



PGRO Final Report

POWDERY MILDEW ON COMBINING PEAS

SLOT TRIALS 2022

Determining the efficacy of several fungicides on powdery mildew in combining peas.

Project title	Determining the efficacy of several fungicides on powdery mildew in combining peas.
Sponsor project reference	
Country / Region / EPPO zone	United Kingdom EPPO Maritime zone
Target crop	Combining peas (<i>Pisum sativum</i>)
Target pest	Powdery mildew (<i>Erysiphe pisi</i>)
Experimental permit reference	
GEP	Yes
Report author	Dina Gomez
Date issued	October 2022
Trial year	2022
Trials by	PGRO Research Ltd Great North Road Thornhaugh Cambridgeshire PE8 6HJ United Kingdom
Sponsor	Several

Chapters

Declarations	2
Objectives	3
Summary	3
Test items and treatments.....	4
Methods	4
Trial site	5
Results.....	7
Discussion.....	8
Appendix.....	9

List of tables

Table 1. Test items.....	4
Table 2. Treatment list.....	4
Table 3. Description of application timings	4
Table 4. Trials diary	5
Table 5. Site details for Stubton trial 2022	5
Table 6. Mean % leaf area infection with pea powdery mildew on 11 th July 2022 at Stubton.....	7
Table 7. Mean phytotoxicity after T1 and T2 application on 11 th July 2022. 10 = no phytotoxicity 0 = dead plant	8

Lists of figures

Figure 1. a. Evaluation plot. b. Powdery mildew symptoms on leaves and pods.	6
Figure 2. Mean % powdery mildew leaf area infection A1, 11 Jul 22.....	7

Declarations

We the undersigned hereby declare that the report submitted constitutes the Final Report of the study above and that all data reported here represent a true and accurate record of the results obtained. Every reasonable effort was made to ensure that disease, insect, weed pressures and crop husbandry were as relevant to the trial aims as possible.



Dina Gomez,
Technical Officer

Objectives

To determine,

- the effect of several fungicides on the control of powdery mildew in combining peas.
- how the efficacy of several fungicides compared against the standards Thiopron, Signum and Sunorg Pro.

Summary

- The treatments confidential 3, confidential 4 and confidential 5, significantly reduced powdery mildew infection in combining peas after the first application, compared to the untreated.
- The control of powdery mildew with these treatments confidential 3, confidential 4 and confidential 5 was comparable to the standard treatments 11 days after T1.

Test items and treatments

Table 1. Test items

Name	Active(s)	Conc.	Formulation	Batch/lot	MAPP
Thiopron	sulphur	825 g/l	SC	na	19147
Signum	boscalid, pyroclostrobin	26.7%, 6.7%	WG	22/155	11450
Sunorg Pro	metconzole	90 g/l	EC	na	15433

Table 2. Treatment list

Trt	Description	Rate(s)	Ai(s)	Timing
1	Control, Untreated	n/a	n/a	n/a
2	Thiopron	5.5 kg	4537.5 g	T1 + T2
3	Signum	1.0 kg	26.7 g, 6.7 g	T1 + T2
4	Sunorg Pro	0.8 l	72 g	T1 + T2
5	Confidential 1	n/a	na	T1 + T2
6	Confidential 2	n/a	n/a	T1 + T2
7	Confidential 3	n/a	n/a	T1 + T2
8	Confidential 4	n/a	n/a	T1 + T2
9	Confidential 5	n/a	n/a	T1 + T2

Table 3. Description of application timings

Timing	Growth stage or description of timing	BBCH
T1	3 to 5 filling pods	73-75
T2	50 % of pods ripe	85

Methods

Trial design - Plots measured 18 m² (1.8x10 m) and were arranged in a randomised complete block layout with four replications according to EPPO guideline PP1/152(4).

Sprayer details - Treatments were applied using a hand operated compressed air boom sprayer with a width of two meters. Lurmark 02F110 nozzles were used, operating at a pressure of 2 bar for a fine/medium droplet quality. Spray volumes were 200 l/ha.

Assessments - Powdery mildew was assessed as percentage leaf area infection on 25 plants per plot (based on EPPO guidelines PP1/57(3)). Assessments were made 11 days after T1. No assessment was done after T2 application due to rapid plant senescence. Phytotoxicity was recorded 11 days after T1. For the phytotoxicity evaluation, a scale from 0 to 10 was used, where 10 = No phytotoxicity and 0 denoted dead crop according to EPPO guideline PP1/135(4).

