



VCS POTATOES LTD

SPOT Farm East (Elveden) 2016– Residual Herbicide Demonstration Report



Background

The urea based selective residual herbicide active linuron has been the major residual herbicide applied to the potato crop of the UK on loamy and sandy loam soil types for over 30 years. This active provides cost effective, crop safe control of many weeds observed on these soil types including S.nettle, Fat Hen, B.Bindweed and Mayweeds. The future of this active is currently uncertain in the present regulatory environment. Approval currently continues until March 2020 but it is highly likely the active will lose its approval registration before this time with current indications that the latest final use up will be mid 2018.

Aims

This demonstration aimed to assess the efficacy and crop safety of alternative residual herbicides and residual herbicide mixtures avoiding the use of linuron. The majority of the treatments included a recently approved (2014) a.i. - metabromuron. Two non replicated blocks A and B were

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planted on different dates. Block A planted 21st April to correspond with traditional planting dates and Block B 27th May to allow comparison later in the season to coincide an open day - 5th July.

Site Details

The demonstration site - Lodge Warren was a loamy sand. Block A and Block B were planted with Maris piper with an identical seed stock (Scotch S FG5 97484-7090) the stock was treated with Storite Super (thiabendazole and imazalil) post harvest and in addition the seed was treated with Monceren DS (pencycuron) @ 1kg/T at planting.

Region	West Suffolk
Field Name	Lodge Warren
Soil type	Loamy sand
Variety	Maris Piper

Fertiliser Applications

Soil Information	Soil Index	Available Nutrients from FYM application kg/ha	Base Fertiliser Applied kg/ha	Top Dressing Applied kg/ha
Nitrogen	0	4	140	70
Phosphate	3	61	50	
Potash	2-	174	230	
Magnesium	1	30		80
pH	7.8			70

Application details

	Block A	Block B
Planting Date	21 st April	27 th May
Application date	13-14 th May	6 th June
Ground Cover assessment	1 st June	22 nd June
Weed counts	13 th June	4 th July

The treatments were identical on both Block A and Block B

Treatment List

Trt No.	Water Volume	Herbicide Application	Cost £/ha
1	300 l/ha	STANDARD Afalon (<i>linuron 500g/l</i>) 1.35l + Stomp Aqua (<i>pendimethalin 455g/l</i>) 2.2 l/ha + Shotput (<i>metribuzin 70%</i>) 200g/ha	£34
2	200 l/ha	Praxim (<i>metobromuron 50g/l</i>) 3l + Shotput (<i>metribuzin 70%</i>) 300g/ha	£63
3	200 l/ha	Praxim (<i>metobromuron 500g/l</i>) 3l + Stomp Aqua (<i>pendimethalin 455g/l</i>) 2.2 l/ha	£73
4	200 l/ha	Praxim (<i>metobromuron 500g/l</i>) 3l/ha + Defy (<i>prosulfocarb800g/l</i>) 4l/ha	£82
5	200 l/ha	Praxim (<i>metobromuron 500g/l</i>) 3 l/ha + Artist (<i>metribuzin 17.5% + flufenacet 24%</i>) 1 kg/ha	£83
6	200 l/ha	Praxim (<i>metobromuron 500g/l</i>) 2 l/ha + Stomp Aqua (<i>pendimethalin 455g/l</i>) 2.2 l/ha + Shotput (<i>metribuzin 70%</i>) 200 g/ha	£59
7	200 l/ha	Praxim (<i>metobromuron 500g/l</i>) 2 l/ha + Stomp Aqua (<i>pendimethalin 455g/l</i>) 2.2 l/ha + Gamit 36SC (<i>clomazone 360 g/l</i>) 125ml/ha	£63
8	200 l/ha	Praxim (<i>metobromuron 500g/l</i>) 2 l/ha + Defy (<i>prosulfocarb800g/l</i>) 3l/ha + Shotput (<i>metribuzin 70%</i>) 200 g/ha	£61
9	200 l/ha	Defy (<i>prosulfocarb800g/l</i>) 4l/ha	£26
10	200 l/ha	Praxim (<i>metobromuron 500g/l</i>) 4l/ha	£74
11	200 l/ha	Stomp Aqua (<i>pendimethalin 455g/l</i>) 2.9 l/ha	£23
12	200 l/ha	Shotput (<i>metribuzin 70%</i>) 500g/ha	£12

Figure 1 : Treatments and Costing

Note: diquat 3l/ha + NI Wetter 200ml/ha applied in addition to all above applications

Demonstration Plan

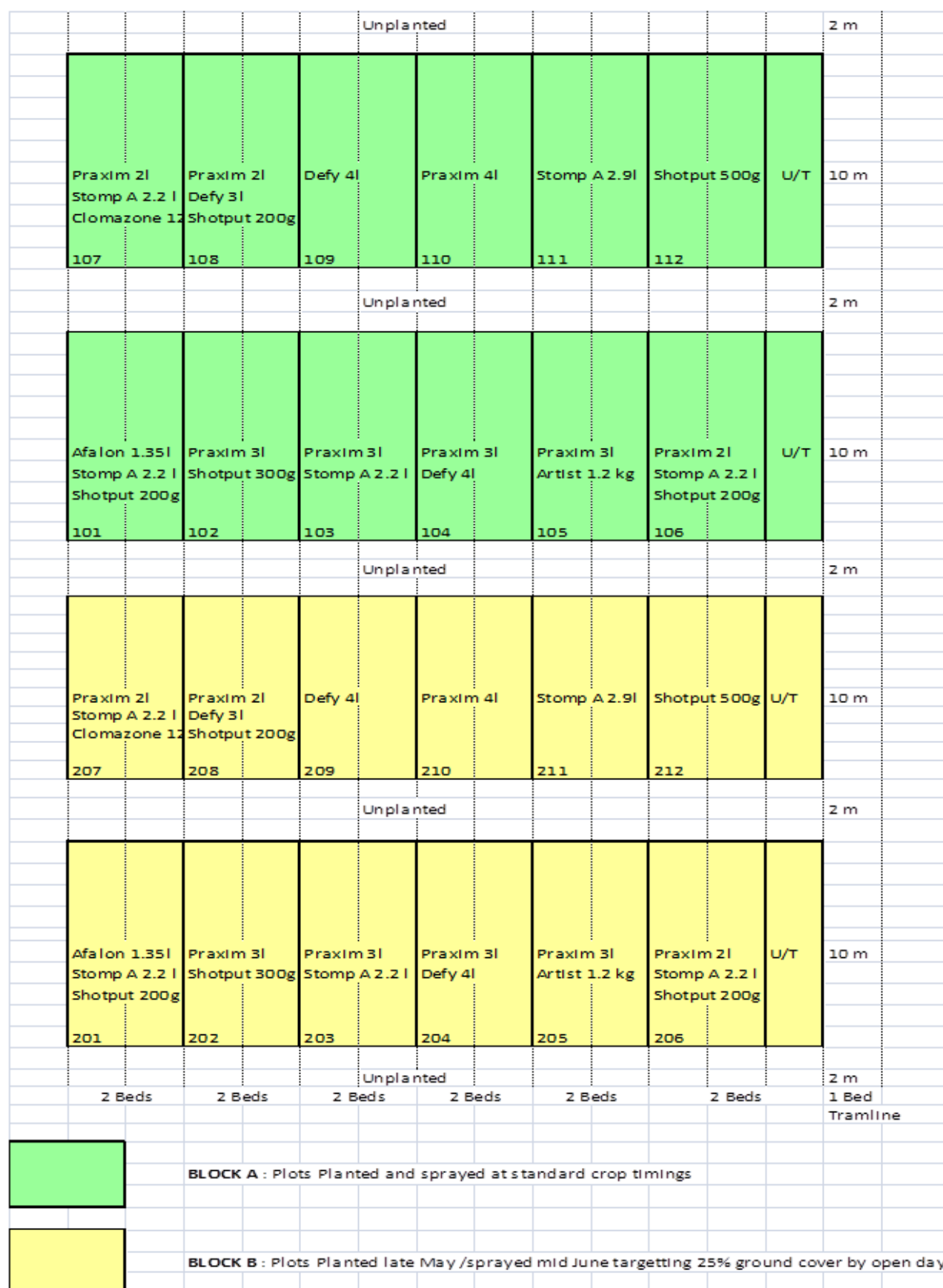


Figure 2 : Demonstration Plan

Observations – Block A

Assessments of ground cover, Figure 3 and weed counts, Figure 4 were undertaken on Block A

