times starting on 26th June 2020 and repeated every 14 days on 10th July, 24th July and 7th August. The crop was managed as per commercial practice with the exception that no other fungicides were applied to the trial area

A preliminary assessment was carried out on 26th June to determine whether plants were already infected. Plots were then assessed for downy mildew incidence and severity on 10th July, 24th July and 7th August. These were compared with a water control and an industry standard spray of Signum (boscalid and pyraclostrobin).

Disease assessments were carried out on six of the central plants in the plot, excluding one plant on either end of the plot. The percentage of symptomatic plants within the plot (incidence) and the degree of infection (severity) was recorded by assessing the percentage of leaf area exhibiting signs of downy mildew symptoms for each plant per plot.

Table 1. Treatment list.

AHDB Code	Active substance	Product name/ manufacturer code	Formulation batch no.	Content of active substance in product	Formulation type
Untreated	N/A	N/A	N/A	N/A	N/A
Industry standard	boscalid + pyraclostrobin	Signum	12-M00622	26.7 % w/w + 6.7 % w/w	Water dispersible granule
AHDB9809	N/D	N/D	N/D	N/D	N/D
AHDB9883	N/D	N/D	N/D	N/D	N/D
AHDB9967	N/D	N/D	N/D	N/D	N/D
AHDB9941	N/D	N/D	N/D	N/D	N/D
AHDB9939	N/D	N/D	N/D	N/D	N/D
AHDB9808	N/D	N/D	N/D	N/D	N/D

Results

Phytotoxicity

No phytotoxic effects were noted in any of the treatments, suggesting that all the tested products are crop safe.

Efficacy

The trial was reliant on natural levels of spore infection, and as a result disease progression was slow because of low disease pressure. At the first assessment (26 June), prior to the first treatment application, there was no disease present in the plots.

Disease incidence:

There were no significant differences on any assessment date in downy mildew incidence for any of the products tested compared with the untreated control. *P. sparsa* was present in all treatments at the second assessment (**Table 2**), with at least 50% incidence in all treatments including Signum (grower standard). At the third assessment date, disease incidence increased, being present in almost all plants, with plots treated with AHDB9883 having the lowest incidence (83.33%); however, this was not significantly different to the untreated control (100%). At the final assessment date (7 August) disease incidence started to decrease across all the plots, except for plots treated with Signum.

Table 2. Mean foliar *P. sparsa* incidence (percentage of 6 plants infected) per treatment for each of the three assessment dates. Incidence was zero across entire trial at the preliminary assessment on 26 June 2020. Treatments were applied after each assessment.

Date	Disease incidence (%)		
	10/07/2020	24/07/2020	07/08/2020
Treatment			
Untreated	50.0	100.0	87.5
Signum	50.0	95.8	95.8
BAS 743 AQ F	70.8	95.8	83.3
AHDB9883	66.7	83.3	66.7
AHDB9967	58.3	100.0	95.8
AHDB9941	75.0	100.0	95.8
AHDB9939	70.8	100.0	83.3
AHDB9808	66.7	100.0	91.6
F Pr (P-Value)	0.517	0.459	0.088
DF	21	21	21
L.S.D	1.783	1.021	1.211
	Not significantly different from untreated control (p>0.05)		
	Significantly different from untreated control (p<0.05)		

Disease severity:

No significant differences in downy mildew severity for any of the products tested compared with the untreated control were recorded at any assessment date during the trial. Severity increased slowly in the untreated plots from 1.2% to 3.5% between the second (10th July) and final assessment on 7th August (**Table 3**).

While disease severity had increased in all treatments by the 24th of July assessment, severity was not significantly different to the untreated control for any treatments. Plots treated with AHDB9883 had the lowest severity at the final assessment, indicating that this was the most effective treatment, although the results were not significantly different to the untreated control.

Disease severity was greater than the untreated control for the industry standard, AHDB9967 and AHDB9941 at the final assessment, suggesting these products had increased disease severity. In fact, disease severity increased for all treatments at some point during the trial, compared with the untreated control. At the first assessment (10th July) severity increased in all treatments except for Signum. Similarly, by the 24th of July, disease severity had increased in all treatments except for AHDB9883.

Table 3. Mean foliar *P. sparsa* severity (percentage of leaf area affected - %) per treatment for each of the three assessment dates. Treatments were applied after each assessment.

