



PGRO Final Report

DOWNY MILDEW ON SPRING BEANS

SLOT TRIALS 2022

Determining the efficacy of several fungicide on downy mildew in spring beans.

Project title	Determining the efficacy of several fungicide on downy mildew in spring beans.
Sponsor project reference	
Country / Region / EPPO zone	United Kingdom EPPO Maritime zone
Target crop	Spring beans (<i>Vicia faba</i>)
Target pest	Downy mildew (<i>Peronospora viciae</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

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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 fungicide on downy mildew in spring beans.
- How the efficacy of these fungicides compares against the standards SL567A and Phorce.

Summary

- There was significant control of downy mildew in spring beans, with the standards and Confidential products treatments compared to the untreated-control after the T1 treatment application (5 and 11 days after). The treatments, SL567A, Confidential 2 and Confidential 3 gave the best control at A2 and A3.
- There were no significant effects of any of the treatments in reducing downy mildew at A4 and A5, 6 and 16 days after T2 application. This could be due to the rapid plant growth stimulated by the warm weather during June and early July that led to reduction of disease development and early senescence.

Test items and treatments

Table 1. Test items

Name	Active(s)	Conc.	Formulation	Batch/lot	MAPP
SL567A	metalaxyl-M	465.2 g/l	SC	na	12380
Phorce	N:P ₂ O ₅ : K ₂ O	5-38-15	SC	na	na

Table 2. Treatment list

Trt	Description	Rate(s)	Ai(s)	Timing
1	Control, Untreated	n/a	n/a	n/a
2	SL567A	1.6 l	744.32 g	T1 + T2
3	Phorce	1.0 l	N:P ₂ O ₅ :K ₂ O (5:38:15)	T1 + T2
4	Confidential 1	n/a	n/a	T1 + T2
5	Confidential 2	n/a	n/a	T1 + T2
6	Confidential 3	n/a	n/a	T1 + T2
7	Confidential 4	n/a	n/a	T1 + T2

Table 3. Description of application timings

Timing	Growth stage or description of timing	BBCH
T1	30-50 % open flower	63-65
T2	Flowering finishing, petals start to fall, first pods visible	67-69

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 - Downy mildew was assessed as percentage leaf area infection on 25 plants per plot (based on EPPO guidelines PP1/65(4)). Assessments were made immediately prior each treatment application and 5 days and 11 days after T1 application, also 6 days and 16 days after T2 application. Phytotoxicity was scored 5 days after T1 application and 6 days after T2 application. 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.

Table 4. Trials diary

Activity	Timing	BBCH	Date
Applications	T1	63-65	10-Jun-22
	T2	67-69	21-Jun-22
Assessments	A1	63-65	10-Jun-22
	A2 (+ phyto)	65-67	15-Jun-22
	A3	67-69	21-Jun-22
	A4 (+ phyto)	69-72	27-Jun-22
	A5	72-75	07-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%(LOI); Sand: 60%, Silt: 18%. Clay: 22%
Crop	Spring beans (<i>Vicia faba</i>)
Variety	Ghengis
Drill date	17 March 2022
Inputs	Nirvana (4.4 l/ha) pre-emergence (30-Mar)



a



b

Figure 1. a. Evaluation plot. b. Downy mildew symptoms on leaves, stems, and pods.

Results

One of the confidential fungicide products showed signs of precipitation after 30 min of dissolving in water, when preparing the solution for spraying. The other products dissolved well in water.

Downy mildew infection recorded in untreated plots at the time of T1 application was 16.53% of the leaf infected area (Table 6).

At A2, 5 days after T1, all treatments gave significant control of downy mildew compared to the untreated plots.

At A3, 11 days after T1, SL 567A, and a combination of Confidential 2 and 3 gave significant control of downy mildew compared to the untreated plots. The standard Phorce and Confidential 1 and Confidential 4 treatments had slightly less performance in the control of downy mildew in spring beans and they are statistically similar to the control (untreated).