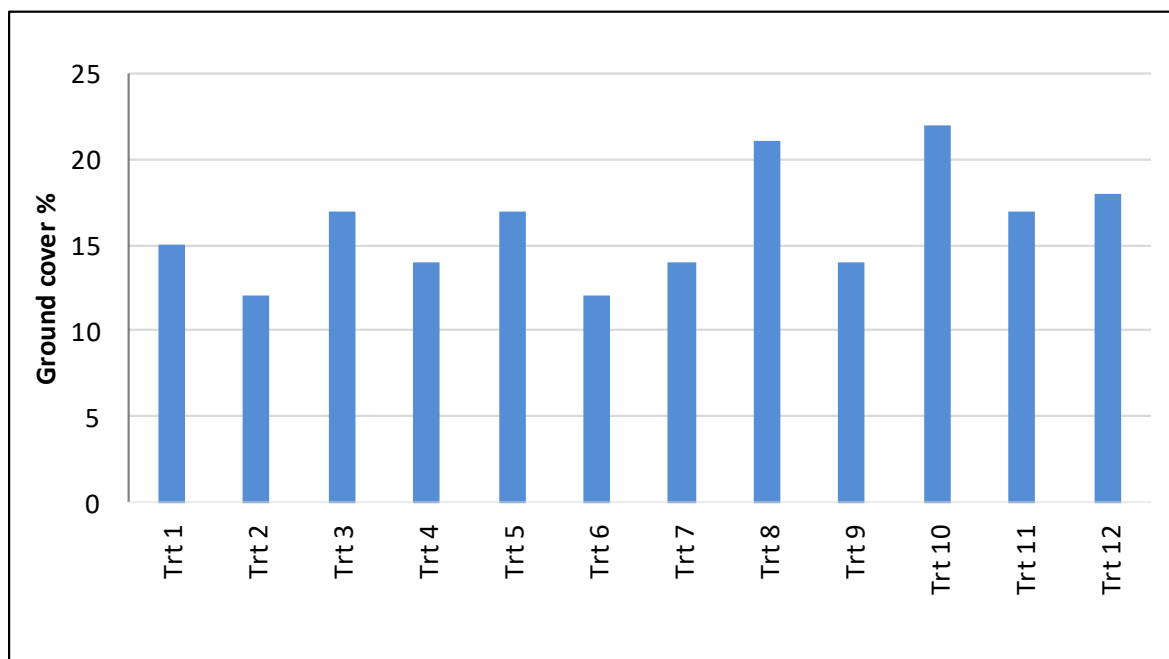


Figure 3 : Block A Ground cover % 1st June

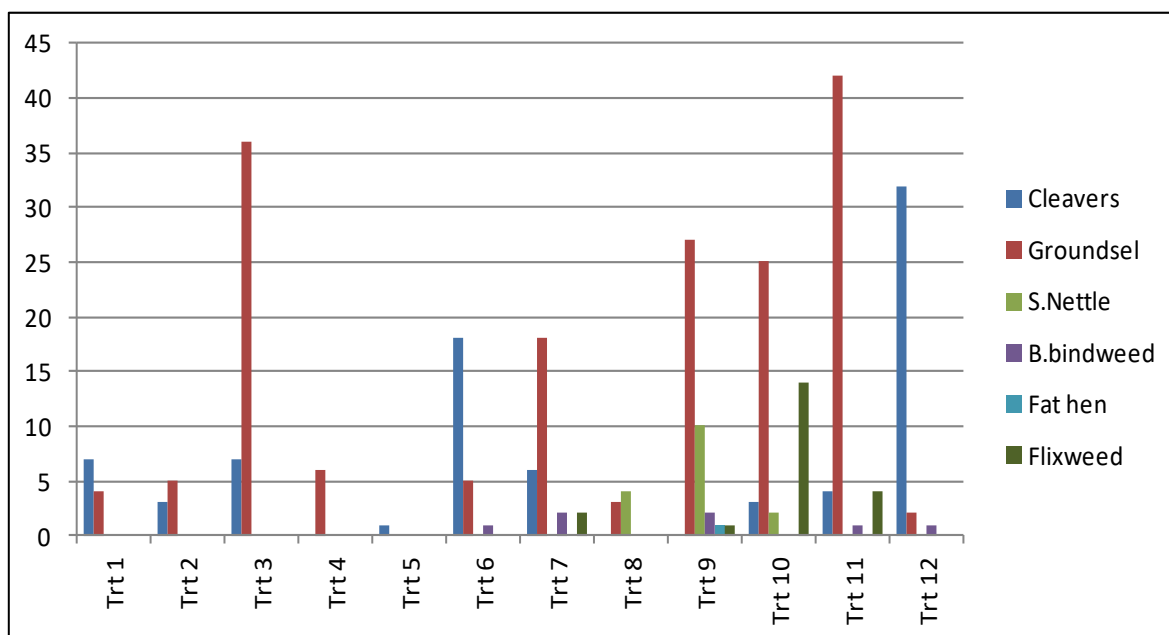


Figure 4 : Block A Weed count assessments 2x1.5m Bed 13th June

Observations – Block B

Assessment of ground cover, Figure 5 and weed counts, Figure 6 were undertaken on Block B

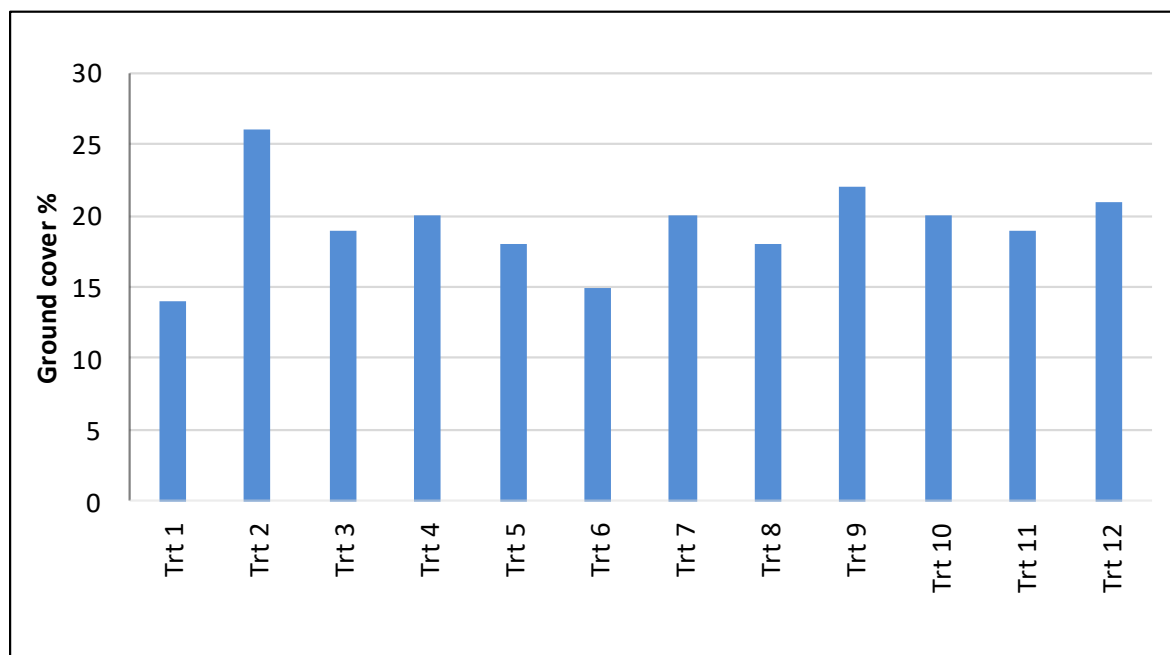


Figure 5 : Ground cover % 22nd June

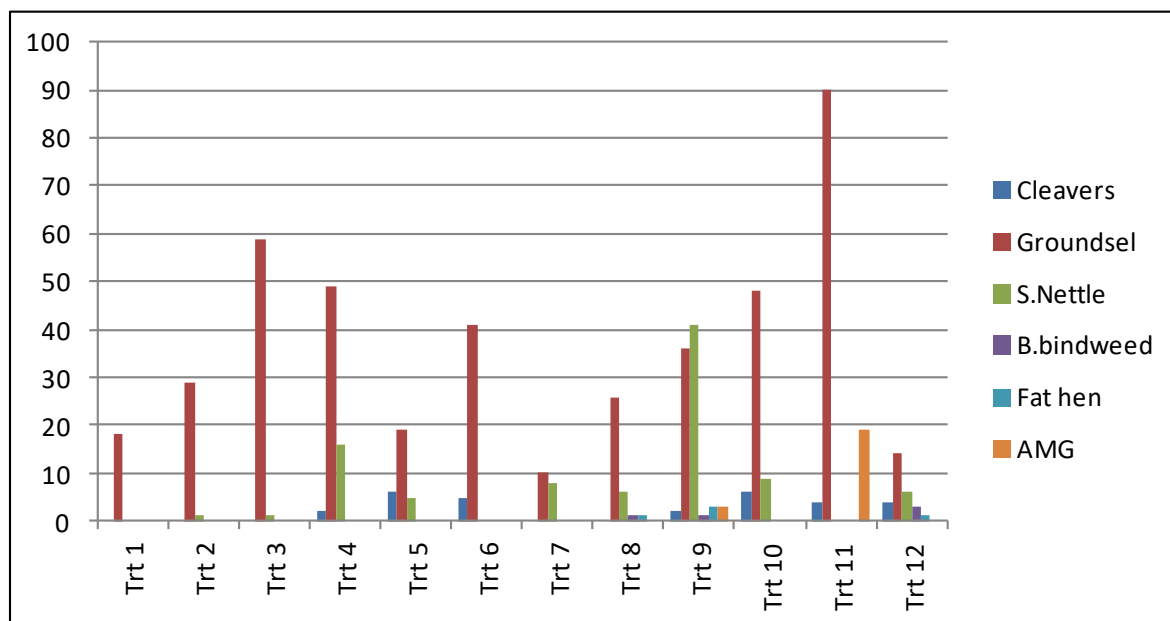


Figure 6 : Block B Weed count assessments 2x1.5m Bed 4th July

No phytotoxicity was observed for any treatments within Block A, assessment 1st June and Block B, assessment 22nd June. These assessments occurred at approximately 20% ground cover for all plots. However minor veinal yellowing (characteristic of metribuzin uptake) was observed on Trt 12 Block A on 7th June.

Discussion

Comparison of the ground cover assessments on block A and B suggest no restrictions to crop growth from any of the residual herbicide applications treatments.

An untreated area, Figure 7, allowed an assessment of weed species present on the site, these were dominated by groundsel, cleavers, s.nettle and annual meadow grass (AMG). Weed species present at lower levels include fathen, flixweed, b.bindweed, field pansy and cranesbill.

It was considered only the weed species present at higher levels allow a comparison of efficacy from the various treatments within this demonstration.

Untreated Area



Figure 7 : Untreated area

Assessments - Groundsel

The observed total weed count of groundsel from block A and B, Figure 7 reveals variation between treatments