	Mean Severity (%)
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Date	10/07/2020	24/07/2020	07/08/2020
Treatment			
Untreated	1.2	2.5	3.5
Signum	1.0	4.8	7.0
BAS 743 AQ F	2.3	4.1	3.2
AHDB9883	2.0	2.2	1.8
AHDB9967	1.6	4.3	6.5
AHDB9941	2.6	6.5	6.9
AHDB9939	1.7	2.8	3.3
AHDB9808	2.0	4.7	3.9
F Pr	0.344	0.094	0.210
DF	21	21	21
L.S.D	1.399	2.919	4.789
	Not significantly different from untreated control (p>0.05)		
	Significantly different from untreated control (p<0.05)		

Conclusions

- None of the products caused phytotoxic effects to the crop.
None of the products had any efficacy against Blackberry downy mildew.

Take home message:

No significant reductions in disease incidence or severity were found. None of the products trialed provided significant control of downy mildew. While all steps were taken ensure successful infection, disease severity remained low across all treated and the untreated plots.

Objectives

1. To evaluate the effectiveness of fungicides against downy mildew (*Peronospora sparsa*) on blackberry as measured by disease incidence, severity and % efficacy.
2. To monitor the treated crop for phytotoxicity.

Trial conduct

The commercial blackberry variety Loch Ness was selected because of known susceptibility to downy mildew infection. The crop was planted the week beginning 18th May 2020 at a grower site located in Oxfordshire. The trial was placed in this crop and laid out as a randomised complete block design, replicated four times relying on natural infection sources. Eight treatments were applied four times once the crop had reached 30-39 BBCH, starting on 26th June 2020 and repeated every 14 days on 10th July, 24th July and the 7th August. Plots were visually assessed for downy mildew incidence and an estimated severity. These were compared with a water control and an industry standard spray of Signum (boscalid and pyraclostrobin). No other fungicides were used during the trial

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

Relevant EPPO guideline(s)		Variation from EPPO
EPPO PP1/135(4)	Phytotoxicity assessment	None
EPPO PP1/152(4)	Guideline on design and analysis of efficacy evaluation trials	None
EPPO PP1/225 (2)	Minimum effective dose	None
EPPO PP1/181 (4)	Conduct and reporting of efficacy evaluation trials including good experimental practice	None
EPPO PP 1/214(3)	Principles of acceptable efficacy	None
EPPO PP 1/224(2)	Principles of efficacy evaluation for minor uses	None

There were no deviations from EPPO guidance.

Test site

Item	Details
Location address	Abingdon, Oxfordshire. OX13 5PD
Crop	Blackberry
Cultivar	Loch Ness
Soil or substrate type	Coir
Agronomic practice	Planted 18 th May 2020
Prior history of site	Raspberry/Blackberry

Trial design

Item	Details
Trial design:	Randomised Block
Number of replicates:	4
Row spacing (cm) :	100
Plot size: (w x l)	0.2 x 1.5
Plot size: (m ²)	0.3
Number of plants per plot:	8
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	N/A	N/A	N/A	N/A	N/A
Standard	boscalid + pyraclostrobin	Signum	12-M00622	26.7 % w/w + 6.7 % w/w	Water dispersible granule
AHDB9809	N/D	N/D	N/D	N/D	N/D
AHDB9883	N/D	N/D	N/D	N/D	N/D
AHDB9967	N/D	N/D	N/D	N/D	N/D
AHDB9941	N/D	N/D	N/D	N/D	N/D
AHDB9939	N/D	N/D	N/D	N/D	N/D
AHDB9808	N/D	N/D	N/D	N/D	N/D

Methods, assessments and records

Fungicides were applied according to standard programme timings, with application of the first treatments (A) before symptoms were present in the crop (26th June BBCH 30-39). All following applications B, C, D (10th June, 24th June and 07th August) were applied 14 days after the previous application timing.

Five disease assessments were carried out, the first four coincided with treatment applications. The preliminary assessment was carried out before application A, with all following assessments carried out prior to treatment application on the same day.

The planned fifth assessment two weeks after the final application was not completed. Due to a miscommunication with the grower all infected material was removed resulting in no disease present at the assessment.

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 (Water)	N/A	N/A	A,B,C,D
2	Signum	40.05 + 10.05	1.5	A,B,C,D
3	AHDB9809	N/D	2.0	A,B,C,D
4	AHDB9883	N/D	0.5	A,B,C,D
5	AHDB9967	N/D	2.0	A,B,C,D
6	AHDB9941	N/D	2.5	A,B,C,D
7	AHDB9939	N/D	0.6	A,B,C,D
8	AHDB9808	N/D	4.5	A,B,C,D

Application details

	Application A	Application B	Application C	Application D
Application date	26/06/2020	10/07/2020	24/7/2020	07/08/2020
Time of day	11:00	11:00	10:50	12:00
Crop growth stage (Max, min average BBCH)	30-39	30-39	30-39	30-39
Crop height (cm)	15	8	25	30

