

SCEPTREPLUS

Final Trial Report

Trial code:	P1901288 (SP50)
Title:	Broad-leaved weed control in legumes
Crop	Vining peas and green beans.
Target	Broad-leaved weeds
Lead researcher:	Jim Scrimshaw
Organisation:	PGRO
Period:	March 2019 to September 2019
Report date:	September 2019
Report author:	Jim Scrimshaw
ORETO Number: (certificate should be attached)	384

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

19th March 2020



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Date

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Authors signature

control due to low levels of weeds. The uneven emergence may have masked some treatment effects as past PGRO work has identified aclonifen as a material that can significantly affect emergence.

Where significant control of weeds was seen in the green bean work pre-emergence AHDB9917, pre and early post emergence sprays of AHDB9898 and applications of AHDB9987 were the most promising and worthy of further investigation.

Objectives

Identify active substances with potential for broad-leaved weed control in legumes and evaluate their efficacy in vining peas and dwarf french beans

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
PP1/091(3)	Weeds in Phaseolus and Pisum'	A single trial of each was conducted at each site.

There were no other deviations from EPPO guidance.

The following were also used for reference: PGRO SOP's E1 version 12 (receipt and storage of chemicals), E2 version 7 (measuring samples of chemicals), E3 version 8 (trial site and layout), E6 version 10 (recording data), E12 version 8 (statistical analysis),

Test site for peas

Item	Details
Location address	Wold Dyke Farm, Middleton on the Wolds, East Riding of Yorkshire, YO25 9DA (Grid Reference SE92814913)
Crop	Vining peas
Cultivar	Vining peas: Boogie
Soil or substrate type	Clay Loam
Agronomic practice	Conventional
Prior history of site	

Trial design

Item	Details
Trial design:	Randomised complete block

Number of replicates:	4
Row spacing:	15cm
Plot size: (w x l)	2m x 5m
Plot size: (m ²)	10m ²
Number of plants per plot:	1100
<i>Leaf Wall Area calculations</i>	

Test site for green beans

Item	Details
Location address	Beeswax Farms, Stubton, NG23 5DA (Grid Reference SK884496)
Crop	Dwarf green beans
Cultivar	Lomami
Soil or substrate type	Clay Loam
Agronomic practice	Conventional
Prior history of site	

Trial design

Item	Details
Trial design:	Randomised complete block
Number of replicates:	4
Row spacing:	20cm
Plot size: (w x l)	2m x 10m
Plot size: (m ²)	20m ²
Number of plants per plot:	900
<i>Leaf Wall Area calculations</i>	

Treatment details

AHDB Code	Active substance	Product name/ manufacturer's code	Formulation batch number	Content of active substance in product	Formulation type	Adjuvant
AHDB9917	N/D	N/D	N/D	N/D	N/D	-
AHDB9898	N/D	N/D	N/D	N/D	N/D	-
-	Aclonifen	Emerger	EV56008883	600 g/l	SC	-
AHDB9987	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			
2.	AHDB9917	N/D	0.7 l/ha	A
3.	AHDB9917	N/D	0.7 l/ha	C
4.	AHDB9917	N/D	0.35 l/ha	A
5.	AHDB9917	N/D	0.35 l/ha	C
6.	AHDB9898	N/D	1.0 l/ha	A
7.	AHDB9898	N/D	1.0 l/ha	B
8.	Emerger	N/D	2.0 l/ha	A
9.	AHDB9987	N/D	2.0 l/ha	A
10.	AHDB9987	N/D	2.0 l/ha	B