Analysis – data were analysed using Analysis of Variance in R Studio.

Table 4. Trials diary

Activity	Timing	BBCH	Date
Applications	T1	73-75	30-Jun-22
	T2	85	13-Jul-22
Assessments	A1 (+ phyto)	75-78	11-Jul-22

Trial site

Table 5. Site details for Stubton trial 2022

Test site information	
Town	Stubton
Postcode	NG23 5JH
N	52°59'20.16"
W	0°49'52.53"
Site description	Low weed pressure, mid-field.
Soil analysis	pH: 7.6; P: index 1, K: index 1, Mg: index 2; OM: 4.7%(LOD); Sand: 60%, Silt: 18%. Clay: 22%
Crop	Combining peas (<i>Pisum sativum</i>)
Variety	Bluetime
Drill date	17 March 2022
Inputs	Nirvana (4.4 l/ha) pre-emergence (30-Mar), Benta 480 SL 1.8 l/ha + Butoxone 1.8 l/ha post-emergence (26 Apr) and Aphox (279g/ha) (1-Jun)



a



b

Figure 1. a. Evaluation plot. b. Powdery mildew symptoms on leaves and pods.

Results

None of the products tested show any signs of precipitation and mixed well in water, when preparing the spraying solution.

Powdery mildew infection recorded in untreated plots at the time of T1 application was 0.87% of the leaf infected area.

At A1, 11 days after T1 application, all treatments gave a significant reduction of powdery mildew infection compared to the untreated control (Table 6). There was no opportunity to conduct an assessment after the T2 application as the plants senesced much more rapidly than would be expected, due to hot temperatures in July (Appendix).

Table 6. Mean % leaf area infection with pea powdery mildew on 11th July 2022 at Stubton.

No.	Treatment	11-Jul (A1)
1	Untreated	36.47 d
2	Thioproton	3.18 ab
3	Signum	4.79 ab
4	Sunorg Pro	4.85 ab
5	Confidential 1	6.36 b
6	Confidential 2	14.51 c
7	Confidential 3	2.20 ab
8	Confidential 4	1.65 ab
9	Confidential 5	0.67 a
F-value		90.47
P-value		0 (< 0.001)***

