SCEPTREPLUS

Final Trial Report

Trial code:	SP 26
Title:	**Weed Control in Alliums (Leeks and Onions)**
Crop	Outdoor Leeks, (with relevance to bulb onion and salad onion)
Target	Broadleaf Weeds,
Lead researcher:	Angela Huckle
Organisation:	RSK ADAS, Boxworth
Period:	March 2018 – December 2018
Report date:	31st January 2019
Report author:	David Norman, Fresh Produce Consultancy Ltd
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

20th December 2018
Date

Authors signature

Trial Summary

Introduction

Broad leaf weed control in leeks has become increasingly difficult, mainly due to approval losses of contact herbicides in recent years. The loss of actives such as cyanazine, prometryne, ioxynil and linuron means important weeds such as fat hen, pansy, small nettle, composite and polygonum weeds are becoming increasing difficult to control. This one year trial aims to screen potential new contact herbicides alone and in tank mix combinations with existing actives for weed control efficacy and phytotoxicity in leeks on a peat soil site.

Methods

A randomised, replicated trial (three replicates) was carried out at a commercial leek grower site in Cambridgeshire (Nightlayer Leek Company Ltd) on an organic peaty soil type. There were 20 treatments including untreated controls. The test treatments were aclonifen, AHDB9889, AHDB9890, alone or with tank mixtures of bromoxynil (Buctril), fluroxypyr (Starane HL), or bentazone (Basagran SG). Treatments were applied at the 2 true leaf stage.

Results

Table 1. Mean % weed cover, higher the figure, more weeds

	Mean % Weed Cover					
Date	**21-Jun**	**28-Jun**	**05-Jul**	**12-Jul**	**19-Jul**	**27-Jul**
Treatment						
Untreated %	20.78	37.24	44.90	60.99	78.79	88.54
1.Aclonifen 0.5	2.24	10.00	15.00	16.60	23.29	50.00
2.Aclonifen 1.0	3.34	6.49	10.00	10.00	11.57	20.00
3.AHDB9889 0.25	5.19	11.57	15.0	28.30	30.00	43.31
4.AHDB9889 0.5	4.15	10.00	11.57	25.00	38.18	75.17
5.AHDB9890 0.25	3.87	21.62	26.63	39.71	55.36	81.03
6.AHDB9890 0.5	7.58	28.30	32.91	43.16	50.51	58.68
7.Aclonifen 0.5 Bromoxynil 0.4	2.86	5.18	6.49	6.49	16.21	19.31
8.AHDB9889 0.25 Bromoxynil 0.4	3.86	11.57	13.24	14.39	24.53	37.54
9.AHDB9890 0.25 Bromoxynil 0.4	3.96	10.00	11.57	21.62	28.30	58.68
11.Aclonifen 0.5 Bentazone 0.3	3.61	6.49	8.16	11.57	18.12	21.35
12.AHDB9889 0.25 Bentazone 0.3	4.28	13.24	13.24	21.62	34.86	50.15
13.AHDB9890 0.25 Bentazone 0.3	5.30	13.24	15.00	38.03	43.31	51.87
14.Aclonifen 0.5 Fluroxypyr 0.2	3.96	10.00	11.14	13.01	26.52	36.60
15.AHDB9889 0.25 Fluroxypyr 0.2	4.28	11.57	11.57	23.18	27.98	55.36
16.AHDB9890 0.25 Fluroxypyr 0.2	5.00	21.35	24.89	46.50	54.98	73.80
17.Aclonifen 0.5 Fluroxypyr 0.2 Bentazone 0.3	3.61	6.49	8.16	14.76	14.76	23.29
18.AHDB9889 0.25	2.65	9.60	8.16	15.00	18.27	25.00

Fluroxypyr 0.2 Bentazone 0.3						
19.AHDB9890 0.25 Fluroxypyr 0.2 Bentazone 0.3	4.28	14.76	16.60	23.01	31.22	60.64
P value	0.05	0.05	0.05	0.05	0.05	0.05
d.f	41	41	41	41	41	41
Lsd	7.372	6.332	5.995	8.553	11.578	14.24
	Not significantly different from untreated control (p>0.05)					
	Significantly different from untreated control (p<0.05)					

Table 2. Crop Damage (phytotoxicity)
Higher score, more crop damage. 0 = no damage 10=crop dead