Crop coverage (%)	N/A	N/A	N/A	N/A
Application Method	Spray	Spray	Spray	Spray
Application Placement	Foliar	Foliar	Foliar	Foliar
Application equipment	Oxford precision sprayer	Oxford precision sprayer	Oxford precision sprayer	Oxford precision sprayer
Nozzle pressure	2.0	2.0	2.0	2.0
Nozzle type	Flat fan	Flat fan	Flat fan	Flat fan
Nozzle size	02F110	02F110	02F110	02F110
Application water volume/ha	400.00	400.00	400.00	400.00
Temperature of air - shade (°C)	30.2	18.1	23.3	34.5
Relative humidity (%)	61.8	51.05	83.2	35.5
Wind speed range (m/s)	0.3	1.6	8.3	0
Dew presence (Y/N)	N	N	N	N
Temperature of soil - 2-5 cm (°C)	N/A	N/A	N/A	N/A
Wetness of soil - 2-5 cm	Dry	Damp	Damp	Dry
Cloud cover (%)	0	75	85	0

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
Downy mildew	<i>Peronospora sparsa</i>	PSPESR	0.0%	1.208%	3.458%

Assessment details

Young blackberry plants were planted on 18th May and allowed to grow to 15cm height before preliminary assessments and treatment applications. A preliminary full disease assessment was performed at this date, immediately before the first treatment application. Four additional assessments were subsequently completed at 14 day intervals. Disease incidence was assessed by recording the percentage of symptomatic plants within the plot. Disease severity was assessed by visually recording the estimated percentage of leaf area exhibiting signs of downy mildew symptoms for each plant per plot. A final assessment 14 days after the final treatment was planned; however, due to a miscommunication all infected plant material was removed.

Crop safety effects (phytotoxicity) were noted and symptoms recorded on a whole plot scale. These were scored on a scale from 0 to 10, with 10 being 'dead', and 0 being 'no effect' (**Table 4**). Plots which scored below 2 were deemed to have a commercially acceptable level of damage.

Table 4. Scale used for the assessment of the extent of phytotoxic damage in treated plots.

Crop tolerance score	Equivalent to crop damage (% phytotoxicity)
0	no damage
1	5-10%
2*	10-15%

3	15-25%
4	25-40%
5	40-50%
6	50-60%
7	60-70%
8	70-80%
9	80-95% damage
10	complete crop kill 100%

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

Evaluation date	Evaluation Timing (DA)*	Crop Growth Stage (BBCH)	Evaluation type (efficacy, phytotox)	Assessment
26/06/2020	0	30-39	Preliminary	Disease incidence
10/07/2020	14	30-39	Phytotoxic, efficacy	Phytotoxic, disease incidence
24/07/2020	28	30-39	Phytotoxic, efficacy	Phytotoxic, disease incidence
07/08/2020	42	30-39	Phytotoxic, efficacy	Phytotoxic, disease incidence

* DA –days after first spray application.

Statistical analysis

The trial was analysed by Chris Dyer (ADAS statistician) as a randomised block design with three replicates of 8 treatments using ANOVA (Genstat 18th edition). No data transformation was required.

Results

Phytotoxicity

No phytotoxic effects were noted in any of the treatments, suggesting that all of the tested products are crop safe.

Efficacy

The trial was reliant on natural levels of spore infection and as a result disease progression was slow because of low disease pressure. At the first assessment (26 June) prior to the first treatment application there was no disease present in the plots.

Disease incidence:

There were no significant differences on any assessment date in downy mildew incidence for any of the products tested compared to the untreated control. *P. sparsa* was present in all treatments at the second assessment (**Table 5**), with at least 50% incidence in all treatments including Signum (grower standard). At the third assessment date incidence rate increased, being present in almost all plants with Ranman Top having the lowest (83.33%); however, this is not significantly different from the untreated control (100%). At the final assessment date (7 August) incidence started to decrease across all of the plots except Signum, Signum had the same levels as the previous assessment.

Table 5. Mean foliar *P. sparsa* incidence (percentage of 6 plants infected) per treatment for each of the three assessment dates. Incidence was zero across entire trial at the preliminary assessment on 26 June 2020. Treatments were applied after each assessment.

Date	Mean disease incidence (% of plants showing symptoms within the plot)		
	10/07/2020	24/07/2020	07/08/2020
Treatment			
Untreated	50.0	100.0	87.5
Signum	50.0	95.8	95.8
AHDB9809	70.8	95.8	83.3
AHDB9883	66.7	83.3	66.7
AHDB9967	58.3	100.0	95.8
AHDB9941	75.0	100.0	95.8
AHDB9939	70.8	100.0	83.3
AHDB9808	66.7	100.0	91.6
F Pr	0.517	0.459	0.088
DF	21	21	21
L.S.D	1.783	1.021	1.211
	Not significantly different from untreated control (p>0.05)		
	Significantly different from untreated control (p<0.05)		

Disease severity:

No significant differences in downy mildew severity were recorded for any of the products tested compared with the untreated control at any assessment date during the trial. Severity increased slowly in the untreated plots from 1.2% to 3.5% between the second and final assessment on 7th August (**Table 6**). AHDB9883 had the lowest severity at the final assessment, though this was not significantly lower than the untreated control.