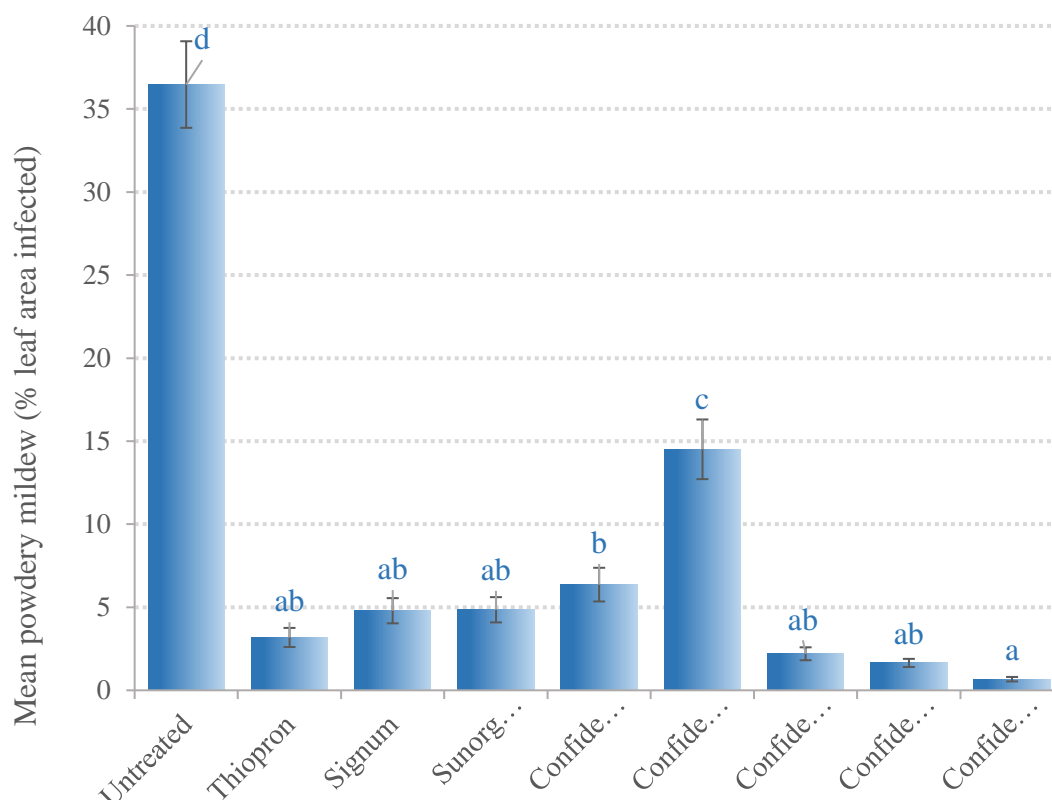


Figure 2. Mean % powdery mildew leaf area infection A1, 11 Jul 22

Phytotoxicity:

No phytotoxic symptoms were observed in any of the treatments at the assessment (Table 7).

Table 7. Mean phytotoxicity after T1 and T2 application on 11th July 2022. 10 = no phytotoxicity 0 = dead plant

No.	Treatment	11-Jul
1	Untreated	10
2	Thiopron	10
3	Signum	10
4	Sunorg Pro	10
5	Confidential 1	10
6	Confidential 2	10
7	Confidential 3	10
8	Confidential 4	10
9	Confidential 5	10

Discussion

This trial was performed in combining peas, variety Bluetime, selected for its susceptibility to powdery mildew (PGRO descriptive list 2022), to evaluate the efficacy of several fungicides on the control of powdery mildew.

The weather in 2022 led to moderate to high levels of powdery mildew in untreated areas; 2022 had dry May and July months compared to 2021 and higher temperatures (average °C) from April onwards in 2022 contrasted with the 2021 season (Appendix).

The control of powdery mildew with treatments: confidential 3, confidential 4 and confidential 5, after the first application was comparable with the standard fungicides tested and the untreated. There was no opportunity to conduct further assessments after the T2 application due to very rapid crop senescence. This was due to high temperatures in June and July, particularly in July.

No phytotoxicity or any unusual events were recorded in this trial. All products appeared to be crop safe.