	Mean Crop Damage 0-10					
Date	**21-Jun**	**28-Jun**	**05-Jul**	**12-Jul**	**19-Jul**	**27-Jul**
Treatment						
Untreated	0	0	0	0	0	0
1.Aclonifen 0.5	4.00	1.67	0.33	0	0	0
2.Aclonifen 1.0	3.00	2.33	1.00	0	0	0
3.AHDB9889 0.25	5.00	2.33	2.00	0	0	0
4. AHDB9889 0.5	5.67	2.67	2.00	0	0	0
5. AHDB9890 0.25	3.67	1.33	0	0	0	0
6. AHDB9890 0.5	4.00	1.67	0	0	0	0
7. Aclonifen 0.5 Bromoxynil 0.4	4.00	2.33	0.33	0	0	0
8. AHDB9889 0.25 Bromoxynil 0.4	5.00	2.33	0.67	0	0	0
9. AHDB9890 0.25 Bromoxynil 0.4	4.67	2.33	0.33	0	0	0
11. Aclonifen 0.5 Bentazone 0.3	4.33	2.33	0.33	0	0	0
12. AHDB9889 0.25 Bentazone 0.3	5.33	2.67	1.33	0	0	0
13. AHDB9890 0.25 Bentazone 0.3	4.00	2.00	0.67	0	0	0
14. Aclonifen 0.5 Fluroxypyr 0.2	3.00	1.33	0.33	0	0	0
15. AHDB9889 0.25 Fluroxypyr 0.2	6.00	3.00	1.00	0	0	0
16. AHDB9890 0.25 Fluroxypyr 0.2	4.67	2.00	0.67	0	0	0
17. Aclonifen 0.5 Fluroxypyr 0.2 Bentazone 0.3	3.33	2.33	0.67	0	0	0
18. AHDB9889 0.25 Fluroxypyr 0.2 Bentazone 0.3	5.33	3.33	1.67	0	0	0
19. AHDB9890 0.25 Fluroxypyr 0.2 Bentazone 0.3	4.33	2.67	0.33	0	0	0
P value	0.05	0.05	0.05			
d.f	41	41	41			
Lsd	0.9636	0.8921	0.9636			
	Not significantly different from untreated control (p>0.05)					
	Significantly different from untreated control (p<0.05)					

Conclusions

Aclonifen gave the best weed control, either when applied alone at 1.0l/ha or in mixtures. AHDB9890 gave the poorest weed control although all treatments improved weed control when compared with the untreated control. AHDB9889 produced the most crop damage, but even that grew out within 3-4 weeks. Crop damage from all treatments had grown out after 4 weeks from treatment.

Take home message: The herbicide active aclonifen shows great promise for leeks and efforts should be made to pursue an approval. AHDB9889 could be useful if there is a route to approval, AHDB9890 is the least useful of the actives tested.

Objectives

To evaluate the effectiveness of three potential new leek herbicides either applied alone at various rates or in mixtures with other existing leek herbicides as is common commercial practice.
To monitor and assess the treated crop for phytotoxicity symptoms.

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
PP 1/267(1)	Weeds in allium crops	None

There were no deviations from EPPO guidance:

Test site

Item	**Details**
Location address	Laurence Bridge Farm, Honey Drove, Wimblington, March, PE15 ODY
Crop	Leeks
Cultivar	Belton
Soil or substrate type	Loamy Peat
Agronomic practice	Commercial Leek Crop, direct drilled 17th April, 250,000 seeds/ha Residual herbicide Wing-P 2.0l/ha + Cleancrop Amigo 1.5l/ha 27/04/18 Barley cover crop sprayed Laser 2.0l/ha + crop-oil 1.0l/ha + manganese sulphate 3.0kg/ha 22/05/18 No further sprays to trial area
Prior history of site	Previous crop wheat, farm has standard fen rotation, wheat, sugar beet, potatoes

Trial design

Item	**Details**
Trial design:	Randomised block design, amended to fit spray tramlines
Number of replicates:	3
Row spacing:	5 single rows on 2.0 M bed, 40cm
Plot size: (w x l)	2.0m X 6.0m
Plot size: (m^2)	12 (m^2)
Number of plants per plot:	270
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	Adjuvant
Untreated	n/a	n/a	n/a	n/a	n/a	n/a
n/a	aclonifen	Bandur	EV-56006446	600g/l	SC	n/a
AHDB9889	N/D	N/D	N/D	N/D	N/D	N/D
AHDB9890	N/D	N/D	N/D	N/D	N/D	N/D
n/a	bromoxynil	Buctril	ENP 3001253	22.5%	EC	n/a
n/a	bentazone	Basagran SG	02-000031	87%	SG	n/a
n/a	fluroxypyr	Starane HI-Load HL	F 00617E002	33.3%	EC	n/a