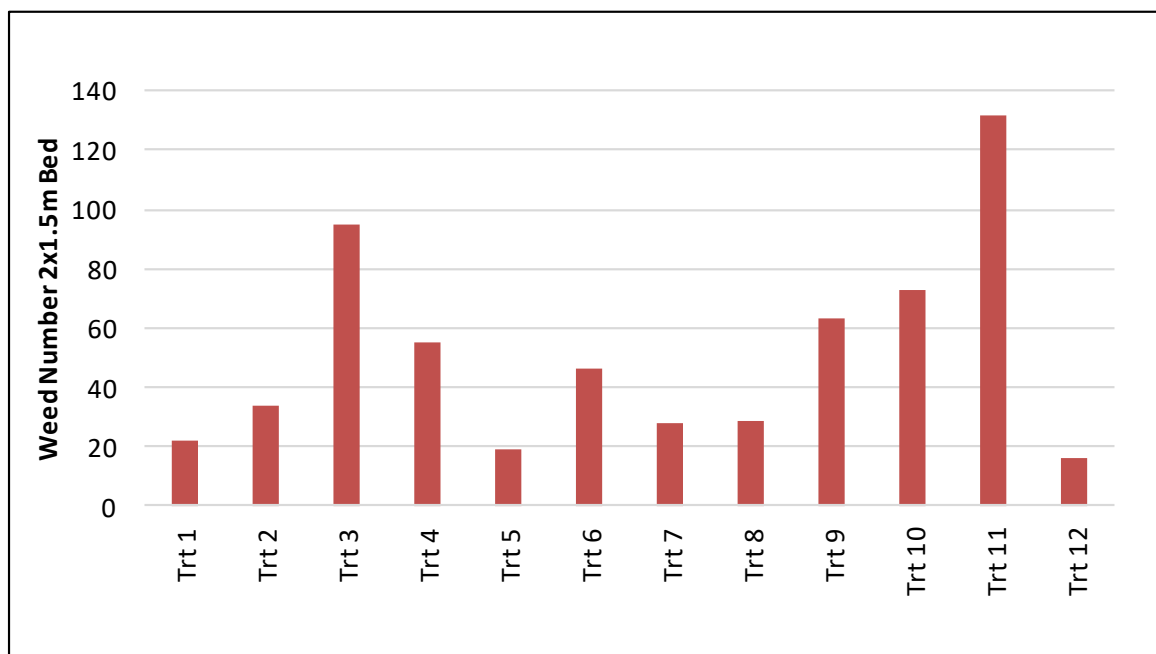


Figure 7 : Groundsel counts Total 3m Bed block A & B

Best Performance

- Trt 12 Shotput (metribuzin 70%) 500g/ha (Figure 8 A)
- Trt 5 Praxim (metobromuron 500g/l) 3l/ha + Artist (metribuzin 225g/kg, flufenacet 240g/kg) 1kg/ha
- Trt 1 Afalon (linuron 500g/l) 1.2 l/ha + Stomp Aqua (pendimethalin 455g/l) 2.2 l/ha + Shotput (metribuzin 70%) 200g/ha

Worst Performance

- Trt 11 Stomp Aqua (pendimethalin 455g/l) 2.9 l/ha (Figure 8 B)
- Trt 3 Praxim (metobromuron 500g/l) 3l/ha + Stomp Aqua (pendimethalin 455g/l) 2.2 l/ha
- Trt 10 Praxim (metobromuron 500g/l) 4l/ha



Figure 8 A & B : Trt 12 and Trt 11 Block A 14th June

The results indicate the level of metribuzin applied has the largest influence on the residual control of groundsel within this demonstration. Clomazone in a 3 way combination also provided good control of groundsel.

Assessments - S.Nettle

The observed total weed count of s.nettle from block A and B, Figure 9 reveals variation between treatments

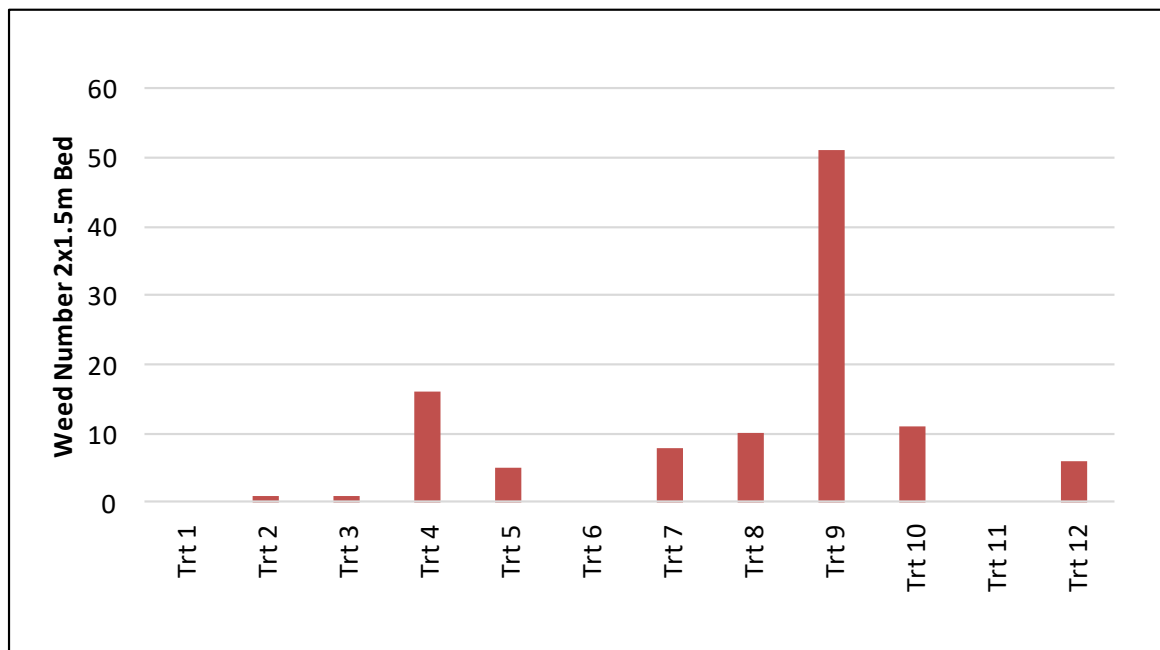


Figure 9 : S.Nettle counts Total 3m Bed block A & B

Best Performance

- Trt 1 Afalon (linuron 480 g/l) 1.35 l/ha + Stomp Aqua(pendimethalin 455g/l) 2.2 l/ha + Shotgun (metribuzin70%) 200g/ha (Figure 10A)
- Trt 6 Praxim (metobromuron 500g/l) 3l/ha + Stomp Aqua(pendimethalin 455g/l) 2.2 l/ha + Shotgun (metribuzin70%) 200g/ha
- Trt 11 Stomp Aqua (pendimethalin 455g/l) 2.9 l/ha

Worst Performance

- Trt 9 Defy (prosulfocarb 800 g/l) 4l/ha (Figure 10B)
- Trt 4 Praxim (metobromuron 500g/l) 3l/ha + Defy (prosulfocarb 800 g/l) 4l/ha
- Trt 10 Praxim (metobromuron 500g/l) 4l/ha



Figure 10 A & B : Trt 1 and Trt 9 Block A 14th June

The results indicate the application of pendimethalin has the largest influence on the residual control of S.nettle

Assessments – Cleavers

The observed total weed count of cleavers from block A and B, Figure 10 reveals variation between treatments

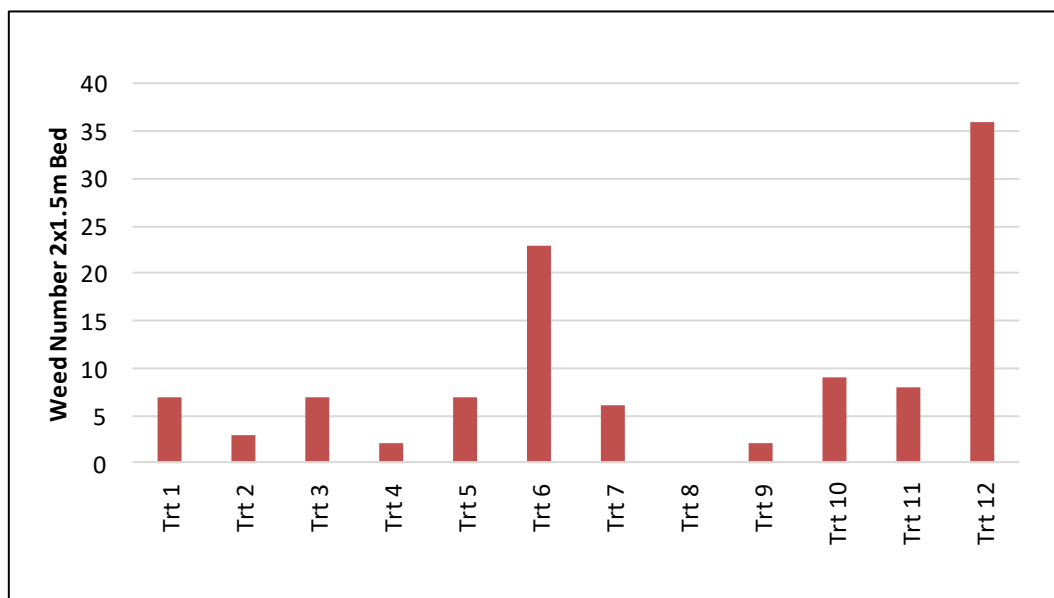


Figure 11 : Cleaver counts Total 3m Bed block A & B

Best Performance

- Trt 8 Praxim (metobromuron 500g/l) 2l/ha + Defy (prosulfocarb 800 g/l) 3l/ha + Shotput (metribuzin 70%) 200g/ha (Figure 12A)
- Trt 9 Defy (prosulfocarb 800 g/l) 4l/ha
- Trt 4 Praxim (metobromuron 500g/l) 3l/ha + Defy (prosulfocarb 800 g/l) 4l/ha

Worst Performance

- Trt 12 Shotput (metribuzin 70%) 500g/ha (Figure 12B)
- Trt 6 Praxim (metobromuron 500g/l) 2l/ha + Stomp Aqua (pendimethalin 455g/l) 2.2 l/ha + Shotput (metribuzin 70%) 200g/ha
- Trt 10 Praxim (metobromuron 500g/l) 4l/ha



Figure 12 A & B : Trt 8 and Trt 12 Block A 14th June

The results indicate prosulfocarb is likely to have the greatest influence on control although considerable variation occurred across the trial with the greatest level of cleavers occurring on one side of the trial which may have affected the results

Assessments - Annual Meadow Grass (AMG)