Application details

	Vining Pea Application A	Vining Pea Application B	Green Bean Application A	Green Bean Application B	Green bean Application C
Application date	14 th May 2019	31 st May 2019	22 nd May 2019	20 th June 2019	27 th June 2019
Time of day	Mid-day	11.30am – 12.00	Mid-day	10.00am – 10.15am	10.25 – 10.35am
Crop growth stage (Max, min average BBCH)	BBCH:000	BBCH: 11-12	BBCH:001	cotyledon	1 trifoliolate
Crop height (cm)	0	3-5cm	0	5cm	10cm
Crop coverage (%)	0	5%	0	10%	15%
Application Method	Spray	Spray	Spray	Spray	Spray
Application Placement	Soil	Soil	Soil	Soil	Soil
Application equipment	Azo plot sprayer	Azo plot sprayer	Azo plot sprayer	Azo plot sprayer	Azo plot sprayer
Nozzle pressure	2 bar	2 bar	2 bar	2 bar	2 bar
Nozzle type	HYPRO 110 yellows	HYPRO 110 yellows	Hypro 110 yellows	Hypro 110 yellows	Hypro 110 yellows
Nozzle size	0110 015	0110 015	0110 015	0110 015	0110-015
Application water volume/ha	200 l/ha	200 l/ha	200 l/ha	200l/ha	200l/ha
Temperature of air - shade (°C)	19°C	18°C	15°C	16 °C	16°C
Relative humidity (%)	40%	80	52%	60%	
Wind speed range (m/s)	0.9 m/s	0.9 – 2.2	0 - 0.9	1.8 – 3.1	Gusty applied between gusts.
Dew presence (Y/N)	No	No	No	No	No
Temperature of soil - 2-5 cm (°C)					
Wetness of soil - 2-5 cm					
Cloud cover (%)	5%	40%	90%	70%	95%

- At Middleton-on-the-Wolds soil pH was 8.0, P, K and Mg indices were 2 (24.2mg/l), 1 (104mg/l) and 1 (47mg/l) respectively. Organic matter content was 6.3% and soil type is clay loam (27% sand, 47% silt, 26% clay).
- At Stubton soil pH was 7.4, P, K and Mg indices were 2 (15.6mg/l), 2- (174mg/l) and 2 (81mg/l) respectively. Organic matter content was 4.5% and soil type is clay loam.

Assessment details

Assessments were carried out to evaluate the weed control properties of the treatments and whether they caused phytotoxic effects on the crop. Third of a metre squared quadrats were placed randomly in plots and the different weed species identified and counted. This was carried out three times per plot to give weed numbers per square metre. Dates of assessments are below.

Peas

Evaluation date	Evaluation Timing (DA)*	Crop Growth Stage (BBCH)	Evaluation type (efficacy, phytotox)	Assessment
31/05/19	17	80% emergence (GS BBCH 10)	Efficacy/ phytotoxicity	Weed number and species present. Phytotoxicity if present.
05/06/19	T1 + 22 T2 + 5	100% emergence (GS BBCH 13)	Efficacy/ phytotoxicity	Weed number and species present. Phytotoxicity if present.
17/06/19	T1 + 34 T2 + 17	BBCH 14-15	Efficacy/ phytotoxicity	Weed number and species present. Phytotoxicity if present.
25/07/19	T1 + 72 T2 + 55	Crop mature	Efficacy/ phytotoxicity	Weed number and species present. Phytotoxicity if present.

* DA – days after application

Green beans

Evaluation date	Evaluation Timing (DA)*	Crop Growth Stage (BBCH)	Evaluation type (efficacy, phytotox)	Assessment
20/06/2019	T1 + 29	100% emergence (GS cots/1 st trifoliates)	Efficacy/ phytotoxicity	Weed number and species present. Phytotoxicity if present.
03/07/19	T1 + 42 T2 + 13	Excessive pest damage GS difficult to determine	Efficacy	Weed number and species present.
17/07/19	T1 + 56 T2 + 27	Little crop remaining because of pest damage.	Efficacy	Weed number and species present.

Statistical analysis

Data were analysed using ANOVA in STAR using an alpha level of 0.05.

Results

Peas

Only pre and early post emergence (BBCH 11 -12) applications were made.

Phytotoxicity

No phytotoxic effects were observed on the peas on any of the assessment dates.

Efficacy

Peas were drilled on 14th May which is toward the back end of a vining pea program into good soil conditions. Generally dry weather followed, and a very limited weed spectrum emerged in low numbers. It is not unusual for these later sown crops to receive no pre-emergence herbicide because weed pressure does not warrant it. Post-em sprays alone are used for weed control and rapidly growing crops smother later germinating weeds.

There was no statistically significant control from any of the treatments of the BRSNN or SINAR present. By the time of the final assessment, 25th July just prior to commercial harvest the crop was thick and any weed there was, was minimal and not going to hinder harvest.