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
10,20	Untreated	0	0	A
1	Aclonifen	300	0.5	A
2	Aclonifen	600	1.0	A
3	AHDB9889	120	0.25	A
4	AHDB9889	240	0.5	A
5	AHDB9890	120	0.25	A
6	AHDB9890	240	0.5	A
7	Aclonifen + Buctril	300 90	0.5 0.4	A
8	AHDB9889	120	0.25	A
9	AHDB9890	120	0.25	A
11	Aclonifen + Basagran SG	300 261	0.5 0.3	A
12	AHDB9889 + Basgran SG	120 261	0.25 0.3	A
13	AHDB9890 + Basagran SG	120 261	0.25 0.3	A
14	Aclonifen + Starane HL	300 66.6	0.5 0.2	A
15	AHDB9889 + Starane HL	120 66.6	0.25 0.2	A
16	AHDB9890 + Starane HL	120 66.6	0.25 0.2	A
17	Aclonifen + Starane HL + Basagran SG	300 66.6 261	0.5 0.2 0.3	A
18	AHDB9889 + Starane HL + Basagran SG	120 66.6 261	0.25 0.2 0.3	A
19	AHDB9890 + Starane HL + Basagran SG	120 66.6 261	0.25 0.2 0.3	A

Application details

	Application A
Application date	13/06/2018
Time of day	0840-0949
Crop growth stage (Max, min average BBCH)	2-3 leaves BBCH 12-BBCH 13
Crop height (cm)	10cm
Crop coverage (%)	5%
Application Method	Spray
Application Placement	Foliar
Application equipment	Azo precision Plot sprayer
Nozzle pressure	2.0bar
Nozzle type	Flat fan
Nozzle size	F04/110
Application water volume/ha	400 l/ha
Temperature of air - shade (°C)	15
Relative humidity (%)	73%
Wind speed range (m/s)	3.0-3.5
Dew presence (Y/N)	N
Temperature of soil - 2-5 cm (°C)	16
Wetness of soil - 2-5 cm	Damp
Cloud cover (%)	30%

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
Broadleaf weeds and grasses	*N/A*	3WEEDT	12% ground cover	21% ground cover	62% ground cover

Assessment details

	Evaluation Timing (DA)*				
Evaluation date	**After conventional insecticides**	**After Bio-insecticides**	**Crop Growth Stage (BBCH)**	**Evaluation type (efficacy, phytotox)**	**Assessment**
21-06-18	8	n/a	12-13	efficacy phytotox	Phytox scale 10=dead 0=nil Weeds % ground cover
28-06-18	15	n/a	13	efficacy phytotox	Phytox scale 10=dead 0=nil Weeds % ground cover
05-07-18	22	n/a	14	efficacy phytotox	Phytox scale 10=dead 0=nil Weeds % ground cover
12-07-18	29	n/a	14	efficacy phytotox	Phytox scale 10=dead 0=nil Weeds % ground cover
19-07-18	36	n/a	15	efficacy phytotox	Phytox scale 10=dead 0=nil Weeds % ground cover
27-07-18	54	n/a	16	efficacy phytotox	Phytox scale 10=dead 0=nil Weeds % ground cover

* DA – days after application

At each assessment as score was made for phytotoxicity and for % weed ground cover, notes were made on weed species present and photographs taken of damage symptoms.

Statistical analysis

The trial was designed as a randomized block design with three replicates including two replicated untreated controls within the 20 treatments. However, to fit into the field tramline spray system and keep in the same variety of leeks, the replicate blocks were re-aligned to make a longer narrower trial area.

As usual with weed trials the distribution of weeds was fairly uneven so the data for weeds had an angular transformation used. All data were analysed by ANOVA using Genstat 18.2 by Chris Dyer at RSK ADAS. For the % efficacy the data was calculated by abbotts formula, an angular transformation was carried out and then the back transformed means are presented, from which abbotts formula was used to calculate the % reduction in weeds.