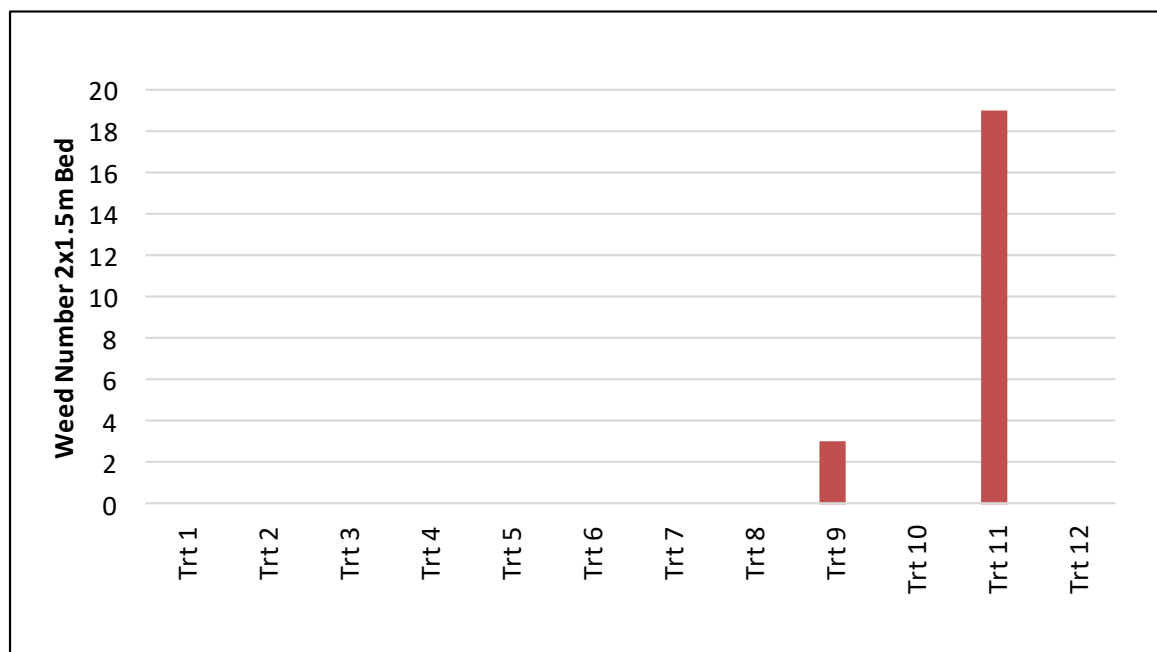


Figure 13 : Cleaver counts Total 3m Bed block A & B

Best Performance

- All treatments except 9 & 10

Worst Performance

- Trt 11 Stomp Aqua (pendimethalin 455g/l) 2.9 l/ha (Figure 14 B)
- Trt 9 Defy (prosulfocarb 800 g/l) 4l/ha



Figure 14 A & B : Trt 5 and Trt 11 Block A 14th June

The results indicate good control of AMG by many of the combination treatments. AMG is susceptible to metribuzin pre-emergence and results indicated no AMG within treatments containing product/combinations with metribuzin. Other treatments without metribuzin also indicate some activity from metobromuron (Trt 10, Trt 2)

Conclusions

The weed spectrum on this site was more limited than expected with only low levels of B.Bindweed, Fathen and Mayweed observed allowing no comparison of treatment performance with respect to these problematic weeds. High levels of Groundsel, Cleavers, S.nettle, AMG and Flixweed (Block A only) were observed allowing a comparison of the treatments with regard to control of these weeds.

The applications of individual a.i.'s allowed assessment of the strengths and weakness of the a.i. within this demonstration, Figure 15, with respect to the individual weeds present however it should be noted this was a non replicated demonstration and these are trends observed. Validation of these observations would require replicated trials within multiple sites and ideally more than one season.

Active Ingredient	metribuzin	metobromuron	prosulfocarb	pendimethalin	clomazone
Weeds					
S.nettle	m.susceptible	m.susceptible	-	susceptible	-
Cleavers	-	-	susceptible	-	m.susceptible
Groundsel	susceptible	L.susceptible	-	-	m.susceptible
Flixweed	-	m.susceptible*	m.susceptible*	-	-
AMG	susceptible	susceptible	-	-	-

Figure 15 : Comparison of A.I. performance

The best overall performance was observed with treatments 5 (metabromuron, metribuzin and flufenacet) and treatment 8 (metobromuron, prosulfocarb and metribuzin), Figure 16. The inclusion of three active substances provided a broader weed spectrum control compared to the application of two active substances



Figure 16 : A: Treatment 5



B: Treatment 8

However treatment 5 and 8 were expensive options, Figure 1, £83/ha and £61/ha respectively and an adequate level of weed control was observed by a number of treatments including the standard treatment 1 (linuron, pendimethalin and metribuzin, £34/ha) within the demonstration.

It should be noted all the above observations and assessments have been assessed from a demonstration block and replication of the treatments over a number of sites would be required to validate the trends observed.

Acknowledgements

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G.Tomalin

VCS Potatoes Ltd

22nd December 2016



VCS POTATOES LTD

SPOT Farm East (Elveden) 2017– Residual and Post-emergence Contact Herbicide Demonstration Report



Background

The urea based selective residual herbicide active linuron has been the major residual herbicide applied to the potato crop of the UK on loamy and sandy loam soil types for over 30 years. This active provides cost effective, crop safe control of many weeds observed on these soil types including S.nettle, Fat Hen, B.Bindweed and Mayweeds. This active is now being revoked, the final date for sales was 3rd June 2017 with a last date for application 3rd June 2018.

Aims

This demonstration aimed to assess the efficacy and crop safety of alternative residual herbicides and residual herbicide mixtures avoiding the use of linuron. Following the revocation date for Linuron, two of the remaining actives are varietal dependant in their phyto-toxicity characteristics – metribuzin, clomazone. The demonstration also assessed the crop safety of the herbicides with regard to twenty three popular varieties grown in the UK. In addition when the crop was 15cm height a post emergence herbicide was applied to 3 plots. The planting and residual herbicide application dates were later than standard application timings to coincide with an open day in early July

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Site Details

The demonstration site – Bishop Hill Middle was a loamy sand. The complete trial was planted on xx April. The seed size of the different varieties varied from 35x45mm, 45x55mm and 55x60mm. All the seed was treated with Monceren DS (pencycuron) @ 1kg/T at planting.

Region	West Suffolk
Field Name	Bishops Hill Middle
Soil type	Loamy sand

Fertiliser Applications

Soil Information	Soil Index	Available Nutrients from FYM application kg/ha	Base Fertiliser Applied kg/ha	Top Dressing Applied kg/ha
Nitrogen	0	4	102.5	131
Phosphate	3	61	50	
Potash	1	174	270	
Magnesium	1	30		70
pH	7.8			

Varieties

Category	Varieties
Processing Varieties	R. Burbank, Royal, Daisy, Performer, Challenger, Shepody, Innovator, Forza
Prepack Varieties	Lanorma, Soraya, Jelly, Marfona, Nectar, Vales sovereign, Saxon, Melody
Crisping Varieties	Brooke
Salad Varieties	Maris Peer, Leontine
Ware Varieties	Maris Piper, Eurostar, Rooster, Markies

Application details

	Date
Planting Date	21 st April
Application date – Pre emergence Residual Herbicides	13-14 th May
Application Date – Contact Herbicides	20 th June
Weed count 1	15 th June
Weed count 2	3 rd July
Weed count 3 (full plot)	31 st August

Treatment List

Trt No.	Water Volume	Herbicide Application 1. 30 th May pre emergence	Herbicide Application 2. 20 th June @ 15cm crop height	Residual Cost £/ha
1	300 l/ha	Untreated		£0
2	200 l/ha	VCS 1717 2.5 l/ha + Retro 3l/ha + NI wetter		TBC
3	200 l/ha	Stomp Aqua 2.8 l/ha + Retro 3l/ha + NI Wetter		£22
4	200 l/ha	Praxim 4l/ha Retro 3l/ha + NI Wetter		£72
5	200 l/ha	Gamit 25EC 200ml/ha + Retro 3l/ha + NI Wetter		£15
6	200 l/ha	Flufenacet 600g/ha A.I. + Retro 3l/ha + NI Wetter		TBC
7	200 l/ha	Artist 1.2 kg/ha + Stomp Aqua 2l/ha + Retro 3l/ha + NI Wetter		£45
8	200 l/ha	Praxim 2.5 l/ha + Stomp Aqua 2 l/ha + shotput 200g/ha + Retro 3l/ha + NI Wetter		£66
9	200 l/ha	Praxim 2.5 l/ha + Defy 3l/ha + Shotput 200 g/ha + Retro 3l/ha + NI Wetter		£71
10	200 l/ha	Stomp Aqua 2 l/ha + Shotput 400g + Retro 3l/ha + NI Wetter		£26
11	200 l/ha	STANDARD Afalon 1.35l + Stomp Aqua 2 l/ha + Shotput 200g + Retro 3l/ha + NI Wetter		£33
12	200 l/ha	Shotput 600g + Retro 3l/ha + NI Wetter		£14
13	200 l/ha	Shotput 600g + Retro 3l/ha + NI Wetter Irrigated 15mm 20 hours post app		£14
14	200 l/ha	STANDARD Afalon 1.35l + Stomp Aqua 2 l/ha + Shotput 200g + Retro 3l/ha + NI Wetter	Shotput 200g/ha	£33+£5
15	200 l/ha	STANDARD Afalon 1.35l + Stomp Aqua 2 l/ha + Shotput 200g + Retro 3l/ha + NI Wetter	Shotput 500g/ha	£33+£12
16	200 l/ha	STANDARD Afalon 1.35l + Stomp Aqua 2 l/ha + Shotput 200g + Retro 3l/ha + NI Wetter	Titus 30g/ha + Shotput 200g/ha + NI Wetter	TBC

Figure 1 : Treatments and Costing

Note: diquat 3l/ha + NI Wetter 200ml/ha co-applied with all residual applications

