SCEPTREPLUS

Final Trial Report

Trial code:	SP51. 2020
Title:	AHDB SCEPTREplus Asparagus herbicide screens (pre-harvest)
Crop	Asparagus
Target	General broadleaf weeds and grasses, 3WEEDT
Lead researcher:	Angela Huckle
Organisation:	RSK ADAS Ltd
Period:	02/2020 – 02/2021
Report date:	23rd February 2021
Report authors:	Callum Burgess and Angela Huckle.
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.

Author:	Callum Burgess		23/02/2021
Technical reviewer:	Dave Kaye		23/02/2021
Final reviewer:	Angela Huckle		23/02/2021

Trial Summary

Introduction

Weeds are a common problem in all field crops and can lead to crop loss, yield reduction and reduced plant health. Selective herbicides that control broad leaved and grass species without damaging the asparagus crop are few, and the diversity of weed species makes it particularly difficult to find effective treatments for a broad range of weeds.

Weed control in asparagus represents a significant concern for growers, with an estimated reduction of income to the grower of up to £32,000/ha for every year of production lost if a plantation becomes overgrown with weeds and has to be 'grubbed out' early. In less extreme cases, weed competition can still significantly reduce yield as there are gaps in current control measures. Due to the restricted range of available herbicides and short windows for their application, weeds are becoming a key concern for growers of these crops.

Asparagus is a long lived perennial crop which emerges in late March to early April and can live for up to 15 years. It can be grown on a wide range of soil types, but well-draining sandy loams are the most common. Asparagus crops have a large and deep root system. The successful growth and production of this crop relies on good access to space and little competition for resources. Utilising effective weed control programmes can make a significant long-term difference for future cultivation and success of the asparagus crop.

The objective of this trial was to identify crop-safe and effective herbicides for postharvest weed control in asparagus crops, aiming to expand the options available to growers.

Methods

The trial was sited in a five year old asparagus crop (Mondeo) in Bodicote, Cherwell, Oxfordshire. Treatments were applied pre-emergence of the crop on 1st April 2020. All treatments were applied with a 2 m boom, using a knapsack sprayer at 400 L/ha water volume. A randomised block design was used for the trial layout, with four replicates of 14 treatments, including a double untreated control (UTC). There were 56 plots in total, each measuring 2 m x 6 m. A single replicate of each treatment was applied at double the rate used in the trial. This was to check for crop safety in situations of an accidental overlap, and how close to margins the crop safety of treatments were.

The plots were assessed on at least four occasions (see 'Assessment details'), focusing on weed cover, species present, and crop phytotoxicity (i.e. treatment safety). Assessments were carried out approximately two, three, four, and five weeks after application for phytotoxicity, and five, six, eight, and ten weeks after treatments were applied for efficacy.

Results

By the conclusion of the trial, three of the treatments significantly reduced percentage weed cover by at least 63% for up to ten weeks after the treatment application, compared to the untreated control (**Table 1**). All of the treatments which performed best contained metribuzin. These were Artist 2.5 L/ha, Emerger 1.75 L/ha + Shotput 0.75 L/ha and the commercial standard Callisto 0.75 L/ha + Gamit 36 CS 0.15 L/ha + Shotput 0.75 L/ha (**Figure 1**). Three further treatments also significantly reduced percentage weed levels, but these only reduced weed by 30% compared to the untreated control. However, they may still be useful in a tank mix to cover a greater range of weed species, and gaps such as black nightshade.

There were no phytotoxic effects seen in any of the plots of the main trial, all scores were zero. But, it should be noted that conditions were dry, and products may have been safer than usual. Even where Callisto was applied at 1.5 L/ha in the fifth replicate, where treatments were applied at double the recommended rates, there were no significant effects on the crop. The only issue was a very slight kink to the spears, which persisted for a month after application. After this the crop grew normally.

The significance of metribuzin being present in all successful treatments and giving approximately the same level of control, suggests that the other actives in the industry standard mix, as well as Emerger have had less impact on the fumitory. It also shows the usefulness of the contact activity of metribuzin in a dry season.

The dry conditions at and after application will have impacted the efficacy of the residual herbicides which rely on moisture at application to work effectively. Therefore the trial is not a fair test of the products with this mode of action. For example, in the postharvest herbicide screen on asparagus (SP 51, 2019) Emerger 1.75 L/ha, AHDB 9977, and the full rate of AHDB 9900 gave very effective weed control, but there was moisture present after application in that trial.