All treatments increased the severity at some point during the trial. At the first assessment on 10th June all treatments except Signum increased disease severity. On the 24th of July assessment, all treatments except AHDB9883 increased disease severity. On the final assessment all treatments except AHDB9809, AHDB9883 and AHDB9939 increased the disease severity. At the final assessment AHDB9809, AHDB9883 and AHDB9939 resulted in a decrease of severity.

Table 6. Mean foliar *P. sparsa* severity (percentage of leaf area affected - %) per treatment for each of the three assessment dates. Treatments were applied after each assessment.

Date	Mean Severity (%)		
	10/07/2020	24/07/2020	07/08/2020
Treatment			
Untreated	1.2	2.5	3.5

Signum	1.0	4.8	7.0
AHDB9809	2.3	4.1	3.2
AHDB9883	2.0	2.2	1.8
AHDB9967	1.6	4.3	6.5
AHDB9941	2.6	6.5	6.9
AHDB9939	1.7	2.8	3.3
AHDB9808	2.0	4.7	3.9
F Pr	0.344	0.094	0.210
DF	21	21	21
L.S.D	1.399	2.919	4.789
	Not significantly different from untreated control (p>0.05)		
	Significantly different from untreated control (p<0.05)		

Discussion

All of the products tested during the trial were found to be crop safe, with no phytotoxic effects seen in any of the coded products.

There were no significant differences in either the incidence or severity of *Peronospora sparsa* infections in the blackberry plants during the trial. There was a minor reduction in the disease incidence in the plants across all of the treatments at the assessment on 7 August however this was not significant.

Humidity levels throughout the trial were conducive for conidia production as there were prolonged periods above the optimal (85%) humidity (Figures 10, 11 and 12 in the Appendix). While it is unclear how long the humidity needs to be optimal for *Peronospora sparsa*, work on *Peronospora belbahrii* (basil downy mildew) indicate that 7.5 hours at 85% humidity is optimal. Rain is required to disperse *P. sparsa* spores and these conidia require at least two hours of leaf wetness for germination to occur. During the trial there was below average rainfall in June, July, and August, which could have resulted in low spore dispersal and reduced leaf wetness for conidial germination.

Steps were taken to try to ensure good disease development during the trial. The susceptible blackberry variety Loch Ness was used in the trial and the selected site had a history of downy mildew and had been used previously for blackberry production. However, the site was clean with no leftover plant material from the previous cropping year which would have aided primary infection. The planned final assessment two weeks after the final treatment did not take place, because due to a miscommunication all infected plant material was removed resulting in no disease being present.

Prior to the failed final assessment, differences in disease levels were starting to be observed in some of the treatments applied to the blackberry plants, and further work on these products is required to determine efficacy against *P. sparsa*. To ensure consistent infection levels a future trial would benefit from an enclosed site where the environment can be made more conducive for the development of downy mildew, with regular overhead irrigation to ensure that there is sufficient leaf wetness and artificial inoculation with infected leaf material.

Conclusions

- None of the products caused phytotoxic effects to the crop.
- None of the products had any efficacy against Blackberry downy mildew.

Acknowledgements

AHDB for funding the work, and the crop protection companies for their financial contributions and provision of samples for the trials. Thanks too to EU Plants, who provided site and crop for the trials.

Appendix

a. Crop diary – events related to growing crop

Crop	Cultivar	Planting date	Row width (m)
Blackberry	Loch Ness	May 2020	1 m

Previous cropping

Year	Crop
2018/19	Blackberry
2017	N/K
2016	N/K

Cultivations

Date	Description
	None as the crop is containerized.

Active ingredients(s)/fertiliser(s) applied to trial area

Date	Product	Rate (kg/ha)
	N/A	

Pesticides applied to trial area

Date	Product	Rate (L/ha)
	None applied through trial	

b. Trial diary

Date	Event
26/06/2020	Trial area marked out, and a preliminary disease assessment was carried out. T1 treatment application applied.
10/07/2020	Second disease assessment (Incidence & severity) completed and T2 spray applied. No phyto noticed.
25/07/2020	T3 disease assessment (Incidence & severity) completed. T3 spray applied.
07/08/2020	T4 disease assessment (Incidence & severity) and spray. Weather was extremely hot at time of application.
21/08/2020	T4+14 disease assessment (Incidence & severity) did not take place. Grower pruned and removed all infected foliage resulting in no Downy mildew present on the crop.

c. Photographs.