PEAS			31-05-2019		05-06-2019		17-06-2019	
			BBCH 11-12		BBCH 13		BBCH 14-15	
Treatment	Rate	Timing	SINAR		BRSNN	SINAR	SINAR	BRSNN
1. Untreated			2.25		2.75	4.75	0.25	5
2. AHDB9917	0.7 l/ha	A	2.5		3.5	2.25	0	4.75
3. AHDB9917	0.7 l/ha	B	3.75		2	3.5	0.5	6.25
4. AHDB9917	0.35 l/ha	A	2.75		3	0.75	0	9
5. AHDB9917	0.35 l/ha	B	3.25		2.5	3.5	0	7
6. AHDB9898	1.0 l/ha	A	5.5		2.25	3.5	0.25	8.5
7. AHDB9898	1.0 l/ha	B	2		1.75	2.25	0	5.75
8. Aclonifen	2.0 l/ha	A	1.75		3.75	0.5	0.75	4
9. AHDB9987	2.0 l/ha	A	1.5		1.25	2	0	3.75
10. AHDB9987	2.0 l/ha	B	2		2.25	2	1	7
NS – not significant			NS		NS	NS	NS	NS

Green beans

Phytotoxicity

There was high pest pressure at the site. Emergence was uneven and then beans were not protected adequately. Birds and hares fed on any foliage which meant there was no meaningful plant parts to continue with phytotoxicity assessments following the 20th June.



Figure 1: uneven emergence



Figure 2: Typical discoloration – 20th June.

Figure 2 shows a typical discoloration that was being seen on some of the plots which was assessed as phytotoxicity. The blind assessment showed that these symptoms were also seen on the untreated plots so may not have been a crop effect caused by treatment. The uneven emergence may have masked some treatment effects as past PGRO work has identified aclonifen as a material that can significantly affect emergence. This was not picked up in this work but has in the past been noted as an effect that appears to be more severe on sandier soils.

Efficacy

			20.6.19		3.7.19			17.7.19		
			1st trifoliolate		Badly grazed			Few beans		
Treatment	Rate	Timing	GERDI	Phyto	GERDI	SONAS	VERPE	GERDI	SONAS	VERPE
1. Untreated			0.0	2.5	0.0	7.0 a	25.3 a	0.5	12.5	45.3 a
2. AHDB9917	0.7l/ha	A	0.0	2.5	0.0	1.8 b	4.8 bc	0.0	5.8	16.0 bcd
3. AHDB9917	0.7l/ha	C	0.0	2.0	0.0	5.5 ab	24.8 a	0.3	8.8	44.5 ab
4. AHDB9917	0.35l/ha	A	1.3	2.3	2.0	4.3 ab	20.3 ab	4.3	10.0	38.8 abc
5. AHDB9917	0.35l/ha	C	0.0	2.0	0.3	5.0 ab	29.3 a	0.2	9.5	44.8 a
6. AHDB9898	1.0 l/ha	A	6.0	2.5	3.5	2.0 ab	0.5 bc	7.0	8.8	0.5 d
7. AHDB9898	1.0l/ha	B	1.8	2.0	0.5	1.5 b	0.5 bc	0.0	10.8	3.8 d
8. Aclonifen	2.0l/ha	A	25.3	1.5	25.0	2.3 ab	11.5 abc	19.5	8.8	27.8 abcd
9. AHDB9987	2.0l/ha	A	27.8	0.8	24.3	0.8 b	0.0 c	23.8	3.8	0.5 d
10. AHDB9987	2.0l/ha	B	16.0	2.0	9.0	4.8 ab	4.5 bc	13.8	13.8	11.0 cd
	CV&		NS	NS	NS	62.04	67.8			50.39
	F _{9,39}					3.74	8.03			10.59
	P					0.0037	<0.001			<0.001

Means with same letter are not significantly different (using Tukey's HSD test).

Weed took some time to emerge. There was a plot wide strip of through the trial which had very high numbers of cranesbill (GERDI). Counts for treatments 6,8,9 and 10 were affected and illustrate that there appeared to be little control of GERDI from AHDB9987 or aclonifen.