There were no significant effects of any of the treatments in reducing downy mildew at A4 and A5, 6 and 16 days after T2 application (Table 6).

Table 6. Mean % leaf area infection with bean downy mildew at all assessment timings at Stubton in 2022.

No.	Treatment	11-Jun (A1)	15-Jun (A2)	21-Jun (A3)	27-Jun (A4)	07-Jul (A5)
1	Untreated	16.53	13.58 c	20.74 b	23.3	32.6
2	SL567A		7.07 ab	11.47 a	24.2	29.5
3	Phorce		9.15 b	17.74 ab	18.5	34.7
4	Confidential 1		7.12 ab	14.17 ab	21.2	29.3
5	Confidential 2		9.85 b	11.9 a	25.1	37.3
6	Confidential 3		5.94 a	11.49 a	21.2	28.4
7	Confidential 4		9.24 b	13.99 ab	21.9	27.8
	<i>F-value</i>		11.52	3.269	0.625	1.165
	<i>p-value</i>		0 (< 0.001)***	0.00354 **	0.711 ns (not significant)	0.323 ns

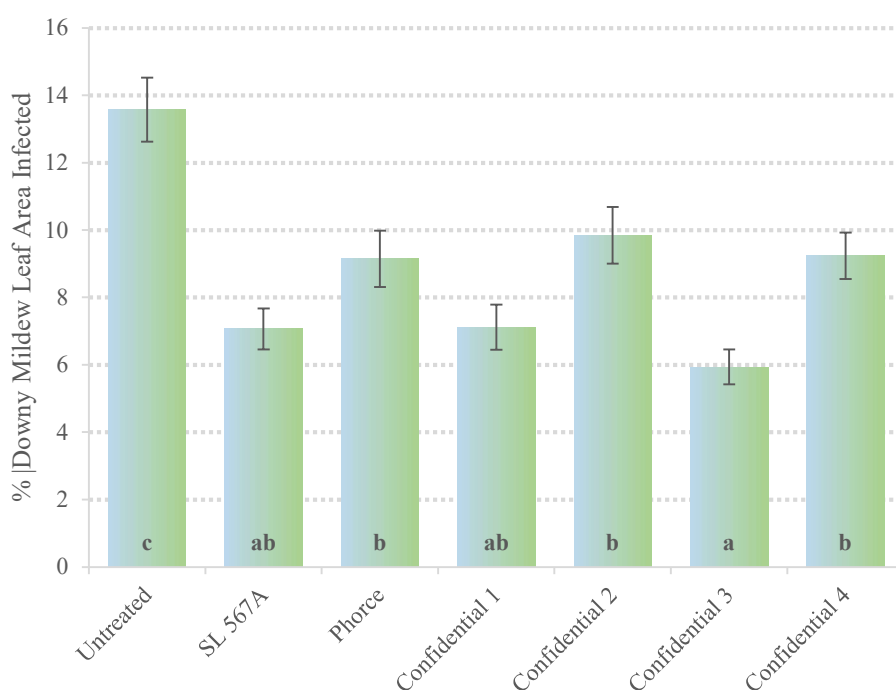


Figure 2. Mean % downy mildew leaf area infection A2, 15 Jun 22

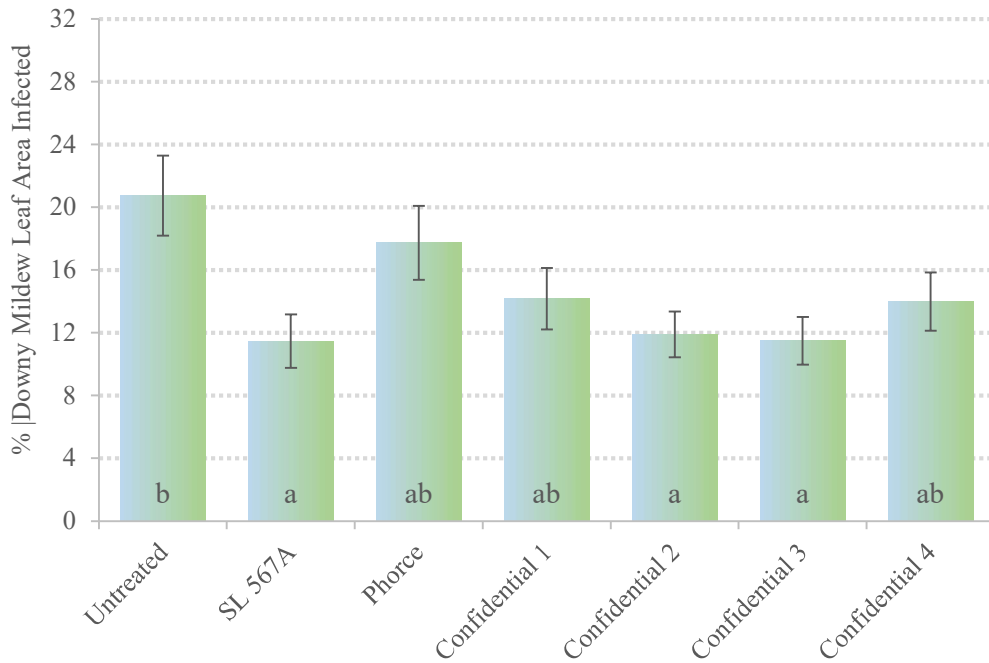


Figure 3. Mean % downy mildew leaf area infection A3, 21 Jun 22

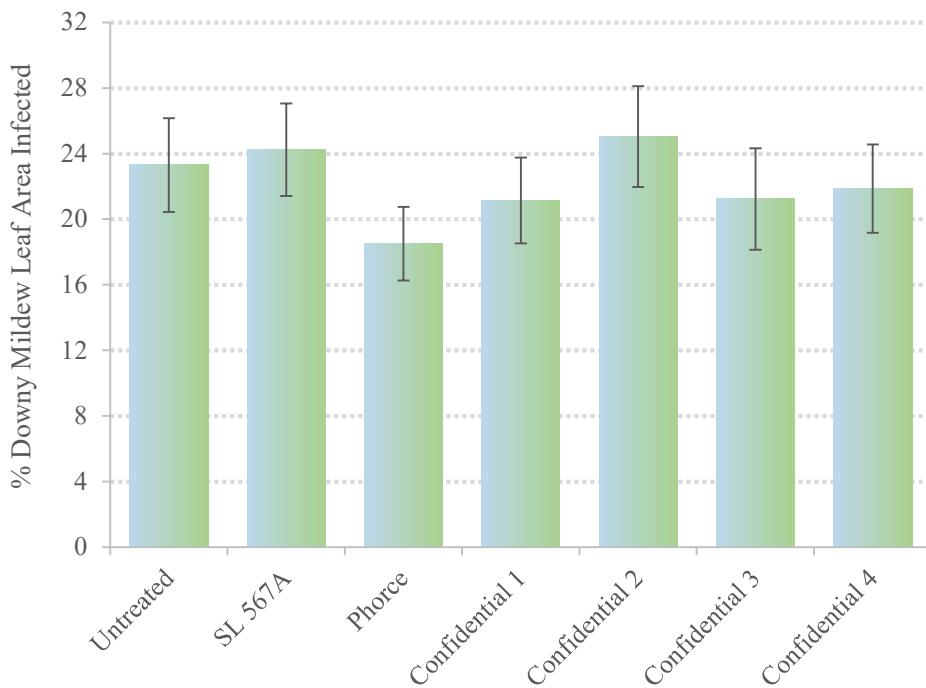


Figure 4. Mean % downy mildew leaf area infection A4, 27 Jun 22

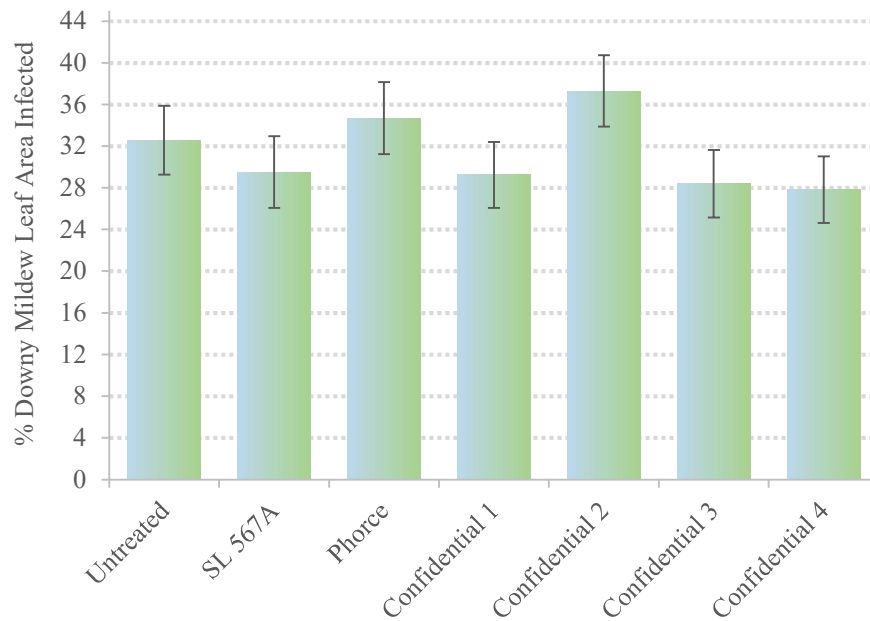


Figure 5. Mean % downy mildew leaf area infection per plant A5, 07 Jul 22

Phytotoxicity:

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

Table 7. Mean phytotoxicity after T1 and T2 application.