Figure 1. Trial area 07/08/2020



Figure 2. Plot 101
Treatment 4 07/08/2020



Figure 3. Plot 102
Treatment 1 07/08/2020



Figure 4. Plot 103
Treatment 3 07/08/2020



Figure 5. Plot 104 Treatment
8 07/08/2020



Figure 6. Plot 105:
Treatment 7 7/08/2020

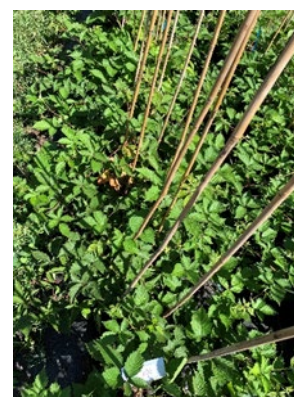


Figure 7. Plot 106:
Treatment 6 7/08/2020



Figure 8. Plot 107:
Treatment 5 07/08/2020



Figure 9. Plot 108
Treatment 207/08/2020

d. Climatological data during study period

Date	Min Temp (°C)	Max Temp (°C)	Average Temp (°C)	Average humidity (°C)
26-06-20	17.5	36.0	24.9	64.3
27-06-20	15.5	27.0	18.9	78.5
28-06-20	12.0	24.5	17.4	75.6
29-06-20	13.0	25.0	17.4	67.6
30-06-20	14.0	23.5	17.4	79.1
1-07-20	14.5	27.0	19.3	75.3
2-07-20	12.0	25.0	17.0	80.7
3-07-20	11.5	24.5	16.5	81.6
4-07-20	15.0	22.5	18.2	90.1
5-07-20	13.0	27.5	19.4	70.8
6-07-20	10.5	22.0	16.3	69.2
7-07-20	11.0	23.0	16.4	75.6
8-07-20	15.0	21.0	17.2	93.4
9-07-20	14.5	23.0	17.9	91.4
10-07-20	12.0	20.5	15.9	74.5
11-07-20	8.5	24.0	15.9	69.4
12-07-20	9.5	31.0	18.3	66.3
13-07-20	12.0	27.0	18.7	72.5
14-07-20	15.5	23.5	18.0	80.2
15-07-20	14.0	22.0	16.9	79.3
16-07-20	15.0	25.5	19.6	74.7
17-07-20	13.5	31.0	21.2	72.1
18-07-20	14.5	28.0	19.7	75.3
19-07-20	14.0	23.0	17.9	77.4
20-07-20	9.0	26.5	17.1	68.1
21-07-20	10.0	27.0	17.6	68.5
22-07-20	12.5	30.0	19.9	69.5
23-07-20	12.5	28.5	18.8	75.0
24-07-20	16.0	27.5	20.5	78.3
25-07-20	15.0	27.0	19.0	89.7
26-07-20	12.5	25.5	17.3	89.6
27-07-20	15.0	20.5	17.1	94.9
28-07-20	12.0	20.5	15.9	79.9
29-07-20	10.5	24.5	17.2	77.7

30-07-20	13.5	30.0	20.4	72.5
31-07-20	13.5	35.0	22.4	72.0
1-08-20	14.5	28.0	20.3	77.6
2-08-20	12.0	25.5	18.1	76.7
3-08-20	12.5	23.0	17.1	75.1
4-08-20	11.0	23.5	16.6	78.0
5-08-20	16.0	26.5	19.6	82.3
6-08-20	16.5	24.5	20.0	90.2
7-08-20	14.5	30.0	21.0	84.3
8-08-20	16.5	32.0	22.3	80.4
9-08-20	16.5	32.5	21.9	78.6
10-08-20	18.0	34.5	23.9	76.3
11-08-20	18.0	39.5	25.4	72.8
12-08-20	19.5	40.0	25.2	76.4
13-08-20	19.0	26.5	21.1	91.6
14-08-20	17.5	20.0	18.6	96.3
15-08-20	16.5	18.5	17.7	98.7
16-08-20	17.5	27.0	20.6	91.5
17-08-20	16.0	23.0	18.0	95.7
18-08-20	15.5	24.0	19.1	93.6
19-08-20	16.0	20.0	18.0	98.9
20-08-20	14.0	29.0	19.6	83.1
21-08-20	16.0	25.0	20.0	72.4