By the 3rd July more species were emerging but there were only three present in reasonable numbers; cranesbill, prickly sow thistle and field speedwell. There was little evidence of cranes bill control at this point. However, prickly sow thistle (SONAS) numbers were reduced significantly by pre-emergence sprays of AHDB9917, an early 1.0 l/ha post-emergence application of AHDB9898 and label rate AHDB9987 applied pre-emergence.

A pre-emergence spray of AHDB9917 at label rate significantly reduced field speedwell numbers (VERPE). Post-emergence and lower rate applications did not. Pre and early post emergence sprays of AHDB9898 were effective as were applications of AHDB9987. Other species present in low numbers were groundsel, fat hen, black nightshade, charlock, pansy, creeping thistle and pale persicaria.

By 17th July weeds were present and the same three remained predominant. There was no perceived control of cranesbill but the highlighted distribution heavily affected any meaningful results. There was no longer any significant control of SONAS from any treatment. However, pre-emergence sprays of label rate AHDB9987 gave the greatest reduction in numbers, compared to the untreated.

Field speedwell numbers continued to be reduced significantly by AHDB9898 at label rate when applied pre-emergence. Pre and early post emergence sprays of AHDB9898 continued to be effective as was AHDB9987 applied at pre and early post-emergence timings.

A similar spectrum of weed to that seen at the time of the last assessment was present but numbers were low.

Discussion

The vining pea trial in Yorkshire was drilled under good soil and weather conditions on 14 May 2019. It was however towards the latter stages of the groups drilling program and drier conditions can be expected at this time of the season. This can hamper weed emergence if seed is present in the drier upper layers. The peas on the other hand can be drilled to an appropriate depth into moisture and they emerge and develop quickly with the rising temperatures. Weeds can be out competed and require minimal control. Possibly for partly this reason the pea work revealed little.

Green beans emerged unevenly, and the measures employed to protect them from hare and bird attack were inadequate. This meant that after an initial weed and phytotoxicity assessment there were few entire plants remaining on plots for further assessment.

It has been agreed between AHDB and PGRO that the work will be repeated in 2020 and that product will be made available earlier in the season.

Conclusions

All treatments appeared to be crop safe in both pea and green bean trials, but nothing of statistical significance can be drawn from the pea work regarding weed control due to low levels of weeds. The uneven emergence may have masked some treatment effects as past PGRO work has identified aclonifen as a material that can significantly affect emergence.

Where significant control of weeds was seen in the green bean work pre-emergence AHDB9917 at label rate, pre and early post emergence sprays of AHDB9898 at label rate and applications of AHDB9987 looked the most promising and worthy of further investigation.

Past work at PGRO with AHDB9898 has indicated that commercially it would be used with a mix partner or co-formulated to broaden the spectrum of weeds controlled. Similarly work with AHDB9987 at pre and early post timings have illustrated its crop safety but pre-emergence it 'needs' a helping hand from a partner product to offer broad spectrum weed control.

Acknowledgements

Thank you to AHDB for funding and supporting this project and for the financial and in-kind contributions from the crop protection manufacturers 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.

Thank you to Swaythorpe Growers Ltd. for providing the site, and general crop maintenance for the duration of the vining pea trial.