Observations - Residual Herbicide Weed counts 15th June

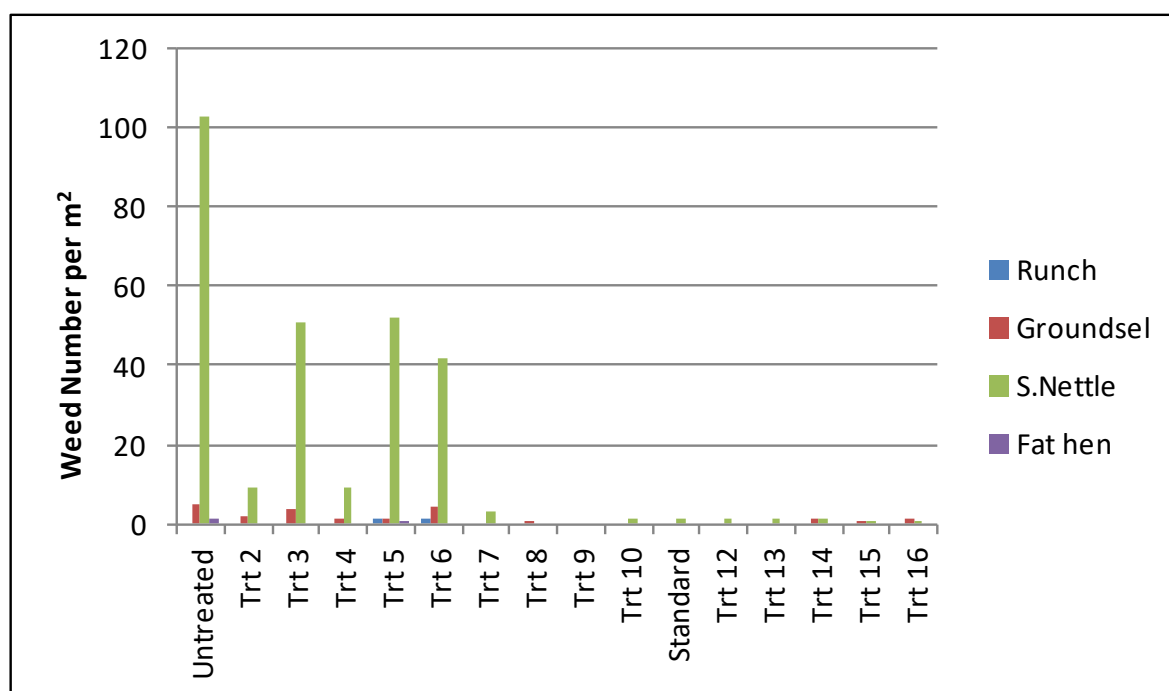


Figure 3 : Block A Weed count assessments 2x1m Bed 15th June

Observations – Residual Herbicide Weed counts 3rd July

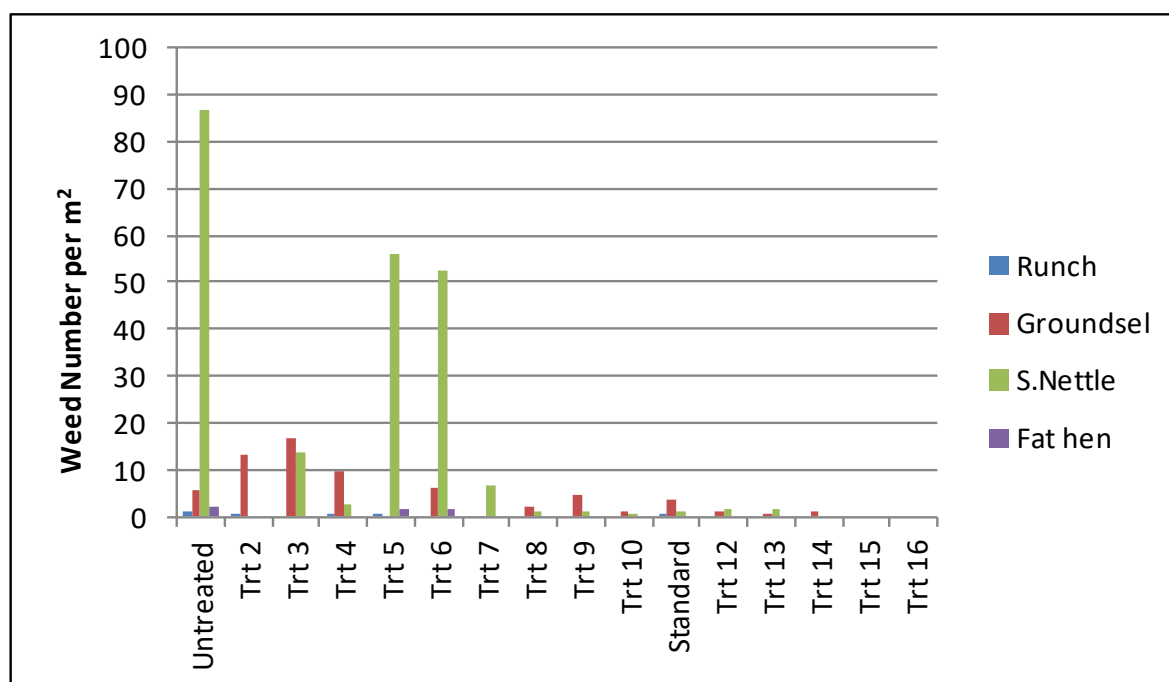


Figure 4 : Block A Weed count assessments 2x1m Bed 3rd July

No phytotoxicity was observed for any residual treatments (treatments 1-13) although a marginally lower crop height was observed within Forza and Innovator within treatment 12 and 13 which contained higher levels of active metribuzin.

Observations – Contact Herbicide Phytotoxicity

At an average 15cm crop height, 20th June, a post emergence contact herbicide application was applied to Strip 14, 15 and 16. These treatments were assessed for levels of phytotoxicity – leaf yellowing/chlorosis 10 days after application – see Figure 5

Variety	Phytotoxicity Score (0 none – 9 severe) – post emergence treatments assessed 30 th June		
	Treatment 14 200g/ha Shotput	Treatment 15 500g/ha shotput	Treatment 16 200g/ha Shotput + 30g/ha Titus+ 200ml NI Wetter
Maris Piper	2	6	4
Performer	1	4	3
Eurostar	2	5	2
Lanorma	1	2	2
Challenger	0	0	0
Shepody	2	4	3
Maris Peer	2	5	4
Leontine	0	3	1
Royal	0	2	1
Soraya	0	1	2
Rooster	0	1	2
Jelly	1	2	1
Markies	0	1	1
Melody	2	4	4
Innovator	4	7	5
Russet Burbank	1	2	2
Daisy	1	3	2
Forza	4	8	6
Marfona	0	0	0
Nectar	1	4	3
Brooke	0	0	1
Vales sovereign	0	0	1
Saxon	0	0	0

Figure 5 : Phytotoxicity Score – Post emergence applications

Discussion

An untreated area, Figure 7 & 8, allowed an assessment of weed species present on the site, these were dominated by small nettle and groundsel with a lower level of runch and fat hen. Weed species also present at very low levels include cranesbill, fools parsley, field pansy and black bindweed.

It was considered only the weed species present at higher levels allow a comparison of efficacy from the various treatments within this demonstration. The below compares residual performance only excluding post emergence treatments 14,15 & 16.



Figure 7 : Untreated area 3rd June



Figure 8 : Untreated area 31st August

Assessments - Groundsel

The observed total weed count of groundsel from observations on 15th June and 3rd July, Figure 8 reveals variation between treatments

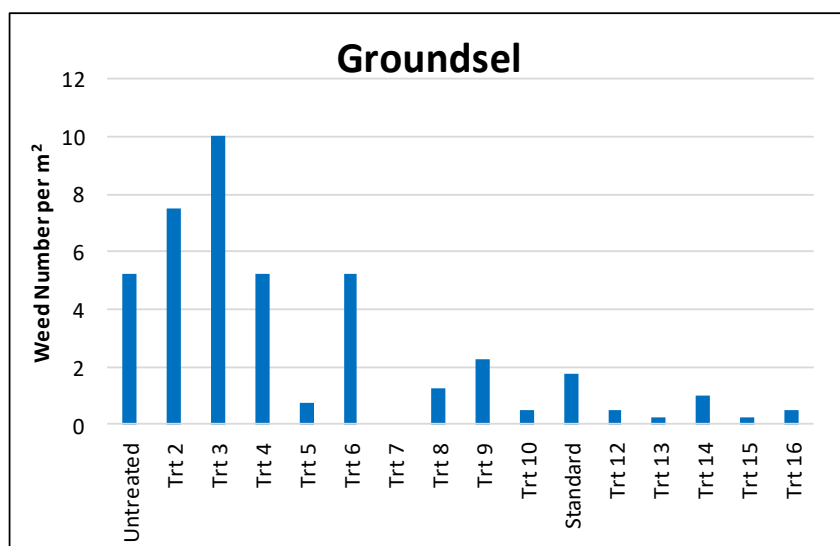


Figure 8 : Groundsel counts Total 4m²

Best Performance

- Trt 7 Artist (metribuzin 225g/kg, flufenacet 240g/kg) 1.2 kg/ha + Stomp Aqua (pendimethalin 455g/l) 2 l/ha (Figure 9 A)
- Trt 13 Shotput (metribuzin 70%) 600g/ha Praxim (metobromuron 500g/l) 3l/ha + Artist (metribuzin 225g/kg, flufenacet 240g/kg) 1kg/ha
- Trt 12 Shotput (metribuzin 70%) 600g/ha (irrigation applied within 24 hrs)

Worst Performance

- Trt 3 Stomp Aqua (pendimethalin 455g/l) 2.8 l/ha (Figure 9 B)
- Trt 2 VCS 1717 (new a.i.) 2.5 l/ha
- Trt 6 flufenacet 600g/ha



Figure 9 A & B : Trt 7 and Trt 7 3rd July

The results indicate the level of metribuzin applied has the largest influence on the residual control of groundsel within this demonstration. Clomozone also provided good control of groundsel.

Assessments - S.Nettle

The observed total weed count of s.nettle from observations on 15th June and 3rd July, Figure 10 reveals variation between treatments

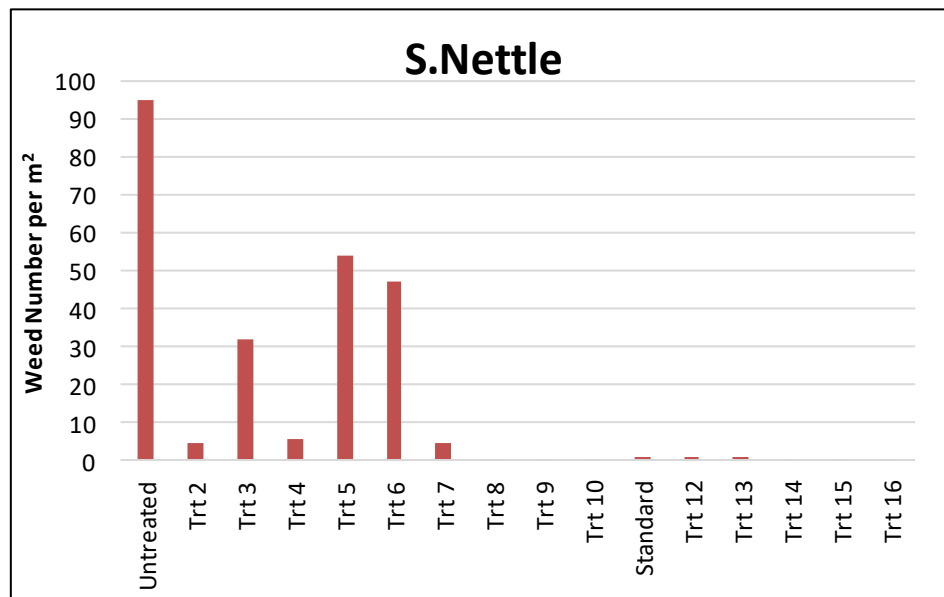


Figure 10 : S.Nettle counts Total 4m²

Best Performance

- Trt 8 Praxim (metobromuron 500g/l) 2.5l/ha + Stomp Aqua(pendimethalin 455g/l) 2 l/ha + Shotput (metribuzin70%) 200g/ha (Figure 11A)
- Trt 9 Praxim (metobromuron 500g/l) 2.5l/ha + Defy (prosulfocarb 800 g/l) 3l/ha + Shotput (metribuzin70%) 200g/ha
- Trt 10 Stomp Aqua (pendimethalin 455g/l) 2 l/ha + Shotput (metribuzin70%) 400g/ha