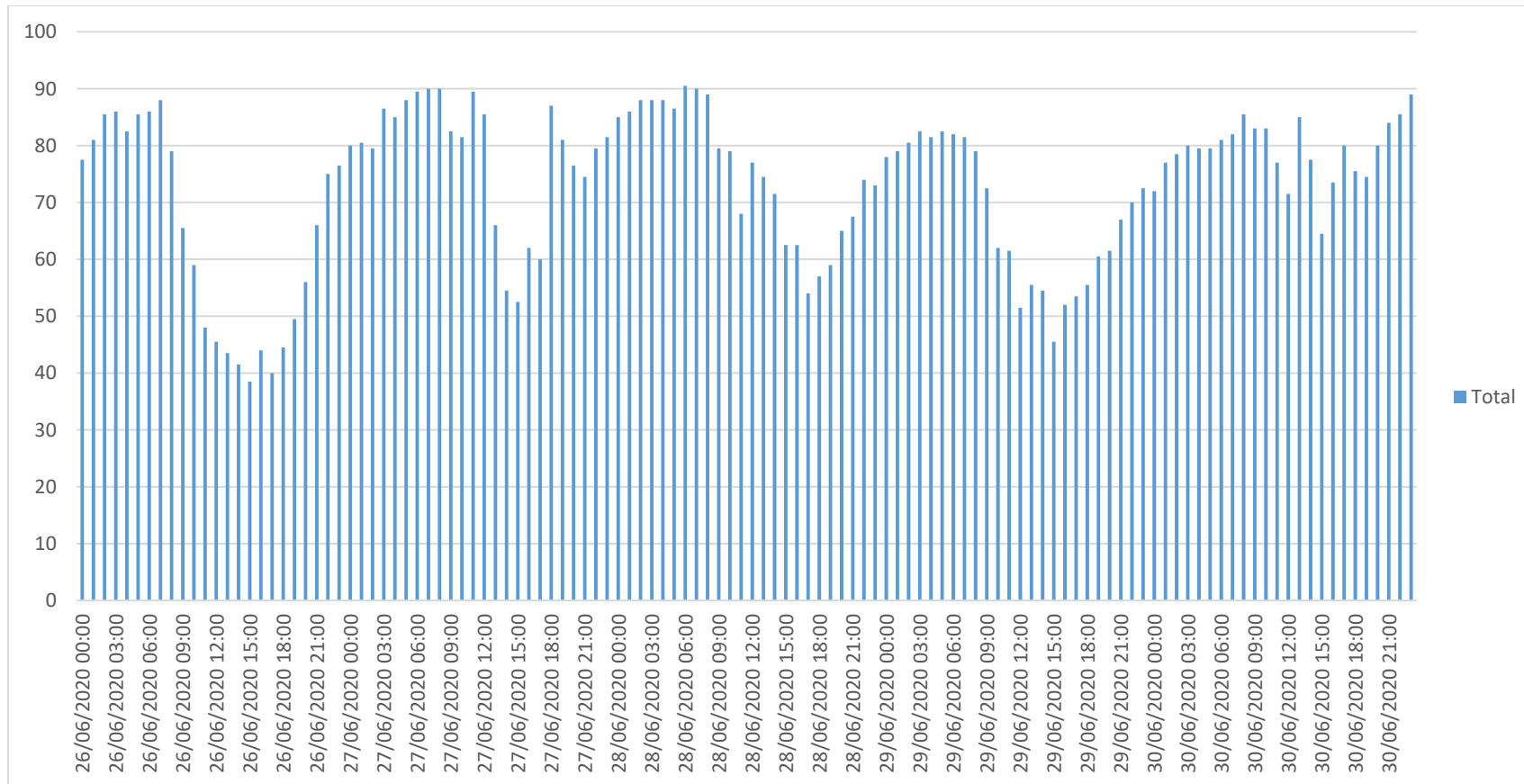


Figure 10. Humidity Date for the month of June.