Results

Table Three. Mean % weed cover, higher figure, more weeds

	Mean % Weed Cover					
Date	**21-Jun**	**28-Jun**	**05-Jul**	**12-Jul**	**19-Jul**	**27-Jul**
Treatment						
Untreated %	20.78	37.24	44.90	60.99	78.79	88.54
Aclonifen 0.5	2.24	10.00	15.00	16.60	23.29	50.00
Aclonifen 1.0	3.34	6.49	10.00	10.00	11.57	20.00
AHDB9889 0.25	5.19	11.57	15.0	28.30	30.00	43.31
AHDB9889 0.5	4.15	10.00	11.57	25.00	38.18	75.17
AHDB9890 0.25	3.87	21.62	26.63	39.71	55.36	81.03
AHDB9890 0.5	7.58	28.30	32.91	43.16	50.51	58.68
Aclonifen 0.5 Bromoxynil 0.4	2.86	5.18	6.49	6.49	16.21	19.31
AHDB9889 0.25 Bromoxynil 0.4	3.86	11.57	13.24	14.39	24.53	37.54
AHDB9890 0.25 Bromoxynil 0.4	3.96	10.00	11.57	21.62	28.30	58.68
Aclonifen 0.5 Bentazone 0.3	3.61	6.49	8.16	11.57	18.12	21.35
AHDB9889 0.25 Bentazone 0.3	4.28	13.24	13.24	21.62	34.86	50.15
AHDB9890 0.25 Bentazone 0.3	5.30	13.24	15.00	38.03	43.31	51.87
Aclonifen 0.5 Fluroxypyr 0.2	3.96	10.00	11.14	13.01	26.52	36.60
AHDB9889 0.25 Fluroxypyr 0.2	4.28	11.57	11.57	23.18	27.98	55.36
AHDB9890 0.25 Fluroxypyr 0.2	5.00	21.35	24.89	46.50	54.98	73.80
Aclonifen 0.5 Fluroxypyr 0.2 Bentazone 0.3	3.61	6.49	8.16	14.76	14.76	23.29
AHDB9889 0.25 Fluroxypyr 0.2 Bentazone 0.3	2.65	9.60	8.16	15.00	18.27	25.00
AHDB9890 0.25 Fluroxypyr 0.2 Bentazone 0.3	4.28	14.76	16.60	23.01	31.22	60.64
P value	0.05	0.05	0.05	0.05	0.05	0.05
d.f	41	41	41	41	41	41
lsd	7.372	6.332	5.995	8.553	11.578	14.24
	Not significantly different from untreated control (p>0.05)					
	Significantly different from untreated control (p<0.05)					

Phytotoxicity

Table 4. Crop Damage (phytotoxicity)
Higher score, more crop damage. 0 = no damage 10=crop dead

	Mean Crop Damage 0-10					
Date	**21-Jun**	**28-Jun**	**05-Jul**	**12-Jul**	**19-Jul**	**27-Jul**
Treatment						
Untreated	0	0	0	0	0	0
1.Aclonifen 0.5	4.00	1.67	0.33	0	0	0
2.Aclonifen 1.0	3.00	2.33	1.00	0	0	0
3.AHDB9889 0.25	5.00	2.33	2.00	0	0	0
4. AHDB9889 0.5	5.67	2.67	2.00	0	0	0
5. AHDB9890 0.25	3.67	1.33	0	0	0	0
6. AHDB9890 0.5	4.00	1.67	0	0	0	0
7. Aclonifen 0.5 Bromoxynil 0.4	4.00	2.33	0.33	0	0	0
8. AHDB9889 0.25 Bromoxynil 0.4	5.00	2.33	0.67	0	0	0
9. AHDB9890 0.25 Bromoxynil 0.4	4.67	2.33	0.33	0	0	0
11. Aclonifen 0.5 Bentazone 0.3	4.33	2.33	0.33	0	0	0
12. AHDB9889 0.25 Bentazone 0.3	5.33	2.67	1.33	0	0	0
13. AHDB9890 0.25 Bentazone 0.3	4.00	2.00	0.67	0	0	0
14. Aclonifen 0.5 Fluroxypyr 0.2	3.00	1.33	0.33	0	0	0
15. AHDB9889 0.25 Fluroxypyr 0.2	6.00	3.00	1.00	0	0	0
16. AHDB9890 0.25 Fluroxypyr 0.2	4.67	2.00	0.67	0	0	0
17. Aclonifen 0.5 Fluroxypyr 0.2 Bentazone 0.3	3.33	2.33	0.67	0	0	0
18. AHDB9889 0.25 Fluroxypyr 0.2 Bentazone 0.3	5.33	3.33	1.67	0	0	0
19. AHDB9890 0.25 Fluroxypyr 0.2 Bentazone 0.3	4.33	2.67	0.33	0	0	0
P value	0.05	0.05	0.05			
d.f	41	41	41			
Lsd	0.9636	0.8921	0.9636			
	Not significantly different from untreated control (p>0.05)					
	Significantly different from untreated control (p<0.05)					

Efficacy

Table 5. Mean % weed reduction from untreated per treatment.