Table 1. Mean percentage weed cover values at five, six, eight and ten weeks after pre-harvest treatment application. WAA = weeks after application

Treatment	**Mean percentage weed cover (%)**			
	5 WAA	**6 WAA**	**8 WAA**	**10 WAA**
	05/05/20	13/05/20	27/05/20	10/06/20
UTC	17.5	28.0	70.0	73.0
Callisto 0.75 L/ha + Gamit 36 CS 0.15 L/ha + Shotput 0.75 L/ha	12.4	10.2	27.0	27.0
AHDB 9900	13.0	31.0	59.0	59.0
Emerger 1.75 L/ha	14.4	32.0	63.0	62.0
Emerger 1.75 L/ha + Shotput 0.75 L/ha	9.6	18.6	23.0	22.0
AHDB 9952	14.0	27.0	54.0	54.0
AHDB 9917	11.4	26.0	58.0	58.0
AHDB 9898	12.6	18.0	50.0	50.0
Artist 2.5 L/ha	13.2	12.2	24.0	21.0
AHDB 9977	14.8	19.4	52.0	51.0
AHDB 9999	13.0	21.4	63.0	63.0
AHDB 9987	16.8	25.0	55.0	55.0
AHDB 9987 + AHDB 9898	13.0	23.0	49.0	49.0
p-value	0.657	0.060	<.001	<.001
d.f.	53	53	53	53
L.S.D.	N/A	14.22	19.90	20.07
Significantly lower than the untreated control				
Not significantly lower than the untreated control				

Figure 1. Artist has been used on the plot in the foreground, with AHDB 9952 beyond the dashed line. There is a clear difference in weed control compared to the plot beyond.

Conclusions

The results of this study demonstrate that in comparison to the industry standard of Callisto 0.75 L/ha + Gamit 36 CS 0.15 L/ha + Shotput 0.75 L/ha, there are alternative effective mixes including metribuzin with similar or slightly better efficacy. The trial also supports the usefulness of maintaining authorisation of metribuzin as a contact-acting selective herbicide for effective weed control in dry seasons which are becoming more frequent.

AHDB 9898 and AHDB 9977 also significantly reduced fumitory, albeit to a lesser degree than metribuzin but would also be useful additions for weed control in asparagus to use in a tank-mix or programme. However, the lack of moisture at application means that it was not possible to clearly distinguish other residual herbicide products to take forward from this trial, and it may be worthwhile repeating the experiment to determine this.

Take home message

In dry conditions, metribuzin provides a good efficacy due to its contact activity, and remains a key part of herbicide programmes for use in asparagus. AHDB 9898 and AHDB 9977 would be useful additions to pursue for authorisation for asparagus.

Objectives

To compare a number of novel residual herbicides alone and in tank mixes with the industry standard tank mix (Callisto 0.75 L/ha + Gamit 36 CS 0.15 L/ha + Shotput 0.75 L/ha) for selectivity (crop safety) and efficacy in asparagus before harvest and spear emergence.

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**
PP1/135(4)	Phytotoxicity assessment	None
PP1/152(4)	Guidelines on design and analysis of efficacy evaluation trials	None
PP1/225 (2)	Minimum effective dose	None
PP1/181 (4)	Conduct and reporting of efficacy evaluation trials including good experimental practice	None
PP 1/214(3)	Principles of acceptable efficacy	None
PP 1/224(2)	Principles of efficacy evaluation for minor uses	None
PP1/290 (1)	Weeds in asparagus	None

There were no deviations from EPPO guidance.