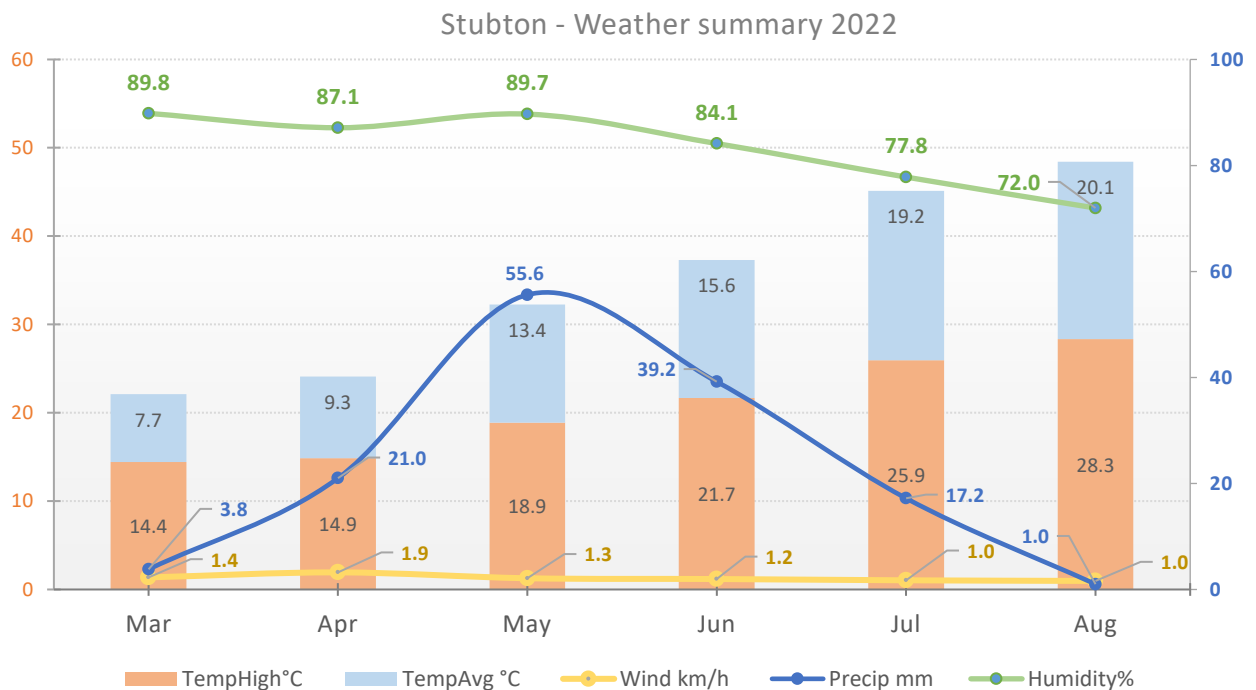
Appendix

Weather data Stubton 2022					
Date	Temperature		Humidity	Wind Speed	Precipitation Accum.
	High °C	Avg °C	Avg %	Avg km/h	Sum mm
17-Mar	13.14	7.53	96.42	1.8	0
18-Mar	15.49	7.96	96.74	1	0.2
19-Mar	14.59	8.17	91.49	3	0
20-Mar	10.72	5.68	89.16	1.9	0
21-Mar	13.07	5.61	84.65	0.9	0.2
22-Mar	18.38	11.14	88.22	1.6	0
23-Mar	19.34	10.71	82.52	0.6	0
24-Mar	18.18	10.32	73.45	0.7	0
25-Mar	18.42	9.18	76.7	0.4	0
26-Mar	18.2	8.78	85.13	1	0
27-Mar	14.7	8.04	99.71	1.3	0
28-Mar	16.68	8.97	87.59	0.6	0
29-Mar	10.15	6.16	99.8	1.4	0
30-Mar	8.52	4.56	99.78	1.7	1.6
31-Mar	6.9	2.15	96.05	2.6	1.8
01-Apr	7.75	2.78	99.56	1.7	3.6
02-Apr	8.67	2.21	93.96	0.7	1.2
03-Apr	11.35	4.09	82.85	1.2	0.2
04-Apr	13.55	9.98	99.01	2.9	5.8
05-Apr	13.69	11.45	95.52	2.5	0
06-Apr	14.32	10.69	95.75	3.5	1.2
07-Apr	10.79	6.85	99.67	3.4	5.6
08-Apr	11.46	5.26	85.62	1.3	0.2
09-Apr	11.45	4.75	80.73	1.4	0.2
10-Apr	13.09	6.53	75.65	0.8	0
11-Apr	16.06	10.42	70.18	3	0
12-Apr	19.94	12.61	94.91	1.2	1.2
13-Apr	17.6	12.39	98.09	1.5	1.6
14-Apr	17.29	10.48	93.77	0.6	0.2
15-Apr	20.87	14.3	86.15	1.1	0
16-Apr	20.58	13.6	85.56	2	0
17-Apr	19.65	12.88	74.89	1.8	0
18-Apr	16.88	11.92	80.06	1.1	0
19-Apr	16.82	10.42	94.26	1.4	0
20-Apr	16.7	10.55	76.72	2.3	0
21-Apr	17.92	10.29	80.72	2.6	0
22-Apr	16.4	10.87	81.2	4	0
23-Apr	15.83	10.75	93.03	4.3	0
24-Apr	16.1	10.81	81.84	3.8	0
25-Apr	13.79	8.38	91.35	1.8	0
26-Apr	14.98	8.13	87.62	1.4	0