Appendix

Climatological data during study

Name: Southburn, Driffield											
Temperature (°C)											
Rain (mm)											
Wind speed (mph)											
Date	Mean temp	High	Time	Low	Time	Rain	Avg wind speed	High	Time	Dom Dir	
01-May-19	11.1	18.4	13.30	3.4	5.15	0.0	2.0	11.0	12.30	ESE	
02-May-19	10.3	15.4	12.45	7.1	3.45	4.2	4.4	15.0	10.30	NE	
03-May-19	6.9	9.9	12.45	3.2	00.00	0.6	3.2	16.0	19.00	NNE	
04-May-19	6.2	10.3	14.45	1.7	3.45	1.4	7.8	31.0	10.45	N	
05-May-19	7.4	10.9	14.30	2.9	00.00	0.0	3.3	16.0	10.45	NW	
06-May-19	5.9	10.0	14.45	0.8	1.45	0.2	3.0	13.0	11.45	NE	
07-May-19	7.6	10.5	16.00	4.3	3.45	1.0	3.4	14.0	16.45	E	
08-May-19	8.6	9.6	10.30	7.6	0.15	13.8	9.5	27.0	12.15	E	
09-May-19	7.8	9.1	10.45	4.3	23.00	0.4	7.4	21.0	13.30	NNE	
10-May-19	7.1	11.3	14.45	0.4	5.30	0.2	2.6	12.0	18.45	ESE	
11-May-19	8.6	13.6	14.15	4.2	6.15	0.8	1.8	11.0	14.30	ENE	
12-May-19	8.9	15.1	13.30	0.1	5.45	0.0	3.2	18.0	17.00	SE	
13-May-19	11.1	19.7	16.45	0.4	4.30	0.0	2.9	13.0	12.45	SW	
14-May-19	12.9	20.9	15.45	3.4	5.30	0.0	2.2	10.0	10.00	SSW	
15-May-19	10.8	18.1	15.15	2.7	5.30	0.0	3.0	14.0	14.00	ESE	
16-May-19	10.8	15.4	14.30	2.9	1.45	0.0	5.3	20.0	14.45	E	
17-May-19	12.1	16.9	14.30	9.3	4.00	0.2	6.6	15.0	8.00	NE	
18-May-19	11.9	15.9	12.15	9.1	23.30	2.2	2.4	10.0	7.45	NE	
19-May-19	12.2	17.8	10.45	8.9	00.00	0.0	2.3	11.0	12.30	E	
20-May-19	12.5	18.4	12.45	7.8	23.15	0.0	1.8	12.0	13.30	E	
21-May-19	11.6	19.6	14.45	3.4	4.30	0.2	3.0	13.0	10.30	WNW	
22-May-19	13	19.7	16.30	3.9	5.00	0.0	5.1	20.0	17.45	W	
23-May-19	12.8	19.2	16.00	4.8	4.45	0.0	4.8	19.0	16.15	W	
24-May-19	12.7	19.4	13.00	6.5	5.00	0.0	3.5	13.0	13.45	W	
25-May-19	13.6	19.5	13.00	6.2	2.30	0.0	3.8	16.0	17.45	W	
26-May-19	15.8	19.8	14.30	11.2	22.30	0.4	9.7	28.0	15.45	W	
27-May-19	11.8	16.3	11.00	8.3	23.45	10.2	5.8	25.0	10.15	W	
28-May-19	10.1	14.1	16.00	8.1	00.00	5.4	2.1	15.0	17.00	ENE	
29-May-19	11.5	16.6	14.00	3.8	4.30	0.8	4.4	19.0	16.45	SW	
30-May-19	17.6	21.4	13.45	13.8	0.30	0.0	8.5	22.0	11.15	W	
31-May-19	17.4	20.7	13.00	14.2	5.15	0.0	6.2	18.0	10.15	WSW	
01-Jun-19	15.2	18.7	14.30	11.0	4.45	0.2	5.1	21.0	1.30	WSW	
02-Jun-19	16.7	21.9	11.45	11.2	00.00	0.2	9.0	30.0	14.45	SSW	
03-Jun-19	13.9	18.8	16.30	9.3	2.45	0.0	8.8	25.0	10.15	SW	
04-Jun-19	12.1	16.0	12.00	9.6	5.15	6.6	5.0	19.0	19.00	SE	
05-Jun-19	12.8	15.9	17.15	9.3	5.00	0.2	6.9	23.0	12.15	SSW	
06-Jun-19	14.2	18.7	16.30	10.4	5.30	0.0	4.8	21.0	14.15	WNW	
07-Jun-19	12.9	16.6	12.45	10.8	1.30	7.6	6.5	23.0	15.00	E	
08-Jun-19	12.2	15.8	11.45	10.6	23.15	0.8	4.8	21.0	13.15	WSW	
09-Jun-19	13.0	17.8	15.00	8.6	4.15	0.2	5.7	19.0	9.45	SW	
10-Jun-19	11.8	13.3	12.00	9.1	4.00	0.6	4.2	17.0	22.15	NNE	

Source: Swaythorpe Growers Ltd.