Mean % weed reduction from untreated using back transformed means data, % Abbotts reduction.

	Mean % Weed reduction from untreated (Abbotts % reduction)					
Date	**21-Jun**	**28-Jun**	**05-Jul**	**12-Jul**	**19-Jul**	**27-Jul**
Treatment						
Untreated % weed cover	20.78	37.24	44.90	60.99	78.79	88.54
1.Aclonifen 0.5	89.20	73.15	66.59	72.78	70.44	43.53
2.Aclonifen 1.0	83.93	82.57	77.73	83.60	85.32	77.41
3.AHDB9889 0.25	75.01	68.93	66.59	53.60	61.92	51.08
4.AHDB9889 0.5	80.03	73.15	74.23	59.01	51.54	15.10
5.AHDB9890 0.25	81.44	41.94	40.69	34.89	29.74	8.48
6.AHDB9890 0.5	63.50	24.01	26.70	29.23	35.89	33.72
7.Aclonifen 0.5 Bromoxynil 0.4	86.26	86.09	85.55	89.36	79.43	78.19
8.AHDB9889 0.25 Bromoxynil 0.4	81.44	68.93	70.51	76.41	68.87	57.60
9.AHDB9890 0.25 Bromoxynil 0.4	80.95	73.15	74.23	64.55	64.08	33.72
11.Aclonifen 0.5 Bentazone 0.3	82.62	82.57	81.83	81.03	77.00	75.89
12.AHDB9889 0.25 Bentazone 0.3	79.41	64.45	70.51	64.55	55.76	43.36
13.AHDB9890 0.25 Bentazone 0.3	74.47	64.45	66.59	37.65	45.03	41.42
14.Aclonifen 0.5 Fluroxypyr 0.2	80.95	73.15	75.19	78.67	66.34	58.66
15.AHDB9889 0.25 Fluroxypyr 0.2	79.41	68.93	74.23	61.99	64.49	37.47
16.AHDB9890 0.25 Fluroxypyr 0.2	75.94	42.67	44.57	23.76	30.22	16.65
17.Aclonifen 0.5 Fluroxypyr 0.2 Bentazone 0.3	82.62	82.57	81.83	75.80	81.27	73.70
18.AHDB9889 0.25 Fluroxypyr 0.2 Bentazone 0.3	87.27	74.22	81.83	75.41	76.81	71.76
19.AHDB9890 0.25 Fluroxypyr 0.2 Bentazone 0.3	79.41	60.37	63.03	62.27	60.38	31.51
P value	0.05	0.05	0.05	0.05	0.05	0.05
d.f	41	41	41	41	41	41
Lsd	7.372	6.332	5.995	8.553	11.578	14.24
	Not significantly different from untreated control (p>0.05)					
	Significantly different from untreated control (p<0.05)					