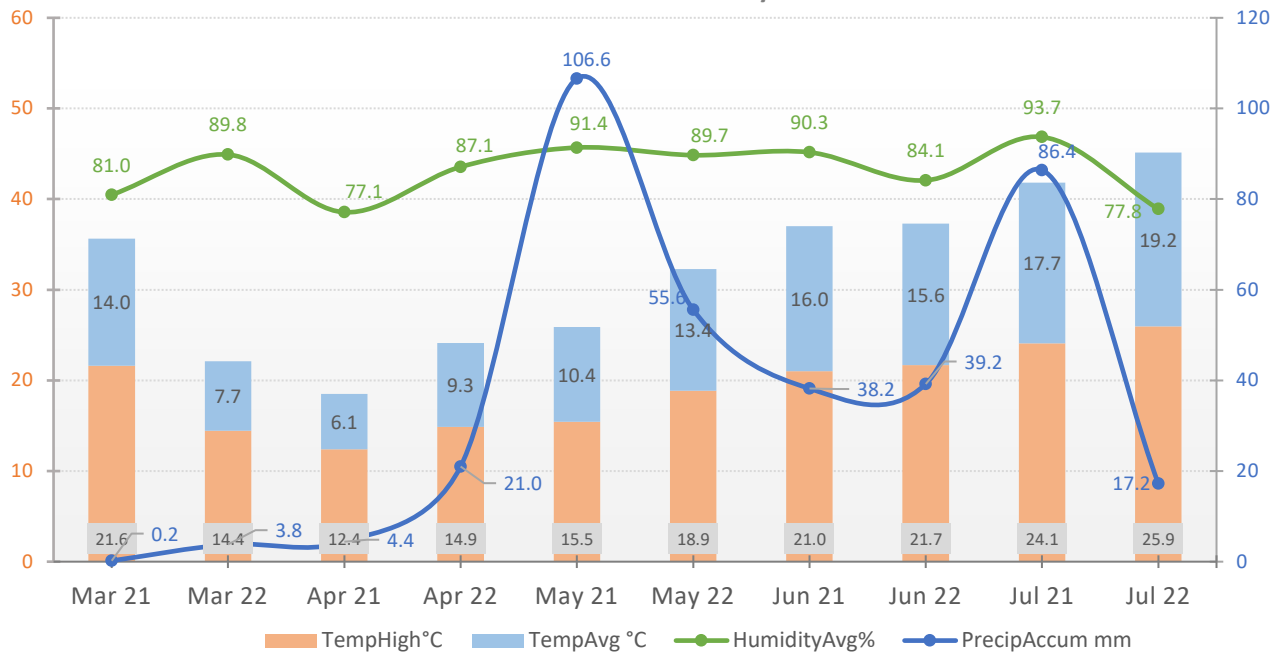
Weather data Stubton 2022					
Date	Temperature		Humidity	Wind Speed	Precipitation Accum.
	High °C	Avg °C	Avg %	Avg km/h	Sum mm
27-Apr	10.6	7.63	81.99	1.4	0
28-Apr	9.96	8.08	99.49	1.6	0
29-Apr	13.11	8.54	79.98	1.1	0
30-Apr	18.38	10.02	73.31	0.6	0
01-May	14.06	11.52	99.87	0.6	0
02-May	16.72	12.41	93.68	0.7	0.4
03-May	13.62	10.57	99.85	0.8	2.6
04-May	17.44	11.77	99.82	1.1	3.6
05-May	20.85	13.17	85.32	0.5	0
06-May	19.16	13.41	93.24	1.1	3.2
07-May	17.74	12.99	99.66	1.5	1
08-May	17.89	11.96	86.21	1.2	0
09-May	20.42	14.58	78.16	2	0
10-May	20.7	16.26	74.25	2.2	0
11-May	16.25	12.31	96.35	1.7	8.6
12-May	17.08	11.89	82.03	1.5	0
13-May	20.17	14.49	80.05	2.1	0
14-May	22.9	15.66	76.83	0.8	0
15-May	21.44	14.96	95.82	2.2	0.6
16-May	23.22	16.23	95.11	1.7	4.6
17-May	24.12	17.79	84.64	1.7	0.6
18-May	21.25	15.86	85.05	1.4	9.8
19-May	20.53	14.91	87.24	0.6	0
20-May	18.11	13.81	94.81	1.2	0.4
21-May	19.19	13.7	88.91	1.1	0
22-May	22.02	15.61	87.39	1.2	0
23-May	18.69	14.49	91.24	0.6	4.6
24-May	18.29	12.78	87.42	1	2
25-May	19.39	13.44	91.9	1.8	0
26-May	19.89	13.92	99.28	1.7	2
27-May	17.99	13.09	74.85	1.6	0.2
28-May	17.65	11.22	83.58	1	0
29-May	16.39	10.19	89.68	1.3	0
30-May	15.8	9.84	98.41	0.9	3.2
31-May	16.14	10.51	99.78	0.6	8.2
01-Jun	18.8	11.3	96.95	0.5	2.4
02-Jun	19.84	13.08	81.5	0.7	0.2
03-Jun	19.78	13.82	93.09	2	0
04-Jun	15.25	12.19	99.88	2.8	0
05-Jun	11.34	10.43	99.73	1.6	19.8
06-Jun	14.35	11.6	99.77	0.6	3.4
07-Jun	21.68	14.23	90.08	0.7	0
08-Jun	21.4	16.18	94.46	1.2	3.4