Climatological data during study Stubton site:

May 1, 2019 - May 31, 2019

Weather station ICLAYPOL2 - Claypole 2 miles from Stubton

Date	Temperature			Humidity			Precip. Accum.
	High	Avg	Low	High	Avg	Low	Sum
05-01-19	20.0 C	13.3 C	7.2 C	99 %	55 %	1 %	0.00 mm
05-02-19	15.5 C	11.9 C	9.4 C	53 %	53 %	53 %	8.13 mm
05-03-19	9.6 C	8.1 C	6.2 C	53 %	53 %	52 %	1.52 mm
05-04-19	11.3 C	6.7 C	2.9 C	53 %	51 %	1 %	0.51 mm
05-05-19	13.0 C	8.4 C	3.7 C	99 %	65 %	1 %	0.00 mm
05-06-19	13.4 C	8.9 C	5.0 C	99 %	63 %	1 %	0.00 mm
05-07-19	16.1 C	9.8 C	5.6 C	99 %	54 %	1 %	0.00 mm
05-08-19	11.4 C	9.6 C	8.4 C	53 %	53 %	53 %	10.16 mm
05-09-19	10.1 C	8.5 C	7.3 C	53 %	53 %	52 %	2.03 mm
05-10-19	13.5 C	8.6 C	6.2 C	53 %	53 %	52 %	6.35 mm
05-11-19	15.0 C	10.1 C	6.2 C	53 %	52 %	8 %	0.00 mm
05-12-19	18.7 C	11.0 C	3.3 C	99 %	57 %	1 %	0.00 mm
5/13/2019	20.4 C	13.3 C	5.5 C	99 %	56 %	1 %	0.00 mm
5/14/2019	20.2 C	14.3 C	5.9 C	99 %	65 %	1 %	0.00 mm
5/15/2019	19.5 C	13.0 C	5.9 C	99 %	51 %	1 %	0.00 mm
5/16/2019	17.6 C	11.5 C	4.2 C	99 %	55 %	1 %	0.00 mm
5/17/2019	17.5 C	12.4 C	8.2 C	54 %	53 %	53 %	0.51 mm
5/18/2019	16.1 C	12.9 C	10.2 C	54 %	53 %	53 %	0.25 mm
5/19/2019	19.8 C	13.9 C	5.9 C	54 %	53 %	52 %	0.00 mm
5/20/2019	20.7 C	15.1 C	9.3 C	99 %	50 %	1 %	0.00 mm
5/21/2019	21.2 C	14.2 C	5.5 C	99 %	58 %	1 %	0.00 mm
5/22/2019	20.8 C	13.5 C	6.5 C	99 %	54 %	1 %	0.00 mm
5/23/2019	22.9 C	16.1 C	8.8 C	99 %	62 %	1 %	0.00 mm
5/24/2019	22.2 C	15.9 C	8.5 C	99 %	65 %	1 %	0.00 mm
5/25/2019	22.4 C	16.5 C	10.3 C	99 %	57 %	1 %	0.00 mm
5/26/2019	19.8 C	16.4 C	11.5 C	54 %	51 %	20 %	1.27 mm
5/27/2019	17.7 C	13.0 C	9.6 C	54 %	53 %	25 %	0.25 mm
5/28/2019	18.5 C	11.9 C	8.9 C	54 %	53 %	22 %	3.56 mm
5/29/2019	16.1 C	12.1 C	4.9 C	53 %	52 %	24 %	1.02 mm
5/30/2019	23.7 C	18.6 C	14.3 C	54 %	54 %	53 %	0.00 mm
5/31/2019	21.4 C	17.2 C	12.2 C	54 %	54 %	53 %	0.00 mm