Worst Performance

- Trt 5 Gamit 25EC (clomazone xx g/l) (Figure 10B)
- Trt 6 flufenacet 600g/ha
- Trt 3 Stomp Aqua (pendimethalin 455g/l) 2.8 l/ha



Figure 10 A & B : Trt 8 and Trt 5 Block A 3rd July

The results indicate the application of combination of actives including pendimethalin, metobromuron and metribuzin have a large influence on the residual control of S.nettle

Assessments – Fat Hen

The observed total weed count of fat hen from observations across the whole strip on 31st August, Figure 12



Figure 11 : Fat Hen counts – complete strip

Best Performance

- Trt 7 Artist (metribuzin 225g/kg, flufenacet 240g/kg) 1.2 kg/ha + Stomp Aqua (pendimethalin 455g/l) 2 l/ha (Figure 12A)
- Trt 2 VCS 1717 (new a.i.) 2.5 l/ha
- Trt 8 Praxim (metobromuron 500g/l) 2.5l/ha + Stomp Aqua(pendimethalin 455g/l) 2 l/ha + Shotput (metribuzin70%) 200g/ha
- Trt 10 Stomp Aqua (pendimethalin 455g/l) 2 l/ha + Shotput (metribuzin70%) 400g/ha
- Trt 11 Standard Linuron (linuron 500g/l) 1.2l/ha + Stomp Aqua(pendimethalin 455g/l) 2 l/ha + Shotput (metribuzin70%) 200g/ha
- Trt 12 Shotput (metribuzin 70%) 600g/ha

Worst Performance

- Trt 5 Gamit 25EC (clomazone xx g/l) (Figure 12B)
- Trt 6 flufenacet 600g/ha



Figure 12 A & B : Trt 2 and Trt 6 3rd July

The results indicate metribuzin is likely to have the greatest influence on control although initial assessment of the new active coded VCS 1717 indicate good control on this site.

Assessments - Runch

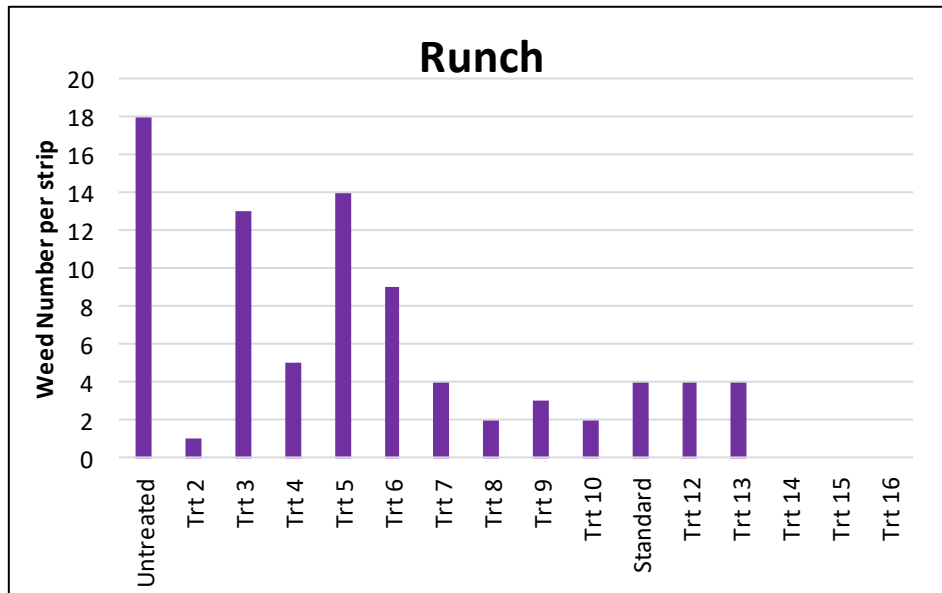


Figure 13 : Runch counts– complete strip

Best Performance

- Trt 2 VCS 1717 (new a.i.) 2.5 l/ha(Figure 14A)
- Trt 8 Praxim (metobromuron 500g/l) 2.5l/ha + Stomp Aqua(pendimethalin 455g/l) 2 l/ha + Shotput (metribuzin70%) 200g/ha
- Trt 10 Stomp Aqua (pendimethalin 455g/l) 2 l/ha + Shotput (metribuzin70%) 400g/ha

Worst Performance

- Trt 3 Stomp Aqua (pendimethalin 455g/l) 2.8 l/ha
- Trt 5 Gamit 25EC (clomazone xx g/l) 200ml/ha
- Trt 6 flufenacet 600g/ha



Figure 14 A & B : Trt 2 and Trt 3 3rd July

The results indicate good control of Runch by many of the combination treatments. Runch is susceptible to metribuzin pre-emergence and results indicated good control with all treatments containing metribuzin. Initial assessment of the new active coded VCS 1717 also indicated good control on this site.

Assessments – Post Emergence Herbicide Varietal Sensitivity

The application of post emergence herbicides caused varying levels of scorch on this demonstration. The effects of Shotput (metribuzin) were varietal and rate dependant, treatment 14, Shotput 200g/ha (metribuzin 70%w/w) and treatment 15 Shotput 500g/ha (metribuzin 70%w/w). The effects of Titus (rimsulfuron), treatment 16 when applied in addition with Shoptput 200g/ha(metribuzin) were quite distinct across all varieties with a mottling pattern. However in addition to the leaf mottling a leaf scorch was observed which was varietal dependant, similar to the levels observed within treatment 14

Overall the levels of scorch due to post emergence metribuzin were lower than would have been anticipated on susceptible varieties within this demonstration.



Figure 15 Innovator



Figure 16 Eurostar



Figure 17 Markies



Figure 18 Challenger

Treatment 15 Shotput 500g/ha (metribuzin 70%)

Conclusions – Residual Herbicides

The weed spectrum on this site was more limited than expected with only low levels of B.Bindweed and Mayweed observed allowing no comparison of treatment performance with respect to these problematic weeds. High levels of Groundsel and S.nettle and moderate levels of Fat Hen and Runch were observed allowing a comparison of the treatments with regard to control of these weeds.

The applications of individual a.i.'s allowed assessment of the strengths and weakness of the a.i. within this demonstration, Figure 20, with respect to the individual weeds present however it should be noted this was a non replicated demonstration and these are trends observed. Validation of these observations would require replicated trials within multiple sites and ideally more than one season.

Active Ingredient	metribuzin	Metobromuron	pendimethalin	clomazone	VCS 1717	Flufenacet
Weeds						
S.nettle	m.susceptibl	m.susceptible	susceptible	-	susceptible	-
Groundsel	susceptible	L.susceptible	-	m.susceptible	-	-
Fat Hen	susceptible	L.susceptible	susceptible	-	susceptible	-
Runch	susceptible	m.susceptible*	m.susceptible	-	susceptible	-

Figure 19 : Comparison of A.I. performance

A commercially acceptable performance was observed with treatments 7 (metribuzin, flufenacet and pendimethalin) ,8 (metobromuron, prosulfocarb and metribuzin),9 (metobromuron, pendimethalin and metribuzin),10 (metribuzin and pendimethalin),11STD Linuron, pendimethalin and metribuzin) ,12(metribuzin) ,13(metribuzin). However the rates of metribuzin within treatments 7,10,12 and 13 (400-600g/ha 70% metribuzin) would be considered too high for some of the varieties within the demonstration for this soil type. Therefore the best broad variety combinations observed from this demonstration, on this soil type are treatment 8 (metobromuron, prosulfocarb and metribuzin) and 9 (metobromuron, pendimethalin and metribuzin). Figure 19. The inclusion of three active substances also provides a broader control over a larger weed spectrum .



Figure 19 :A:Treatment 8



B: Treatment 9

However treatment 8 and 9 were expensive options, Figure 1, £66/ha and £71/ha respectively. If the variety was tolerant of metribuzin, treatment 10 (metribuzin and pendimethalin), £26/ha, would be the most cost effective broad spectrum control.

Conclusions – Contact Herbicides

The phytotoxicity and veinal leaf yellowing due to the post emergence metribuzin on this demonstration was less than expected on varieties previously trialled. However a comparison of effects on varieties within treatment 15 (Shotput 500g/ha metribuzin 70%w/w) enables a grouping of varieties in sensitivity bands, Figure 20

Tollerant	Low Sensitivity	Moderate Sensitivity	High Sensivity
V.Sovereign Brooke Marfona Saxon Rooster Challenger Soraya Markies	Royal Daisy Lanorma R.Burbank Jelly	M.piper Leontine Eurostar Melody Nectar Performer Shepody	Forza Innovator M.Peer

Figure 20 : Sensitivity to metribuzin post emergence

It should be noted all the above observations and assessments for both residual and contact treatments have been assessed from a demonstration block and replication of the treatments over a number of sites would be required to validate the trends observed.

Acknowledgements

VCS Potatoes Ltd would like to thank Elveden Farms, VCS (UK) Ltd and AHDB Potatoes for their assistance with this trial.

G.Tomalin
VCS Potatoes Ltd
29th December 2017



VCS POTATOES LTD

SPOT Farm East (Elveden) 2018– Residual and Post-emergence Contact Herbicide Demonstration Report



Background

The urea based selective residual herbicide active linuron has been the major residual herbicide applied to the potato crop of the UK on loamy and sandy loam soil types for over 30 years. This active provides cost effective, crop safe control of many weeds observed on these soil types including S.nettle, Fat Hen, B.Bindweed and Mayweeds. The approval for Linuron application ceased on 3rd June 2018. This demonstration was the third in a sequence of trials to look at options following the loss of this active.

Aims

This demonstration aimed to assess the efficacy and crop safety of alternative residual herbicides and residual herbicide mixtures avoiding the use of linuron. Following the revocation date for Linuron, two of the remaining actives are varietal dependant in their phyto-toxicity characteristics – metribuzin, clomazone. The demonstration also assessed the crop safety of the alternative herbicides with regard to twenty six popular varieties grown in the UK. In addition when the crop was 15cm height a post emergence herbicide was applied to 3 plots.