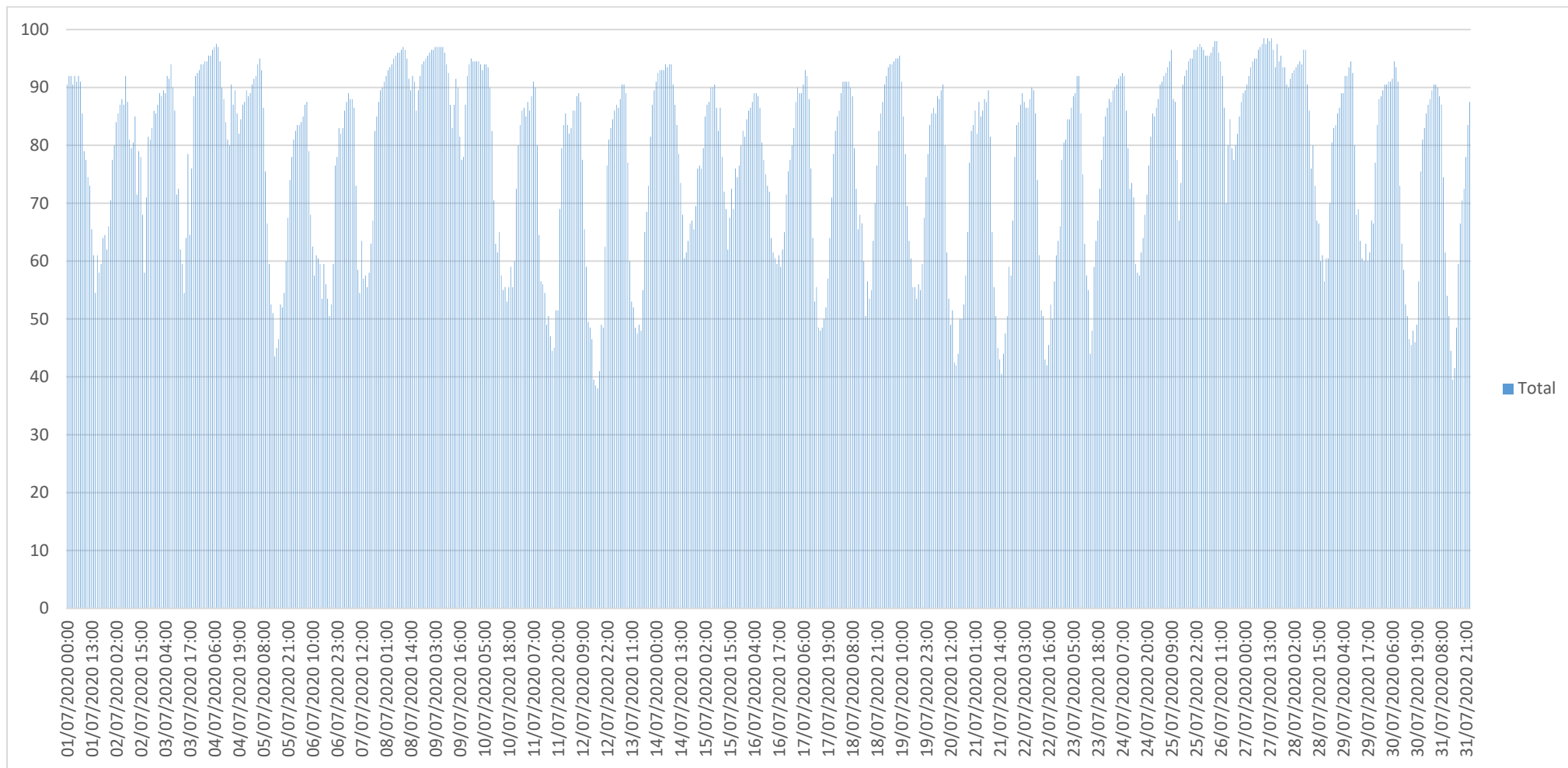


Figure 11. Humidity data for the month of July.