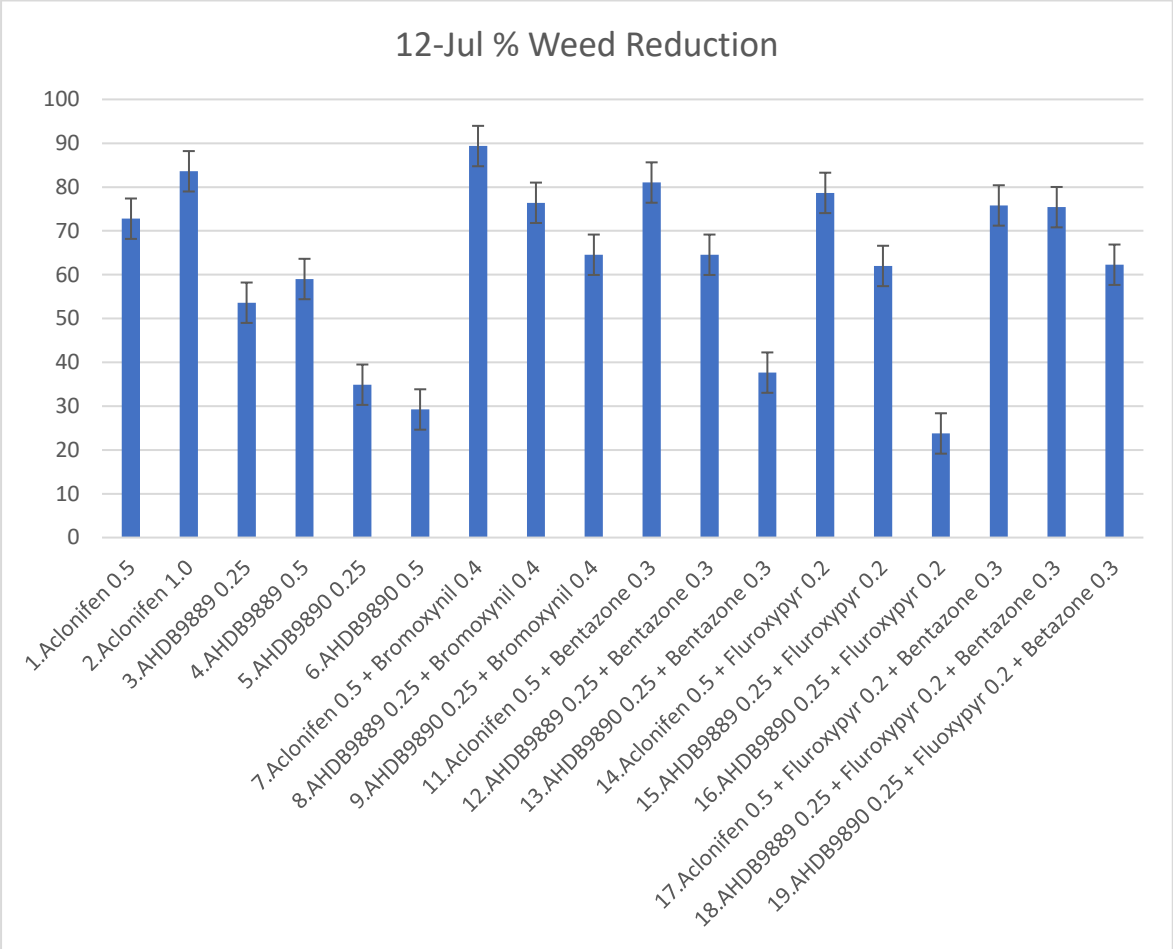


Figure 1. % weed reduction using abbotts formula, 12th July data. lsd 8.553 @ p=0.05%

Discussion

Weed levels were good at this site and provided some good data on reduction of weeds by the herbicides. The assessments at 22, 29 and 35 days after treatment showed that all treatments gave a significant reduction in weeds when compared to the untreated controls, which had 88% weed ground cover by the end of assessments. The main weeds at this sites were groundsel, fat hen, cow parsley, black bindweed, annual nettle, chickweed, cleavers and volunteer potatoes.
There was a perennial creeping thistle patch across a couple of plots in the middle of the trial area, which was discounted from the weed ground cover assessments, otherwise the annual broadleaf weeds were well spread across all plots.

Treatments containing aclonifen generally gave the best weed control, with aclonifen 0.5 L/ha plus bromoxynil 0.4 L/ha performing very well. When used in a three way mix, AHDB9889 gave equivalent performance in weed control as aclonifen applied alone, but AHDB9889 was not as good on its own or in the two way mix. AHDB9890 gave a much poorer level of weed control than either of the other two actives on test, both on its own or in two or three way mixtures.

AHDB9889 caused the most crop damage, either on its own or in two or three way mixtures. This showed as leaf scorching with patchy bleaching and twisting, although even this effect grew out after 3-4 weeks.

Conclusions

Of the tested materials, aclonifen showed the most promise, giving a good level of weed reduction with a limited amount of phytotoxicity which soon grew out. Attempts should made to pursue an approval for leeks with some urgency.

AHDB9889 looked useful although it did cause some considerable crop damage, this may not be surprising as the active is in more common use in warmer, drier climates where leaf wax tends to be better.

AHDB9890 gave a poor level of weed control and although looked safe on the crop would be of minimal benefit.

Acknowledgements

Thanks are given to the grower trial host, Nightlayer Leek Company, Chatteris. To AHDB for providing funding. Technical input from Andy Richardson, Allium and Brassica Agronomy and Phil Langley, G’s Growers. Thanks also to the crop protection manufactures for supporting the work and providing trial samples.