Test site

Item	**Details**
Location address	Wykham Park Farm Wykham Ln, Banbury OX16 9UP
Crop	Asparagus
Cultivar	Mondeo
Soil or substrate type	Sandy clay loam
Agronomic practice	Modified – no herbicides applied pre- or post-harvest
Prior history of site	Asparagus for previous 5 years

Trial design

Item	**Details**
Trial design:	Randomized block
Number of replicates:	4 (with an extra rep applied at double rate)
Row spacing:	0.5 m
Plot size: (w x l)	2.5 m x 6 m
Plot size: (m^2)	15 m^2
Number of plants per plot:	72 plants
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	mesotrione clomazone metribuzin	Callisto + Gamit 36 CS + Shotput	SAV5D15030 n/k n/k	100 g/L 360 g/L (70%)	Suspension Concentrate Capsule suspension Water dispersible granule
AHDB 9900	N/D	N/D	N/D	N/D	N/D
AHDB 9994	N/D	N/D	N/D	N/D	N/D
N/A	aclonifen metribuzin	Emerger + Shotput	EV54003100 n/k	600 g/L (70%)	Suspension concentrate Water dispersible granule
AHDB 9952	N/D	N/D	N/D	N/D	N/D
AHDB 9917	N/D	N/D	N/D	N/D	N/D
AHDB 9898	N/D	N/D	N/D	N/D	N/D
N/A	metribuzin + flufenacet	Artist	EM3H002475	(17.5%) (24%)	Oil dispersion
AHDB 9977	N/D	N/D	N/D	N/D	N/D
AHDB 9999	N/D	N/D	N/D	N/D	N/D
AHDB 9987	N/D	N/D	N/D	N/D	N/D
AHDB 9987 AHDB 9898	N/D	N/D	N/D	N/D	N/D

n/k = not known

Application schedule

Treat number	Treatment: product name or AHDB code	Rate of product (l or kg/ha) First application	Rate of product (l or kg/ha) Second application	Rate of active substance (ml or g a.s./ha) First application	Rate of active substance (ml or g a.s./ha) Second application	Application code
1 and 2	UTC	-	-	-	-	-
3	Callisto + Gamit 36 CS + Shotput	0.75 0.15 0.75	1.5 0.3 1.5	75 54 525	150 108 1050	A
4	AHDB 9900	0.10	0.2	19	38	A
5	Emerger	1.75	3.5	1050	2100	A
6	Emerger + Shotput	1.75 0.75	3.5 1.5	1050 525	2100 1050	A
7	AHDB 9952	1.70	3.4	-	-	A
8	AHDB 9917	0.70	1.4	-	-	A
9	AHDB 9898	0.70	1.4	504	1008	A
10	Artist	2.50	5.0	437	875	A
11	AHDB 9977	2.50	5.0	500 500	1000 1000	A
12	AHDB 9999	4.00	8.0	3200	6400	A
13	AHDB 9987	2.00	4.0	1200	2400	A
14	AHDB 9987 + AHDB 9898	2.00 0.70	4.0 1.4	1200 504	2400 1008	A

Application details

	Application A
Application date	01/04/2020
Time of day	12:00 - 13:08
Crop growth stage (Max, min average BBCH)	Pre-emergence
Crop height (cm)	0
Crop coverage (%)	N/A
Application Method	Spray
Application Placement	Soil
Application equipment	OPS sprayer with a 2m boom
Nozzle pressure	2 Bar
Nozzle type	02/F110
Nozzle size	Medium quality
Application water volume/ha	400 L/ha
Temperature of air - shade (°C)	7.65 (Cloudy)
Relative humidity (%)	66.4
Wind speed range (m/s)	6.85
Dew presence (Y/N)	N
Temperature of soil - 2-5 cm (°C)	Unknown
Wetness of soil - 2-5 cm	Unknown
Cloud cover (%)	100

Untreated levels of pests/pathogens at application and through the assessment period

Common name	Scientific Name	EPPO Code	Infestation level at start of assessment period	Infestation level In the middle of assessment period	Infestation level at end of assessment period
Broad leaved weeds and grasses	N/A	3WEEDT	17.50%	28.0%	70%

Assessment details

Phytotoxicity results were based on visual symptoms, which could include stunting of growth, discoloration, chlorosis, spotting, necrosis, twisting, or scorch of spears, amongst other effects. Where any phytotoxicity was suspected details of the condition were described and scored. Scores ranged from 0 to 10 with each score relating to a percentage from 0 – 100%.

The overall weed levels were recorded at every assessment, using a consistent method of assessment. At each assessment, records of whole-plot % total weed cover score were made for each plot.