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Site Details

The demonstration site – Common Heath 4 was a loamy sand. The complete trial was planted on 25th April. The seed size of the different varieties varied from 35x45mm, 45x55mm and 55x60mm. All the seed was treated with Monceren DS (pencycuron) @ 1kg/T at planting.

Region	West Suffolk
Field Name	Common Heath 4
Soil type	Loamy sand

Fertiliser Applications

Soil Information	Soil Index	Available Nutrients from FYM application kg/ha	Base Fertiliser Applied kg/ha	Top Dressing Applied kg/ha
Nitrogen	0	4	100	120
Phosphate	3	61	50	
Potash	1	174	270	
Magnesium	1	30		70
pH	7.8			

Varieties

Category	Varieties
Processing Varieties	R. Burbank, Royal, Performer, Challenger, Shepody, Innovator, Forza
Prepack Varieties	Lanorma, Soraya, Jelly, Marfona, Nectar, Melody, Sensation, Red Fantasy, Georgina
Crisping Varieties	Brooke, VR808
Salad Varieties	Maris Peer, Leontine, Gwenne, Angelique, Iodea, Gemson, Bambino
Ware Varieties	Maris Piper, Rooster

Application details

	Date
Planting Date	25 th April
Application date – Pre emergence Residual Herbicides	13 th May
Application Date – Contact Herbicides	11 th June
Weed count 1	14 th June
Post emergence Assessment	20 th June

Treatment List

Trt No.	Water Volume	Herbicide Application 1. 13 th May pre emergence	Herbicide Application 2. 11 th June @ 15cm crop height	Residual Cost (not including Contact)£/ha
1		Untreated		£0
2	200 l/ha	Praxim 2.5 l/ha + Stomp Aqua 1.8 l/ha + Shotput 200g/ha + Retro 3l/ha + NI Wetter		£66
3	200 l/ha	Praxim 2.5 l/ha + Defy 3l/ha + Shotput 200g/ha + Retro 3l/ha + NI Wetter		£71
4	200 l/ha	Praxim 4l/ha Retro 3l/ha + NI Wetter		£72
5	200 l/ha	VCS 1717 2.5 l/ha(aclonifen) + Retro 3l/ha + NI Wetter		TBC
6	200 l/ha	Defy 3 l/ha + Retro 3l/ha + NI Wetter		TBC
7	200 l/ha	VCS 1818 (2 actives) + Retro 3l/ha + NI Wetter		TBC
8	200 l/ha	Shotput 1000g/ha + Retro 3l/ha + NI Wetter		£23
9	200 l/ha	Stomp Aqua 1.8 l/ha + Shotput 400g + Retro 3l/ha + NI Wetter		£26
10	200 l/ha	Artist 1.2 kg/ha + Stomp Aqua 1.8l/ha + Retro 3l/ha + NI Wetter		£45
11	200 l/ha	VCS 1717 2.5 l/ha(aclonifen) + Stomp Aqua 1.8 l/ha + Shotput 200g/ha + Retro 3l/ha + NI Wetter		TBC
12	200 l/ha	VCS 1717 2.5 l/ha(aclonifen) + Defy 3l/ha + Shotput 200g/ha + Retro 3l/ha + NI Wetter		TBC
13	200 l/ha	VCS 1717 2.5 l/ha(aclonifen) + Shotput 400g/ha + Retro 3l/ha + NI Wetter		TBC
14	200 l/ha	VCS 1919 (3 actives) + Retro 3l/ha + NI Wetter		TBC
15	200 l/ha	STANDARD Praxim 2.5l/ha + Stomp Aqua 1.8 l/ha + Shotput 200g + Retro 3l/ha + NI Wetter	Shotput 200g/ha	£66 + £5
16	200 l/ha	STANDARD Praxim 2.5l/ha + Stomp Aqua 1.8 l/ha + Shotput 200g + Retro 3l/ha + NI Wetter	Shotput 500g/ha	£66 + £12
17	200 l/ha	STANDARD Praxim 2.5l/ha + Stomp Aqua 2 l/ha + Shotput 200g + Retro 3l/ha + NI Wetter	Titus 30g/ha + Shotput 200g/ha + NI Wetter	£66 + £20
18	200 l/ha	STANDARD Praxim 2.5l/ha + Stomp Aqua 2 l/ha + Shotput 200g + Retro 3l/ha + NI Wetter	Basagran 1.1 kg/ha	£66 + TBC

Figure 1: Treatments and Costing

Note: diquat 3l/ha + NI Wetter 200ml/ha co-applied with all residual applications

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Observations - Residual Herbicide Weed counts 14th June

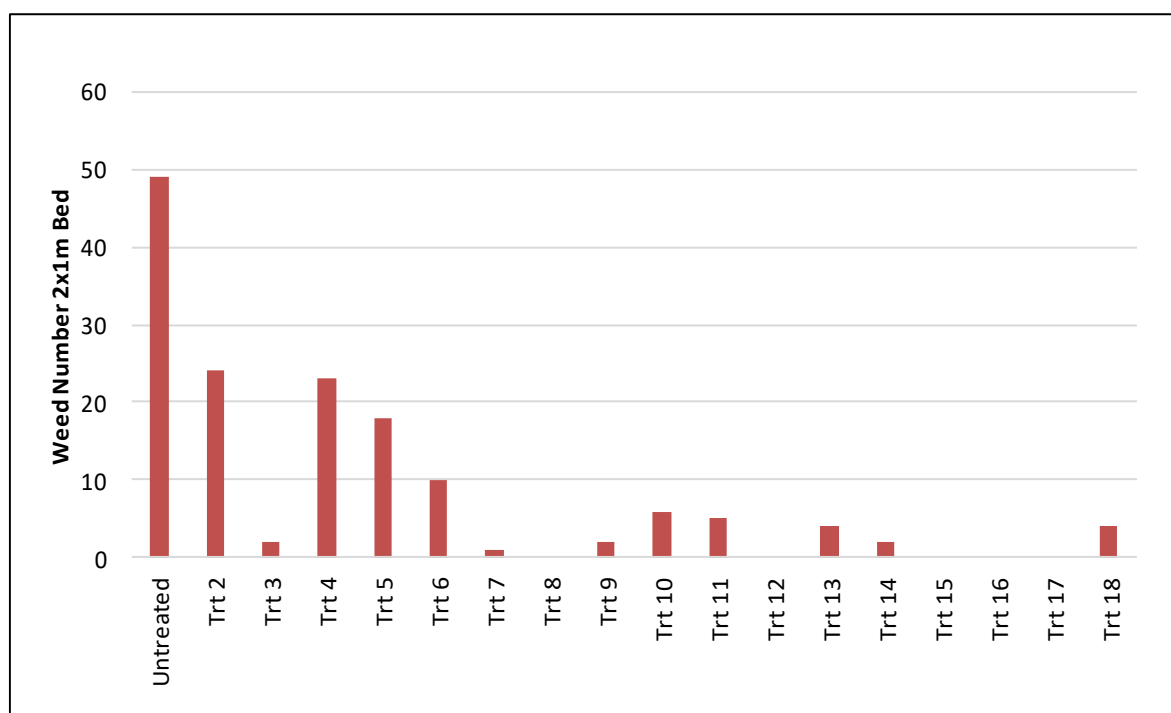


Figure 3 : Weed count – Groundsel assessments 2x1m Bed 14th June

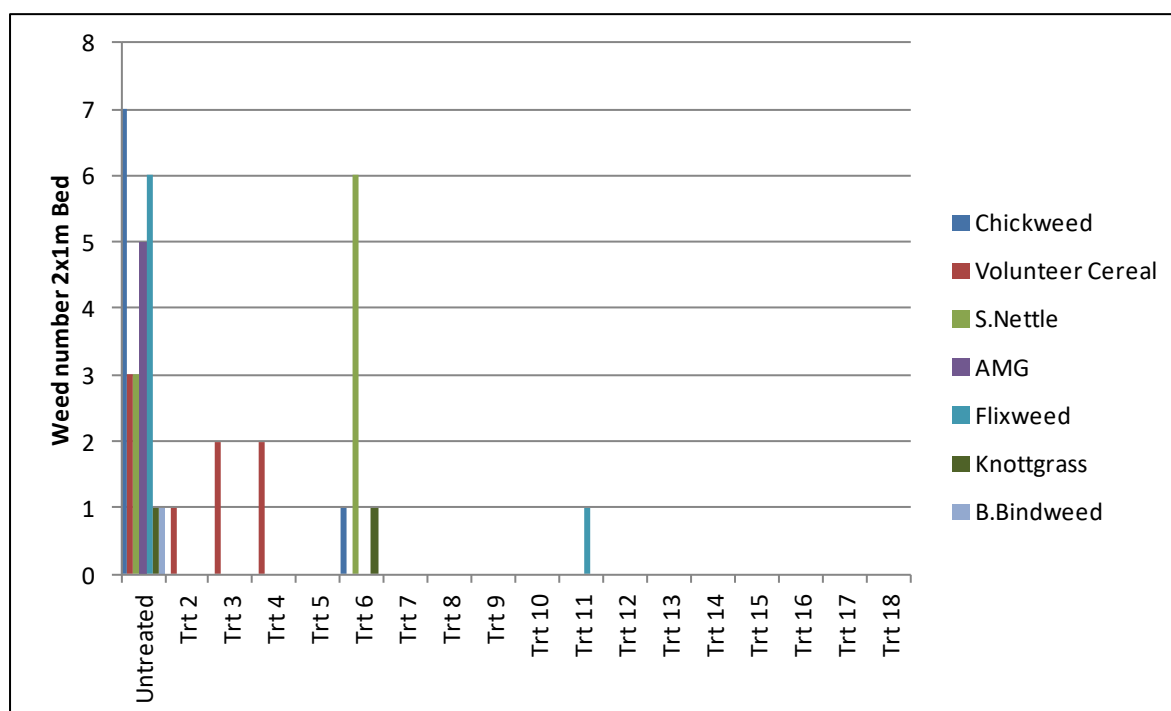


Figure 4 : Block A Weed count assessments 2x1m Bed 14th June

Weed counts, figure 3 and 4, were undertaken on 14th June. The only weed which was observed with significant numbers was Groundsel, Figure 3. No phytotoxicity was observed for any residual only treatments (treatments 1-14).