Appendix

a. Crop diary – events related to growing crop

Crop	Cultivar	Sowing Date	Row width
Leek	Belton	17-04-2018	5 rows on 2M bed
			40cm row width

Crop Diary – pesticide/fertiliser applications

Date	Product	Rate	Type/Use
27-04-2018	Wing-P (pendimethalin + dimethenamid-P)	2.0	Residual BLW herbicide
27-04-2018	Cleancrop Amigo (chlorpropham)	1.5	Residual BLW herbicide
22-05-2018	Laser (cycloxadim)	2.0	Grass weeds, barley cover crop removal
22-05-2018	Crop oil	2.0	surfactant
22-05-2018	Manganese sulphate	3.0	Micro-nutrient
27-05-2018	Ammonium nitrate	125kg/ha	Nitrogen fertiliser

b. Trial diary

Date	Event
17-04-2018	Crop drilled
13-06-2018	Treatments applied
21-06-2018	Weeds, phytotox assessment
28-06-2018	Weeds, phytotox assessment
05-07-2018	Weeds, phytotox assessment
19-07-2018	Weeds, phytotox assessment
27-06-2018	Weeds, phytotox assessment

c.

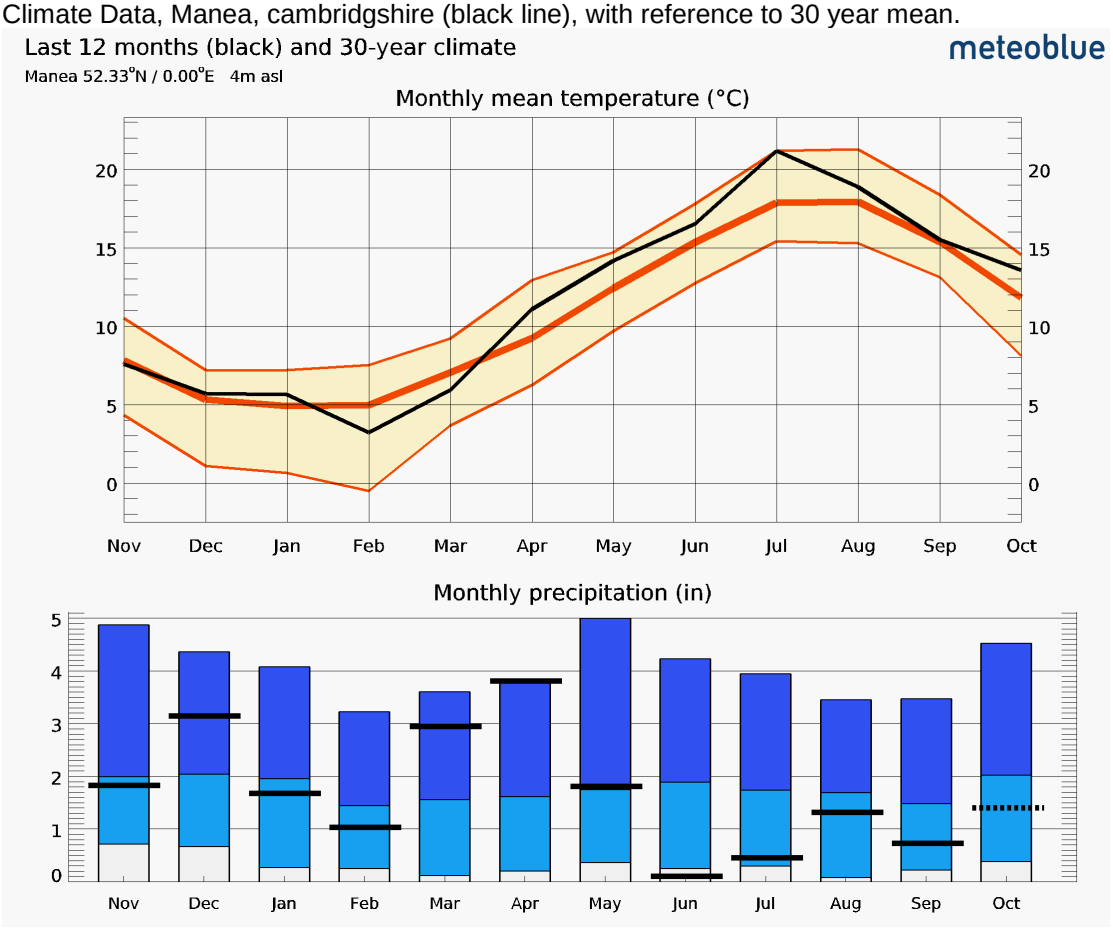
Photograph 1. Trial site 28th June 2018

Photograph 2. Crop damage from AHDB9889

d. Climatological data during study period

February, March and April were much colder and wetter than average, the crop was drilled into good soil moisture, May was a good growing month with normal temperatures and rainfall, giving good crop growth. June and July were drier and warmer than average although the crop progressed normally during the evaluation period.