June 1, 2019 - June 30, 2019

Weather station ICLAYPOL2 - Claypole 2 miles from Stubton

Date	Temperature			Humidity			Precip. Accum.
	High	Avg	Low	High	Avg	Low	Sum
06-01-19	26.2 C	19.4 C	12.2 C	99 %	48 %	1 %	0.00 mm
06-02-19	23.3 C	18.8 C	12.3 C	54 %	54 %	53 %	3.56 mm
06-03-19	19.7 C	15.2 C	11.1 C	99 %	58 %	1 %	0.00 mm
06-04-19	19.1 C	14.0 C	9.4 C	54 %	52 %	1 %	1.52 mm
06-05-19	18.3 C	14.6 C	10.6 C	54 %	53 %	43 %	0.00 mm
06-06-19	20.1 C	15.2 C	9.9 C	99 %	61 %	1 %	0.00 mm
06-07-19	18.4 C	13.2 C	8.1 C	54 %	53 %	53 %	2.03 mm
06-08-19	14.1 C	12.1 C	9.6 C	53 %	53 %	53 %	3.56 mm
06-09-19	20.2 C	14.0 C	8.4 C	99 %	58 %	1 %	0.25 mm
06-10-19	13.5 C	11.6 C	10.1 C	53 %	53 %	53 %	17.78 mm
06-11-19	10.8 C	10.0 C	9.0 C	53 %	53 %	53 %	74.17 mm
06-12-19	15.9 C	12.7 C	9.7 C	53 %	53 %	53 %	23.11 mm
6/13/2019	15.4 C	12.3 C	10.7 C	53 %	53 %	53 %	8.13 mm
6/14/2019	18.8 C	14.2 C	10.2 C	54 %	53 %	53 %	5.59 mm
6/15/2019	19.1 C	14.5 C	9.9 C	54 %	53 %	53 %	4.57 mm
6/16/2019	20.6 C	15.3 C	9.6 C	54 %	53 %	53 %	0.51 mm
6/17/2019	22.1 C	17.7 C	14.1 C	54 %	54 %	53 %	0.00 mm
6/18/2019	21.2 C	16.8 C	12.6 C	54 %	54 %	53 %	2.03 mm
6/19/2019	20.4 C	17.1 C	14.8 C	54 %	54 %	53 %	0.25 mm
6/20/2019	19.4 C	15.4 C	11.3 C	54 %	53 %	53 %	0.25 mm
6/21/2019	20.3 C	15.0 C	7.6 C	54 %	51 %	14 %	0.00 mm
6/22/2019	24.5 C	17.6 C	9.5 C	99 %	65 %	1 %	0.00 mm
6/23/2019	22.5 C	16.4 C	10.5 C	54 %	53 %	53 %	0.51 mm
6/24/2019	22.3 C	18.1 C	14.7 C	54 %	54 %	53 %	1.78 mm
6/25/2019	18.9 C	15.9 C	14.3 C	54 %	53 %	53 %	13.72 mm
6/26/2019	15.8 C	14.1 C	12.2 C	53 %	53 %	53 %	0.00 mm
6/27/2019	20.7 C	15.1 C	10.9 C	54 %	53 %	53 %	0.00 mm
6/28/2019	21.7 C	16.4 C	12.6 C	54 %	53 %	53 %	0.00 mm
6/29/2019	33.1 C	22.4 C	11.1 C	55 %	54 %	53 %	0.00 mm
6/30/2019	23.7 C	19.5 C	14.3 C	54 %	54 %	53 %	0.00 mm

July 1, 2019 - July 31, 2019

Weather station ICLAYPOL2 - Claypole 2 miles from Stubton

Date	Temperature			Humidity			Precip. Accum.
	High	Avg	Low	High	Avg	Low	Sum
07-02-19	21.7 C	16.1 C	9.7 C	99 %	48 %	1 %	0.00 mm
07-03-19	21.5 C	16.4 C	10.4 C	54 %	54 %	53 %	0.00 mm
07-05-19	25.8 C	19.8 C	14.3 C	55 %	54 %	43 %	0.00 mm
07-06-19	21.6 C	16.6 C	13.9 C	54 %	54 %	53 %	3.56 mm
07-08-19	19.6 C	14.4 C	11.3 C	54 %	53 %	53 %	0.00 mm
07-12-19	23.6 C	18.9 C	14.6 C	54 %	54 %	53 %	4.57 mm
7/13/2019	23.0 C	17.9 C	14.6 C	54 %	54 %	53 %	21.34 mm
7/14/2019	20.3 C	16.5 C	12.4 C	54 %	54 %	53 %	3.56 mm
7/15/2019	25.1 C	17.7 C	10.5 C	54 %	54 %	53 %	0.00 mm
7/16/2019	26.5 C	20.0 C	12.6 C	55 %	54 %	53 %	0.00 mm
7/17/2019	24.3 C	20.2 C	14.7 C	54 %	54 %	53 %	1.27 mm
7/18/2019	22.1 C	18.5 C	14.7 C	54 %	54 %	53 %	0.00 mm
7/19/2019	19.6 C	16.4 C	12.1 C	54 %	54 %	53 %	5.33 mm
7/20/2019	22.2 C	18.7 C	14.1 C	54 %	54 %	53 %	6.35 mm
7/21/2019	22.8 C	18.2 C	12.0 C	54 %	54 %	53 %	0.00 mm
7/22/2019	28.4 C	22.8 C	18.1 C	55 %	54 %	54 %	0.00 mm
7/23/2019	32.6 C	22.5 C	15.0 C	55 %	54 %	53 %	0.00 mm
7/24/2019	29.6 C	26.3 C	21.4 C	55 %	55 %	54 %	5.33 mm
7/25/2019	38.1 C	28.2 C	17.7 C	99 %	59 %	1 %	0.00 mm
7/26/2019	26.0 C	22.8 C	19.7 C	55 %	54 %	54 %	3.30 mm
7/27/2019	19.7 C	17.8 C	15.9 C	54 %	54 %	53 %	15.24 mm
7/28/2019	18.6 C	16.4 C	14.8 C	54 %	53 %	53 %	17.02 mm
7/29/2019	26.7 C	19.6 C	14.5 C	55 %	49 %	1 %	1.02 mm
7/30/2019	23.9 C	19.7 C	17.1 C	54 %	54 %	54 %	6.10 mm
7/31/2019	19.1 C	17.2 C	15.8 C	54 %	54 %	53 %	3.30 mm