10 = no phytotoxicity 0 = dead plant

No.	Treatment	15-Jun	27-Jun
1	Untreated	10	10
2	SL567A	10	10
3	Phorce	10	10
4	Confidential 1	10	10
5	Confidential 2	10	10
6	Confidential 3	10	10
7	Confidential 4	10	10

Yield:

There were no significant differences in yield, (t/ha) at 15% moisture content between any of the treatments (Table 8).

Table 8. Mean yield (t/ha) at 15% moisture content (MC).

No.	Treatment	t/ha
1	Untreated	2.39
2	SL567A	2.35
3	Phorce	2.50
4	Confidential 1	2.22
5	Confidential 2	2.32
6	Confidential 3	2.20
7	Confidential 4	2.02
F-value		0.665
p-value		0.679

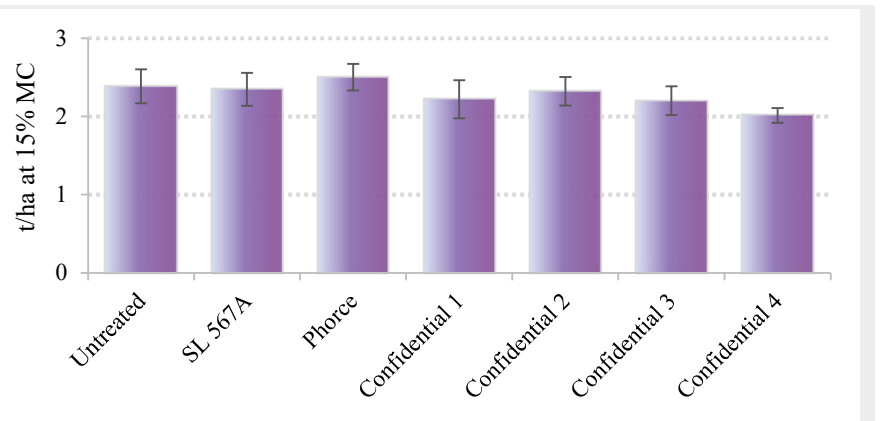


Figure 6. Mean yield (t/ha) at 15% moisture content (MC).