Evaluation date	Evaluation Timing (DA)*	Crop Growth Stage (BBCH)	Evaluation type (efficacy, phytotoxicity)	Assessment
14/04/20	13	N/A	Phytotoxicity	Crop damage (scale 0-10, 10 = dead)
21/04/20	20	N/A	Phytotoxicity	Crop damage (scale 0-10, 10 = dead)
25/04/20	24	N/A	Phytotoxicity	Crop damage (scale 0-10, 10 = dead)
05/05/20	34	N/A	Phytotoxicity + Weed cover	Crop damage (scale 0-10, 10 = dead) Percentage of weed cover (whole plot score)
13/05/20	42	N/A	Weed cover	Percentage of weed cover (whole plot score)
27/05/20	56	N/A	Weed cover	Percentage of weed cover (whole plot score)
10/06/20	70	N/A	Weed cover	Percentage of weed cover (whole plot score)

* DA – days after application

Statistical analysis

This trial was a randomised block design and comprised 14 treatments, including two untreated controls and a grower standard treatment. Treatments were replicated four times.

As the distribution of weeds was generally even across the trial and there was no requirement to transform the data prior to analysis. The % reduction in weeds was calculated from the means using Abbott's formula.

All data were analysed by ANOVA using Genstat (18th edition) by Chris Dyer (ADAS).

Results

Phytotoxicity

No phytotoxicity was recorded in any plots of the main trial throughout the assessment period. A slight twist or kink was only observed in the spears in the plot treated with Callisto 1.5 L/ha + Gamit 36 CS 0.3 L/ha + Shotput 1.5 L/ha in the extra replicate, where treatments were applied at double the recommended rates. This was scored as 2 at two and four weeks after application. Although a slight phytotoxic effect, this was commercially acceptable and transient as the spears grew normally a month after application.

Efficacy – percentage weed cover

There were statistically significant reductions in percentage weed cover over the latter half of the trial period, therefore only the last four assessments are shown in **Table 2**. The main weed species present was fumitory. Six treatments significantly reduced percentage weed levels at ten weeks after application, these were: the commercial standard – Callisto 0.75 L/ha + Gamit 36 CS 0.15 L/ha + Shotput 0.75 L/ha, and the treatments Artist 2.5 L/ha, Emerger 1.75 L/ha + Shotput 0.75 L/ha, AHDB 9977, and AHDB 9898 either alone, or in a tank mix with AHDB 9987. The most effective treatments were those containing metribuzin, which has a greater contact activity compared to the other products in the trial. These treatments reduced percentage weed cover to 27% or below compared with a mean of 73% in the untreated control. This contact activity is advantageous in dry conditions.

Weed seedlings did not emerge until late April/early May due to the dry April. This hindered the efficacy of the experimental residual herbicide products, with the only fully residual treatments to reduce weed levels significantly at the last two assessments being AHDB 9898 and AHDB 9977. These products contained an active ingredient common to both coded products, and this was probably contributing the most weed control activity for these treatments.

Table 2. Mean percentage weed cover values at five, six, eight and ten weeks after pre-harvest treatment application. WAA = weeks after application

Treatment	Mean weed cover (%)			
	5 WAA	6 WAA	8 WAA	10 WAA
	05/05/20	13/05/20	27/05/20	10/06/20
UTC	17.5	28.0	70.0	73.0
Callisto 0.75 L/ha + Gamit 36 CS 0.15 L/ha + Shotput 0.75 L/ha	12.4	10.2	27.0	27.0
AHDB 9900	13.0	31.0	59.0	59.0
Emerger 1.75 L/ha	14.4	32.0	63.0	62.0
Emerger 1.75 L/ha + Shotput 0.75 L/ha	9.6	18.6	23.0	22.0
AHDB 9952	14.0	27.0	54.0	54.0
AHDB 9917	11.4	26.0	58.0	58.0
AHDB 9898	12.6	18.0	50.0	50.0
Artist 2.5 L/ha	13.2	12.2	24.0	21.0
AHDB 9977	14.8	19.4	52.0	51.0
AHDB 9999	13.0	21.4	63.0	63.0
AHDB 9987	16.8	25.0	55.0	55.0
AHDB 9987 + AHDB 9898	13.0	23.0	49.0	49.0
F pr (p-value)	0.657	0.060	<.001	<.001
d.f.	53	53	53	53
L.S.D.	N/A	14.22	19.90	20.07
Significantly lower than the untreated control				
Not significantly lower than the untreated control				

At six weeks after application, the industry standard Callisto + Gamit 36 CS + Shotput had the lowest mean weed coverage at 10.2%, with treatments Artist and AHDB 9898 the next best performers at 12.2% and 18.0% respectively (**Figure 2**). The untreated control, AHDB 9900, AHDB 9994 had the highest weed levels at 28.0%, 31.0% and 32.0% respectively.