Observations – Contact Herbicide Phytotoxicity

At an average 15cm crop height, 11th June, a post emergence contact herbicide application was applied to Strip 15, 16, 17 and 18. These treatments were assessed for levels of phytotoxicity – leaf yellowing/chlorosis 10 days after application – see Figure 5

Variety	Phytotoxicity Score (0 none – 9 severe) – post emergence treatments assessed 22 nd June			
	Treatment 15 200g/ha Shotgun	Treatment 16 500g/ha shotgun	Treatment 17 200g/ha Shotgun + 30g/ha Titus+ 200ml NI Wetter	Treatment 18 1.1 Kg/ha Basagran
Gwenne	0	0	Leaf mottle observed	1
Angelique	0	0	Leaf mottle observed	0
Bambino	0	0	Leaf mottle observed	0
Gemson	0	0	Leaf mottle observed	0
Leontine	1	1	Leaf mottle observed	2
Iodea	0	0	Leaf mottle observed	3
Maris Peer	0	0	Leaf mottle observed	0
Georgina	0	0	Leaf mottle observed	0
Brooke	0	0	Leaf mottle observed	0
VR 808	2	3	Leaf mottle observed	0
Innovator	2	6	Leaf mottle observed	1
Forza	1	5	Leaf mottle observed	1
Challenger	0	0	Leaf mottle observed	0
Russet Burbank	0	0	Leaf mottle observed	2
Royal	0	0	Leaf mottle observed	0
Performer	1	2	Leaf mottle observed	0
Rooster	0	0	Leaf mottle observed	0
Lanorma	0	0	Leaf mottle observed	0
Melody	1	3	Leaf mottle observed	1
Jelly	0	0	Leaf mottle observed	0
Red Fantasy	0	3	Leaf mottle observed	1
Soraya	0	0	Leaf mottle observed	0
Nectar	1	1	Leaf mottle observed	0
M.piper	0	0	Leaf mottle observed	0
Sensation	0	1	Leaf mottle observed	0
Shepody	0	2	Leaf mottle observed	0

Figure 5 : Phytotoxicity Score – Post emergence applications

Discussion

An untreated area, Figure 7, allowed an assessment of weed species present on the site, these were dominated by groundsel with a very low level of alternative weeds. Weed species also present at very low levels include annual meadow grass, volunteer cereals, flixweed, s.nettle, knotgrass, chickweed and black bindweed. Figure 8-20 are photos of each residual treatment at 5th July.



Figure 7 : Untreated area 5th July



Figure 8 : Treatment 2 area 5th July



Figure 9 : Treatment 3 area 5th July



Figure 10 : Treatment 4 area 5th July



Figure 11 : Treatment 5 area 5th July



Figure 12 : Treatment 6 area 5th July



Figure 13 : Treatment 7 area 5th July



Figure 14: Treatment 8 area 5th July



Figure 15: Treatment 9 area 5th July



Figure 16: Treatment 10 area 5th July



Figure 17: Treatment 11 area 5th July



Figure 18: Treatment 12 area 5th July



Figure 19: Treatment 13 area 5th July



Figure 20: Treatment 13 area 5th July

It was considered only groundsel was at sufficient levels to allow a comparison of efficacy from the various treatments within this demonstration.

Assessments - Groundsel

The observed total weed count of groundsel from observations on, Figure 21 reveals variation between treatments

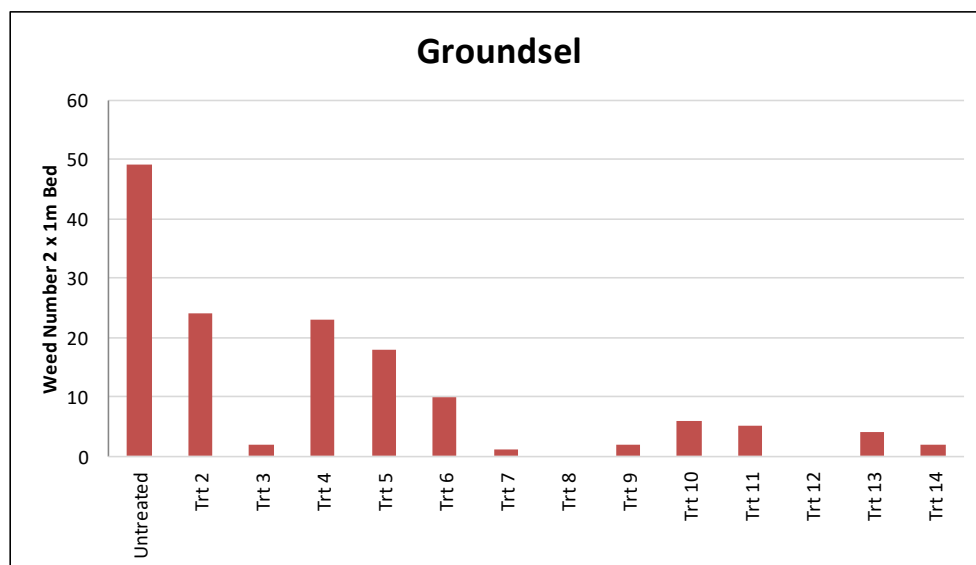


Figure 21 : Groundsel counts Total 4m²

Best Performance

- Trt 8 Shotput (metribuzin 70%) 1.0 kg/ha
- Trt 12 Shotput (metribuzin 70%) 200g/ha + VCS 1717(aclonifen) 2.5 l/ha + Defy (prosulfocarb) 3l/ha
- Trt 7 VCS 1818 (2 actives including clomazone)

Worst Performance

- Trt 2 Praxim(metabromuron) 2.5 l/ha + Stomp aqua(pendimethalin 455g/l) 1.8 l/ha + Shotput (metribuzin 70%) 200g/ha
- Trt 5 VCS 1717 (aclonifen) 2.5 l/ha
- Trt 4 Praxim (metabromuron) 4 l/ha

Assessments – Post Emergence Herbicide Varietal Sensitivity

The application of post emergence herbicides caused varying levels of scorch on this demonstration. The effects of Shotput (metribuzin) were varietal and rate dependant, treatment 15, Shotput 200g/ha (metribuzin 70%w/w) and treatment 16 Shotput 500g/ha (metribuzin 70%w/w), see figure 22-25. The effects of Basagran 1.1kg/ha treatment 18 were also varietal dependant, see figure 26-27.

Overall the levels of scorch due to post emergence metribuzin were lower than would have been anticipated on susceptible varieties within this demonstration.



Figure 22 Innovator



Figure 23 Melody



Figure 24 VR 808

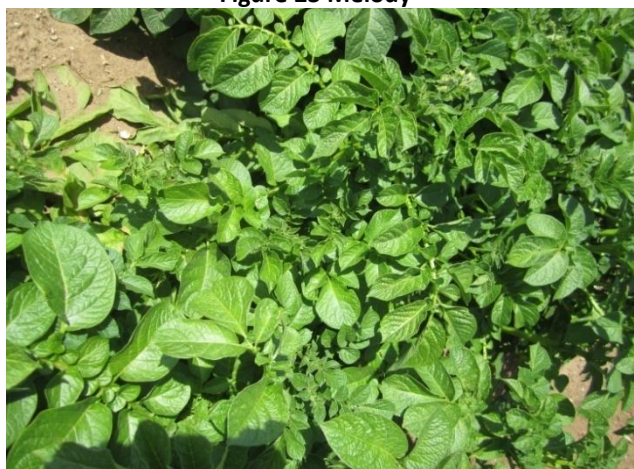


Figure 25 Performer

Treatment 16 Shotput 500g/ha (metribuzin 70%)



Figure 26 Leontine/M. peer



Figure 27 Challenger/R. burbank

Treatment 18 Basagran 1100g/ha (bentazone)

Conclusions – Residual Herbicides

The weed spectrum on this site 2018 was very limited with rapid crop growth quickly suppressing weed growth. Groundsel was the only weed species with sufficient numbers to compare treatments.

The applications of individual a.i. allowed assessment of the strengths and weakness of the a.i. within this demonstration, Figure 28, with respect to groundsel, however it should be noted this was a non replicated demonstration and these are trends observed. Validation of these observations would require replicated trials within multiple sites and ideally more than one season.

Active Ingredient	metribuzin	Metobromuron	pendimethalin	clomazone	VCS 1717	Flufenacet
Weeds						
Groundsel	susceptible	L.susceptible	-	m.susceptible	L.susceptible	-

Figure 28 : Comparison of A.I. performance

All residual applications provided a commercially acceptable performance of weed control on this site, in this season.

Conclusions – Contact Herbicides

Metribuzin

The phytotoxicity and veinal leaf yellowing due to the post emergence metribuzin on this demonstration was less than expected on varieties previously assessed. However a comparison of effects on varieties within treatment 16 (Shotput 500g/ha metribuzin 70%w/w) enables a grouping of varieties in sensitivity bands, Figure 29

Tolerant	Low Sensitivity	Moderate Sensitivity	High Sensitivity
V.Sovereign* Brooke* Marfona Saxon Challenger* Markies	Royal Daisy* Lanorma* R.Burbank Jelly Angelique Bambino Gemson* Rooster Soraya	M.piper Leontine Eurostar Melody Nectar Performer Gwenne Shepody Georgina* Iodea*	Forza Innovator M.Peer VR808

Figure 29 : Sensitivity to metribuzin post emergence * Limited trial data

Basagran

The phytotoxicity/leaf yellowing due to post emergence bentazone was quickly out grown on this site due to high ambient temperatures. A comparison of effects on varieties within treatment 18 (Basagran 1.1kg/ha, bentazone) enables a grouping of varieties within sensitivity bands, Figure 30

Tolerant to Very Low Sensitivity Label 'Ok to treat'	Moderate Sensitivity - Label 'Bordeline'	High Sensitivity - Label 'Do not treat'
M.peer M.piper Gwenne* Angelique* Bambino* Gemson* Iodea* Brooke* Royal* Lanorma* Nectar* Mozart*	Innovator* Rooster* Melody* Forza* Challenger* Soraya* Sensation* Red Fantasy* VR808* Performer* Georgina*	R.Burbank Shepody Leontine* Jelly*

Figure 30 : Sensitivity to bentazone post emergence * Limited trial data

It should be noted all the above observations and assessments for both residual and contact treatments have been assessed from a demonstration block and replication of the treatments over a number of sites would be required to validate the trends observed.

Acknowledgements

VCS Potatoes Ltd would like to thank Elveden Farms, VCS (UK) Ltd and AHDB Potatoes for their assistance with this demonstration.

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VCS Potatoes Ltd

30th March 2019