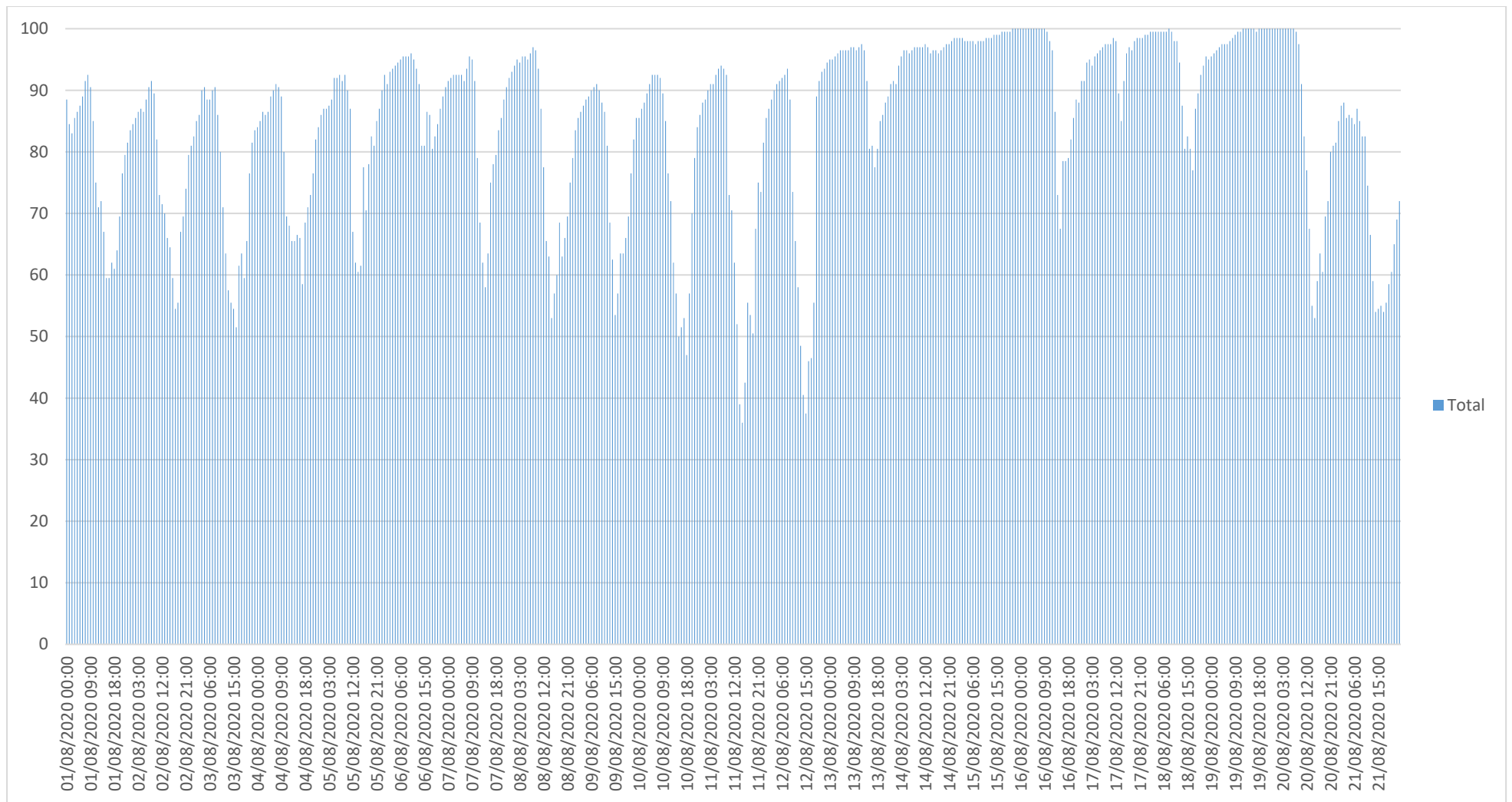


Figure 12. Humidity data for the month of August.

e. Trial design

TREATMENT	DISCARD	DISCARD	2	5	8	4	DISCARD	DISCARD
BLOCK	DISCARD	DISCARD	1	2	3	4	DISCARD	DISCARD
PLOT	DISCARD	DISCARD	108	208	308	408	DISCARD	DISCARD
TREATMENT	DISCARD	DISCARD	5	2	7	2	DISCARD	DISCARD
BLOCK	DISCARD	DISCARD	1	2	3	4	DISCARD	DISCARD
PLOT	DISCARD	DISCARD	107	207	307	407	DISCARD	DISCARD
TREATMENT	DISCARD	DISCARD	6	7	6	1	DISCARD	DISCARD
BLOCK	DISCARD	DISCARD	1	2	3	4	DISCARD	DISCARD
PLOT	DISCARD	DISCARD	106	206	306	406	DISCARD	DISCARD
TREATMENT	DISCARD	DISCARD	7	1	3	8	DISCARD	DISCARD
BLOCK	DISCARD	DISCARD	1	2	3	4	DISCARD	DISCARD
PLOT	DISCARD	DISCARD	105	205	305	405	DISCARD	DISCARD
TREATMENT	DISCARD	DISCARD	8	6	2	6	DISCARD	DISCARD
BLOCK	DISCARD	DISCARD	1	2	3	4	DISCARD	DISCARD
PLOT	DISCARD	DISCARD	104	204	304	404	DISCARD	DISCARD
TREATMENT	DISCARD	DISCARD	3	4	1	7	DISCARD	DISCARD
BLOCK	DISCARD	DISCARD	1	2	3	4	DISCARD	DISCARD
PLOT	DISCARD	DISCARD	103	203	303	403	DISCARD	DISCARD
TREATMENT	DISCARD	DISCARD	1	8	5	3	DISCARD	DISCARD
BLOCK	DISCARD	DISCARD	1	2	3	4	DISCARD	DISCARD
PLOT	DISCARD	DISCARD	102	202	302	402	DISCARD	DISCARD
TREATMENT	DISCARD	DISCARD	4	3	4	5	DISCARD	DISCARD
BLOCK	DISCARD	DISCARD	1	2	3	4	DISCARD	DISCARD
PLOT	DISCARD	DISCARD	101	201	301	401	DISCARD	DISCARD

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 
Alison Breward
Authorised signatory

Certification Number ORETO 409



HSE
Chemicals Regulation Division



Department of
**Agriculture and
Rural Development**