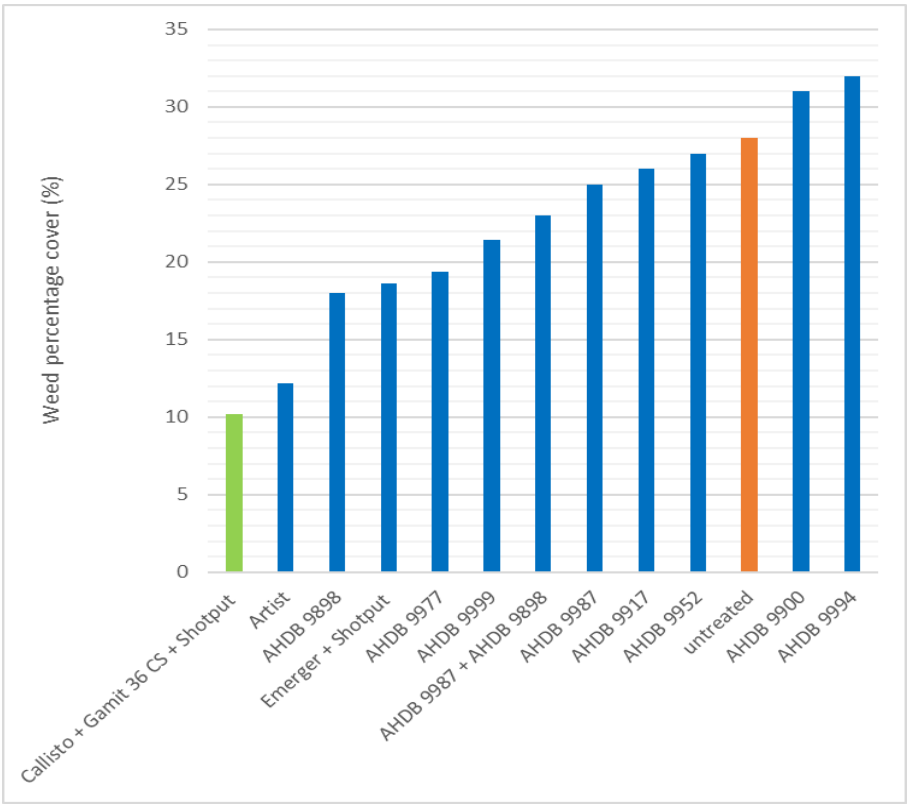

Figure 2. Mean percent weed cover at six weeks after application across 13 treatments in order of severity, 13 May 2020. p= 0.06, L.S.D. = 14.22.

At eight weeks after application, the treatments Emerger + Shotput, Artist, Callisto + Gamit 36 CS + Shotput, continue to give the lowest mean weed coverage at 23.0%, 24.0%, and 27.0% respectively, but at this assessment, AHDB 9898 while still reducing weed levels, does not show the longevity of control compared to the treatments containing metribuzin (**Figure 3**).