Discussion

This trial was performed in spring beans, variety Genghis, selected for its susceptibility to downy mildew (PGRO descriptive list 2022), to evaluate the efficacy of SL567A and Phorce (standards) and others fungicide molecules on the control of downy mildew.

The weather in 2022 led to moderate to high levels of downy mildew; 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).

There was a control of downy mildew with all the treatments at A2, 5 days after the first T1 application, compared to the untreated plots, with the best control given by Confidential 3 treatment.

11 days after T1 application, all the treatments gave a significant efficiency compared to the untreated. The best control of downy mildew was obtained with the standard SL567A, Confidential 2 and Confidential 3.

At the last two assessment dates, there were no significant differences in control between any of the treatments and the untreated plots. This was due to good plant growth and warm weather during June and early July that led to reduction of disease development and early senescence. As such, there was no significant benefit of applying the T2 application on the 21st June.

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

There were no significant differences in yield between any of the treatments, possibly due to the early senescence of the crop in 2022. The conditions in July were a combination of high mean maximum temperature 25.9 °C, low mean accumulated precipitation 17.2 mm and low mean relative humidity 77.8%, that prompted very rapid crop senescence.

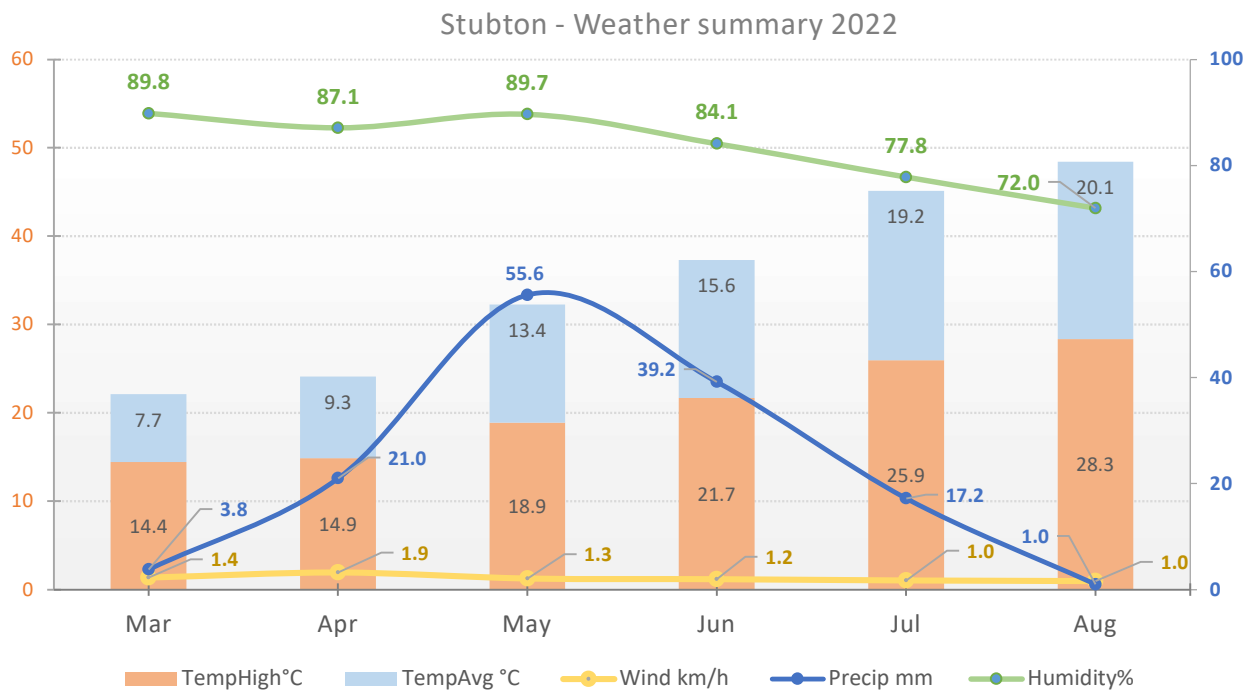
Appendix

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

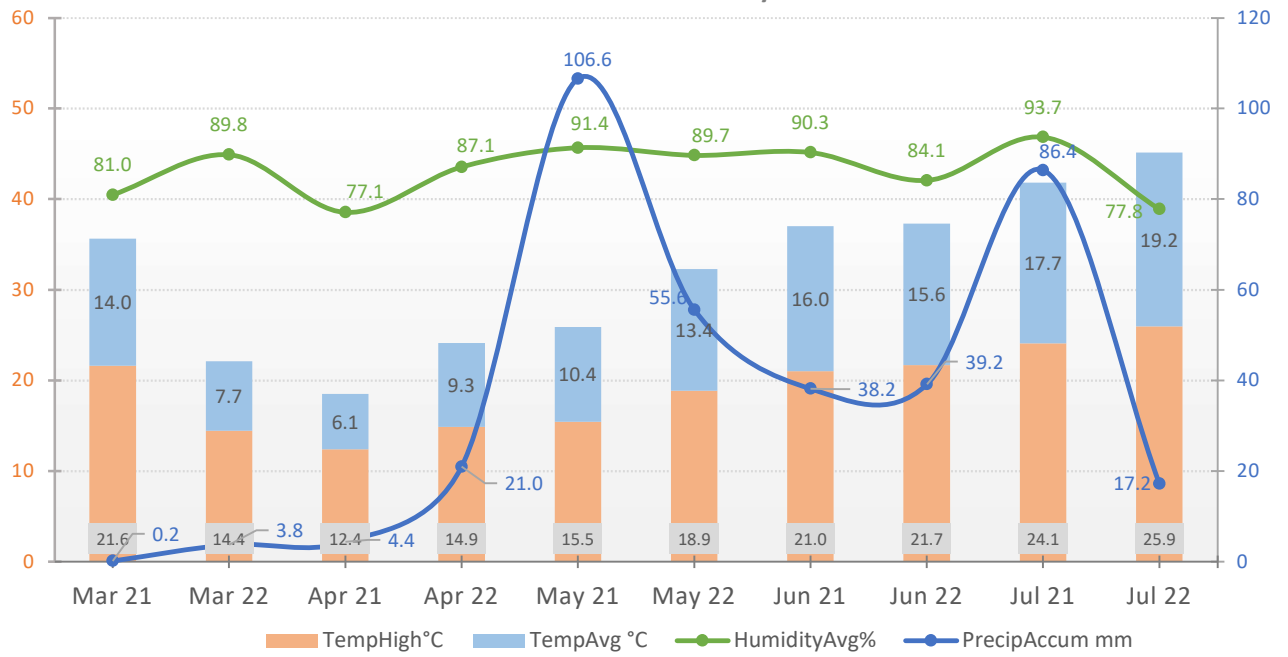
Weather data Stubton 2022					
Date	Temperature		Humidity	Wind Speed	Precipitation Accum.
	High °C	Avg °C	Avg %	Avg km/h	Sum mm
27-Apr	10.6	7.63	81.99	1.4	0
28-Apr	9.96	8.08	99.49	1.6	0
29-Apr	13.11	8.54	79.98	1.1	0
30-Apr	18.38	10.02	73.31	0.6	0
01-May	14.06	11.52	99.87	0.6	0
02-May	16.72	12.41	93.68	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					
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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





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Effective date: 1 January 2018
Expiry date: 31 December 2022

Signature


Authorised signatory

Certification Number

ORETO 384