d. Raw data from assessments

e. Soil analysis: Middleton-on-the-Wolds.



Contact : PGRO GREAT NORTH ROAD THORNHAUGH PETERBOROUGH PE8 6HJ Tel. : 01780 782585	Client : SCEPTRE AND BSF
X494	
Please quote the above code for all enquiries	
Sample Matrix : Agricultural Soil	Laboratory Reference Card Number 13110/19
	Date Received 09-Jul-19 Date Reported 15-Jul-19

SOIL ANALYSIS REPORT

Laboratory Sample Reference	Field Details			Index			mg/l (Available)		
	No.	Name or O.S. Reference with Cropping Details	Soil pH	P	K	Mg	P	K	Mg
58147/19	1	SCEPTRE + BSF <i>No cropping details given</i>	8.0	2	1	1	24.2	104	47

*If general fertiliser and lime recommendations have been requested, these are given on the following sheets.
The analytical methods used are as described in DEFRA Reference Book 427
The index values are determined from the DEFRA Fertiliser Recommendations RB209 9th Edition.*

Released by Gina Graham On behalf of NRM Ltd Date 15/07/19

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Registered Number: 05655711

PAAG
Professional Agricultural Analysis Group

Soil analysis Stubton.



Contact : PGRO GREAT NORTH ROAD THORNHAUGH PETERBOROUGH PE8 6HJ Tel. : 01780 782585	Client : STUBTON 2019
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X494

Please quote the above code for all enquiries

Sample Matrix : Agricultural Soil

Laboratory Reference	
Card Number	70268/19

Date Received	10-Jan-19
Date Reported	17-Jan-19

SOIL ANALYSIS REPORT

Laboratory Sample Reference	Field Details		Soil pH	Index			mg/l (Available)		
	No.	Name or O.S. Reference with Cropping Details		P	K	Mg	P	K	Mg
501307/19	1	STUBTON 2019 <i>No cropping details given</i>	7.6	2	2-	2	15.6	174	81

*If general fertiliser and lime recommendations have been requested, these are given on the following sheets.
The analytical methods used are as described in DEFRA Reference Book 427
The index values are determined from the DEFRA Fertiliser Recommendations RB209 9th Edition.*

Released by Katie Dunn On behalf of NRM Ltd Date 17/01/19

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Registered Number: 05655711

PAAG
Professional Agricultural Analysis Group

f. Trial design

G Rep 4	6	1	2	10	4	8	3	9	5	7	G Rep 4
G Rep 3	10	4	9	7	2	5	8	6	3	1	G Rep 3
G Rep 2	8	6	5	2	1	9	3	7	10	4	G Rep 2
G Rep 1	9	4	7	3	6	5	10	1	8	2	G Rep 1

g. ORETO certificate.



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 
Alison Kenward
Authorised signatory

Certification Number
ORETO 384



HSE
Chemicals Regulation Division



Department of
**Agriculture and
Rural Development**