Weather data Stubton 2022					
Date	Temperature		Humidity	Wind Speed	Precipitation Accum.
	High °C	Avg °C	Avg %	Avg km/h	Sum mm
09-Jun	19.89	14.81	91.62	1.5	0.2
10-Jun	22.35	17.02	80.46	1.9	0
11-Jun	21.92	15.99	82.81	2	0.6
12-Jun	21.2	14.98	75.84	1.3	0
13-Jun	18.66	14.36	85.74	0.7	0
14-Jun	23.94	16.34	80.27	0.5	0
15-Jun	27.51	17.45	80.3	0.3	0
16-Jun	26.98	19.11	74.95	0.4	0
17-Jun	31.03	23.18	69.44	1.4	0
18-Jun	16.93	13.86	99.78	0.4	7
19-Jun	19.91	13.19	90.82	0.7	0.2
20-Jun	21.73	14.76	81.55	0.7	0
21-Jun	25.51	17.98	69.48	0.5	0
22-Jun	27.96	19.67	75.51	0.3	0
23-Jun	24.98	19.08	76.24	0.6	0
24-Jun	23.17	17.26	90.87	1.3	0
25-Jun	22.45	16.86	71.49	2.4	0
26-Jun	22.74	16.36	69.55	2.6	0
27-Jun	21.45	14.68	81.93	1.5	0.6
28-Jun	22.6	15.8	73.84	2.1	0
29-Jun	23.8	17.42	80.39	1.6	1.4
30-Jun	21.15	15.73	85.73	0.7	0
01-Jul	22.03	15.25	85.93	1.1	0
02-Jul	19.8	14.61	99.06	1.8	2.8
03-Jul	22.21	14.96	88.95	0.8	0
04-Jul	21.95	14.89	79.25	1.1	0
05-Jul	22.47	15.61	78.28	0.9	0
06-Jul	23.06	17.26	93.19	1.3	0
07-Jul	26.42	19.05	79.04	0.9	0
08-Jul	28.64	19.87	74.75	0.8	0
09-Jul	26.93	19.55	73.32	0.7	0
10-Jul	30.07	20.43	68.86	0.6	0
11-Jul	31.68	22.39	67.24	0.4	0
12-Jul	27.7	22.71	72.19	0.5	0
13-Jul	26.95	19.98	67.87	0.6	0
14-Jul	22.88	15.77	78.77	0.6	0.2
15-Jul	24.78	16.71	79.16	1	0
16-Jul	27.79	18.46	70.65	0.3	0
17-Jul	31.1	22.48	60.14	1	0
18-Jul	36.67	27.07	41.27	0.7	0
19-Jul	40.78	29.32	42.76	1.2	0
20-Jul	28.21	23.09	74.16	1.3	0
21-Jul	21.24	18.74	84.11	1	0

Weather data Stubton 2022					
Date	Temperature		Humidity	Wind Speed	Precipitation Accum.
	High °C	Avg °C	Avg %	Avg km/h	Sum mm
22-Jul	21.05	16.81	91.45	1.1	0.6
23-Jul	25.8	20.22	78.92	1.7	0
24-Jul	28.11	21.94	84.77	3.1	0.4
25-Jul	23.65	18.66	89.04	1.8	0.4
26-Jul	21.78	16.06	84.08	0.6	0.2
27-Jul	22.82	17.48	77.2	1.2	0.4
28-Jul	24.42	17.66	74.5	1.1	3.2
29-Jul	24.72	18.46	77.73	0.9	0
30-Jul	25.39	19.75	96	1	0.4
31-Jul	23.28	19.34	99.48	1.1	8.6
01-Aug	26.27	19.73	69.45	0.7	0
02-Aug	28.12	22.49	91.09	2.5	1
03-Aug	27.87	21.76	80.57	1.6	0
04-Aug	24.68	17.26	72.92	0.8	0
05-Aug	22.55	15.05	72.41	0.8	0
06-Aug	24.1	15.71	72.28	0.6	0



Stubton - weather summary 2021 and 2022





Certificate of

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

This certifies that

PGRO Research Ltd

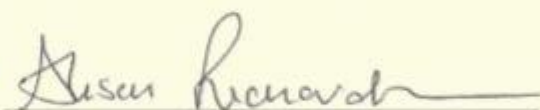
complies with the minimum standards laid down in
Regulation (EC) 1107/2009 for efficacy testing.

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
Biologicals and Semiochemicals**

Date of issue: 9 January 2018
Effective date: 1 January 2018
Expiry date: 31 December 2022

Signature


A Susan Kucenas
Authorised signatory

Certification Number

ORETO 384