Climate Data, Manea, cambridgshire (black line), with reference to 30 year mean.



e. Raw data from assessments

Plot No	Rep	Treatment	Damage score 21 Jun	%Weeds 21 Jun	Damage score 28 jun	% Weeds28 Jun	Damage score 5 Jul	% weeds 5 Jul	% weeds 12 Jul	% weeds 19 July	% weeds 27 Jul
1	1	1	5	0	2	10	1	15	15	25	50
2	1	2	3	1	2	5	2	10	10	10	20
3	1	3	5	1	2	10	2	15	30	30	40
4	1	4	6	1	2	10	2	15	25	30	*
5	1	5	4	2	1	20	0	25	30	50	*
6	1	8	4	5	1	15	0	15	25	35	70
7	1	6	4	7	1	30	0	20	30	30	40
8	1	12	6	5	3	15	1	15	20	45	40
9	1	14	3	4	1	10	0	15	20	30	40
10	1	17	4	3	3	10	1	10	15	20	25
11	2	5	4	5	1	25	0	30	60	75	90
12	1	Untreated	0	15	0	40	0	60	70	90	90
13	1	Untreated	0	15	0	30	0	40	65	80	90
14	1	9	5	3	2	10	0	10	20	25	50
15	1	11	4	3	2	5	0	10	10	15	20
16	2	6	5	10	2	25	0	40	40	40	60
17	1	7	4	5	2	10	0	10	10	25	30
18	2	9	5	5	3	10	1	15	25	30	50
19	2	8	5	2	3	10	1	10	10	15	25
20	2	Untreated	0	15	0	30	0	30	50	70	80
21	1	16	6	5	2	15	1	25	50	70	80
22	2	Untreated	0	50	0	60	0	50	70	80	90
23	1	13	4	3	2	10	0	15	25	40	30
24	1	15	6	5	3	15	1	15	30	40	75
25	1	18	6	3	3	15	2	10	15	20	25
26	2	1	4	5	2	10	0	15	20	25	50
27	1	19	5	5	3	15	0	15	25	30	75
28	2	17	3	5	2	5	0	10	20	15	25
29	2	2	3	5	3	10	1	10	10	15	20
30	2	4	6	7	3	10	2	10	25	35	70
31	2	11	4	3	2	5	1	5	10	15	15
32	2	12	5	3	2	15	1	10	25	30	70
33	2	13	4	4	2	15	0	15	50	50	75
34	2	14	3	3	1	10	0	5	10	20	30
35	2	15	6	5	3	10	1	10	20	20	50
36	2	19	4	5	2	20	0	20	30	45	80
37	3	5	3	5	2	20	0	25	30	40	70
38	3	1	3	5	1	10	0	15	15	20	50

39	2	3	5	10	2	10	1	15	30	30	40
40	3	8	6	5	3	10	1	15	10	25	20
41	2	7	4	2	3	2	1	5	5	10	10
42	3	15	6	3	3	10	1	10	20	25	40
43	3	18	5	3	3	5	2	10	15	20	25
44	3	16	4	5	2	20	0	30	60	70	80
45	3	6	3	6	2	30	0	40	60	80	75
46	2	16	4	5	2	30	1	20	30	25	60
47	2	18	5	2	4	10	1	5	15	15	25
48	3	17	3	3	2	5	1	5	10	10	20
49	3	19	4	3	3	10	1	15	15	20	25
50	3	Untreated	0	20	0	40	0	50	60	80	90
51	3	7	4	2	2	5	0	5	5	15	20
52	3	2	3	5	2	5	0	10	10	10	20
53	3	9	4	4	2	10	0	10	20	30	75
54	3	4	5	6	3	10	2	10	25	50	80
55	3	11	5	5	3	10	0	10	15	25	30
56	3	Untreated	0	15	0	25	0	40	50	70	90
57	3	12	5	5	3	10	2	15	20	30	40
58	3	14	3	5	2	10	1	15	10	30	40
59	3	3	5	7	3	15	3	15	25	30	50
60	3	13	4	10	2	15	2	15	40	40	50

f. Trial design
Trial Site Plan

10	12	14	3	13
7	2	9	4	11
16	18	17	19	20
7	15	18	16	6
19	5	1	3	10
11	12	13	14	15
1	19	17	2	4
16	20	13	15	18
6	7	9	8	10
5	20	10	9	11
8	6	12	14	17
1	2	3	4	5

72m

6m

2m

g. 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 Richardson
Authorised signatory

Certification Number
ORETO 409

HSE
Chemicals Regulation Division

Department of Agriculture and Rural Development