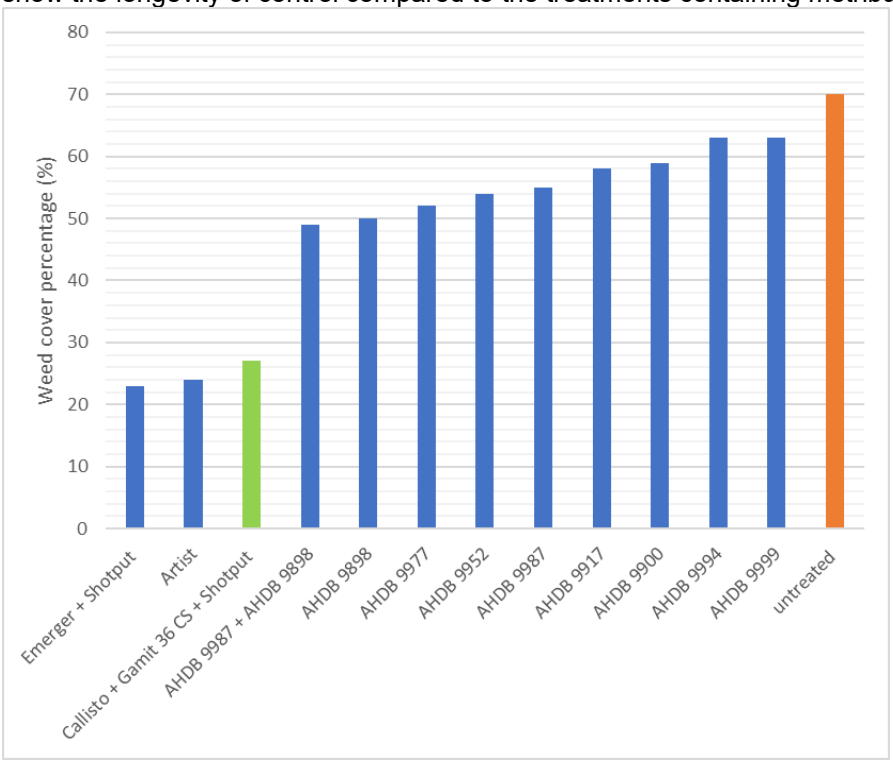

Figure 3. Mean percent weed cover at eight weeks after application across 13 treatments in order of severity, 27 May 2020. p <0.001, L.S.D. = 19.9

At ten weeks after application, treatments Emerger + Shotput, Artist, Callisto + Gamit 36 CS + Shotput show persistent efficacy with the lowest mean weed coverage of 21.0%, 22.0%, and 27.0% respectively (**Figure 4**). Therefore this level of weed control is maintained throughout the harvest period.

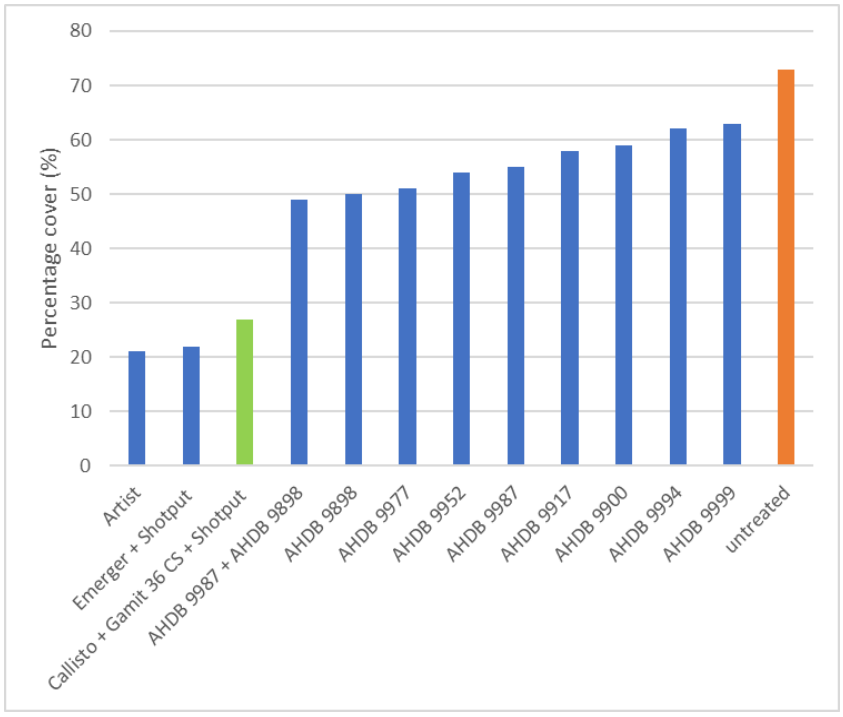

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Figure 4. Mean percent weed cover at ten weeks after application across 13 treatments in order of severity, 10 June 2020. p <0.001, L.S.D. = 20.07

Efficacy – percentage weed reduction

In **Table 3** it is shown that the three best performing treatments (Artist 2.5 L/ha, Emerger 1.75 L/ha + Shotput 0.75 L/ha and Callisto 0.75 L/ha + Gamit 36 CS 0.15 L/ha + Shotput 0.75 L/ha) reduce fumitory by at least 61% at eight and ten weeks after treatment application.

Table 3. Mean percentage weed reduction compared to the untreated control at five, six, eight and ten weeks after pre-harvest treatment application. Minus (-) values indicate an increase in weed levels. Figures highlighted in **bold** are significantly different to the untreated control.

Treatment	Mean weed reduction (%)			
	5 WAA	6 WAA	8 WAA	10 WAA
	05/05/20	13/05/20	27/05/20	10/06/20
Callisto 0.75 L/ha + Gamit 36 CS 0.15 L/ha + Shotput 0.75 L/ha	29.2	**63.6**	**61.4**	**63.1**
AHDB 9900	25.7	-10.7	15.7	19.2
Emerger 1.75 L/ha	17.7	-14.3	10.0	15.1
Emerger 1.75 L/ha + Shotput 0.75 L/ha	45.2	33.6	**67.2**	**69.8**
AHDB 9952	20.0	3.6	22.8	26.1
AHDB 9917	34.8	7.2	17.2	20.5
AHDB 9898	28.0	35.7	**28.6**	**31.5**
Artist 2.5 L/ha	24.6	**56.4**	**65.7**	**71.3**
AHDB 9977	15.4	30.7	25.7	**30.2**
AHDB 9999	25.7	23.6	10.0	13.7

Treatment	Mean weed reduction (%)			
	5 WAA	6 WAA	8 WAA	10 WAA
	05/05/20	13/05/20	27/05/20	10/06/20
AHDB 9987	4.0	10.7	21.4	24.6
AHDB 9987 + AHDB 9898	25.7	17.8	**30.0**	**32.8**

Discussion

No concerning crop effects were observed in the trial from any of the treatments. However it should be noted that in the fifth replicate where treatments were applied at double rate, a transient effect was seen from a tank mix of Callisto 1.5 L/ha + Gamit 0.3 L/ha + Shotput 1.5 L/ha where a slightly kinked appearance to the emerged spears persisted for a month. At these rates a greater effect on the crop would have normally been expected, therefore with the dry weather it has likely been a 'safer' year for crop effects. It would be advantageous to see the promising products identified in this work tested under wetter conditions. Caution should therefore be exercised regarding the crop safety results.

Considering treatment efficacy as percentage plot cover, there is a gradual increase in weed cover from zero at the time of application to 73% in the untreated control plots ten weeks later. The main weed species present was fumitory. As the time after application increased the weed coverage in the untreated control surpassed all the treated plots, and selected treatments significantly reduced weed levels at six weeks after treatment.

Most notable are treatments Artist 2.5 L/ha, Emerger 1.75 L/ha + Shotput 0.75 L/ha, and the industry standard tank mix Callisto 0.75 L/ha + Gamit 36 CS 0.15 L/ha + Shotput 0.75 L/ha, which all show effective and persistent weed control. These treatments all contain the active substance metribuzin which is a systemic triazinone with contact and residual activity being taken up by both roots and foliage, and is known to persist in soil, hence longevity of efficacy.

The significance of metribuzin being present in all successful treatments and giving approximately the same level of control, suggests that the other actives in the industry standard mix, as well as Emerger have had less impact on the fumitory. It also shows the usefulness of the contact activity of metribuzin in a dry season.

The dry conditions at and after application will have impacted the efficacy of the residual herbicides which rely on moisture at application to work effectively. Therefore the trial is not a fair test of the products with this mode of action. For example, in the postharvest herbicide screen on asparagus (SP 51, 2019) Emerger 1.75 L/ha, AHDB 9977, and the full rate of AHDB 9900 gave very effective weed control, but there was moisture present after application in that trial.

Conclusions

The results of this study demonstrate that in comparison to the industry standard of Callisto 0.75 L/ha + Gamit 36 CS 0.15 L/ha + Shotput 0.75 L/ha, there are alternative effective mixes including metribuzin with similar or slightly better efficacy. The trial also supports the usefulness of maintaining authorisation of metribuzin as a contact-acting selective herbicide for effective weed control in dry seasons which are becoming more frequent.

AHDB 9898 and AHDB 9977 also significantly reduced fumitory, albeit to a lesser degree than metribuzin but would also be useful additions for weed control in asparagus to use in a tank-mix or programme. However, the lack of moisture at application means that it was not possible to clearly distinguish other residual herbicide products to take forward from this trial, and it may be worthwhile repeating the experiment to determine this.

Acknowledgements

AHDB for funding the work, and the crop protection companies for their financial contributions and provision of samples for the trials. Thanks to John Colegrave who provided the site and crop for the trial, and Claire Donkin and Phil Langley for their technical input.

Appendix

A) Trial diary

Date	Activity
01/04/2020	Pre-harvest spray applied – dry conditions
08/04/2020	Trial visit to check emergence – soil condition still dry
14/04/2020	Phytotoxicity score – no weed emergence
21/04/2020	Phytotoxicity score – a little weed emergence (12 mm rain weekend before)
25/04/2020	Phytotoxicity score – still only a little weed emergence
05/05/2020	Weed cover (%) and weed count
13/05/2020	Weed cover (%) and weed count
27/05/2020	Weed cover (%)
10/06/2020	Weed cover (%)

B) Crop photos:

Figure 5. Plot photo showing levels at the first weed assessment (left) on the 05/05/20 and after (right) on the 27/05/20.

Figure 6. Each of the figures that follow, also follow this layout with the first weed assessment date on the left, and the third weed assessment on the right.

Figure 6a) Emerger 1.75 L/ha

Figure 6b) AHDB 9917

Figure 6c) AHDB 9952

Figure 6d) Untreated control 1

Figure 6e) AHDB 9987 + AHDB 9898

Figure 6f) AHDB 9900

Figure 6g) AHDB 9898

Figure 6h) AHDB 9999

Figure 6i) Untreated control 2

Figure 6j) AHDB 9977

Figure 6k) AHDB 9987

Figure 6l) Artist 2.5 L/ha

Figure 6m) Callisto 0.75 L/ha + Gamit 36 CS 0.15 L/ha + Shotput 0.75 L/ha

Figure 6n) Emerger 1.75 L/ha + Shotput 0.75 L/ha

Figure 7. Fumitory emerging from the soil at the fourth assessment date 05/05/2020.

C) Trial design

TREATMENT	DISCARD	DISCARD	5	9	14	8	12	4	3	DISCARD	DISCARD
BLOCK			5	5	5	5	5	5	5		
PLOT			508	509	510	511	512	513	514		
TREATMENT	DISCARD	DISCARD	2	7	11	6	10	1	13	DISCARD	DISCARD
BLOCK			5	5	5	5	5	5	5		
PLOT			501	502	503	504	505	506	507		
TREATMENT	DISCARD	DISCARD	4	13	5	3	14	2	11	DISCARD	DISCARD
BLOCK			4	4	4	4	4	4	4		
PLOT			408	409	410	411	412	413	414		
TREATMENT	DISCARD	DISCARD	6	9	1	10	12	7	8	DISCARD	DISCARD
BLOCK			4	4	4	4	4	4	4		
PLOT			401	402	403	404	405	406	407		
TREATMENT	DISCARD	DISCARD	4	8	12	9	11	14	7	DISCARD	DISCARD
BLOCK			3	3	3	3	3	3	3		
PLOT			308	309	310	311	312	313	314		
TREATMENT	DISCARD	DISCARD	6	2	5	10	1	13	3	DISCARD	DISCARD
BLOCK			3	3	3	3	3	3	3		
PLOT			301	302	303	304	305	306	307		
TREATMENT	DISCARD	DISCARD	12	2	11	13	10	3	6	DISCARD	DISCARD
BLOCK			2	2	2	2	2	2	2		
PLOT			208	209	210	211	212	213	214		
TREATMENT	DISCARD	DISCARD	5	8	7	1	14	4	9	DISCARD	DISCARD
BLOCK			2	2	2	2	2	2	2		
PLOT			201	202	203	204	205	206	207		
TREATMENT	DISCARD	DISCARD	7	11	10	2	12	5	13	DISCARD	DISCARD
BLOCK			1	1	1	1	1	1	1		
PLOT			108	109	110	111	112	113	114		
TREATMENT	DISCARD	DISCARD	3	6	4	14	8	1	9	DISCARD	DISCARD
BLOCK			1	1	1	1	1	1	1		
PLOT			101	102	103	104	105	106	107		

D) 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 *Authorised signatory*

Certification Number
ORETO 409

HSE
Chemicals Regulation Division

Department of Agriculture and Rural Development