

Comparing TruFlex[®], Roundup Ready[®] and triazine tolerant canola in high rainfall environments

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Key findings

- All applications of in-crop herbicides reduced annual ryegrass (ARG) weed numbers compared to the untreated control.
- The inclusion of a pre-emergent herbicides reduced weed numbers compared to reliance on post-emergent programs alone.
- A fully Integrated Weed Management program provided effective control of all weeds, whilst reducing the potential for increasing the onset of metabolic resistance developing.
- No significant differences were observed between the pre-emergent herbicides propyzamide or Overwatch[®] for yield and weed control.

Why do the trial?

South Australian mainland growers could grow genetically modified (GM) canola varieties for the first time in 2021. This technology allows for the application of glyphosate over the top of established canola for the control of annual ryegrass and broadleaf weeds.

This trial was set up to compare spray programs, using both pre-emergent and post-emergent herbicide options. Spray programs were compared for differences in weed control when using Roundup Ready[®] or TruFlex[®] technology on weed control and crop yield.

As there is a developing metabolic resistance to Group 9 (previously Group M) herbicides in SA there is also a need to evaluate the benefits of including additional herbicide mode of action groups into a canola spray programs.

How it was done?

Plot size	2.0 m x 10.0 m	Fertiliser	MAP @ 80 kg/ha
Seeding date	April 28, 2021	Seeding	DAP (18:20) + 1% zinc @ 80 kg/ha
	Hart, SA	June 15	Urea 100 kg/ha
		July 10	Urea 100 kg/ha
		July 30	Urea 100 kg/ha
Fungicide	July 10	Aviator [®] Xpro 600 mL/ha (100 L water /ha)	
	August 26	Aviator [®] Xpro 800 mL/ha (100 L water /ha)	
Water rates	Pre-emergent (A) – 100 L/ha 2 – 4 leaf (B), 6 leaf (C), 8 – 10 leaf (D) and 1 flower (E) – 75 L/ha		

Various combinations of glyphosate rates and timings were trialed at Giles Corner in 2021 (Table 1).

Annual ryegrass seed at a 5 kg/ha was broadcast over the trial area just prior to seeding on April 28 and was incorporated by seeding (IBS) 2 – 3 hours prior. No knockdown herbicides were required due to dry conditions and no weed emergence across the site. Seeding was carried out with a knife-point press wheel system on a 20 cm row spacing.

Table 1: Variety and herbicide treatments trialed at Giles Corner.

No.	Variety	Pre-emergent (A) (April 28)	2 - 4 Leaf (B) (June 11)	6 Leaf (C) (July 10)	8 - 10 Leaf (D) (July 30)	First flower (E) (August 12)
		Treatment (rate/ha)				
1	ATR Bonito	UTC	UTC	UTC	UTC	UTC
2	ATR Bonito	Propyzamide 1 L + Atrazine 1.1 kg				
3	Hyola 410 XX	UTC	UTC	UTC	UTC	UTC
4	Hyola 410 XX	Propyzamide 1 L				
5	Hyola 410 XX	Nil	Roundup Ready® PL 1.67 L		Roundup Ready® PL 1.67 L	
6	Hyola 410 XX	Propyzamide 1 L	Roundup Ready® PL 1.67 L		Roundup Ready® PL 1.67 L	
7	Hyola 410 XX	Nil	Roundup Ready® PL 1.67 L			
8	Hyola 410 XX	Nil	Roundup Ready® PL 1.15 L	Roundup Ready® PL 1.15 L		Roundup Ready® PL 1.15 L
9	Hyola 410 XX	Nil		Roundup Ready® PL 1.67 L		Roundup Ready® PL 1.67 L
10	Hyola 410 XX	Nil	Roundup Ready® PL 1.67 L			Roundup Ready® PL 1.67 L
11	Hyola 410 XX	Propyzamide 1 L				Roundup Ready® PL 1.67 L
12	Hyola 410 XX	Nil				Roundup Ready® PL 1.67 L
13	Hyola Garrison XC	Propyzamide 1 L	Roundup Ready® PL 1.15 L + Intervix® 500 mL	Roundup Ready® PL 1.15 L		Roundup Ready® PL 1.67 L
14	Hyola 410 XX	Propyzamide 1 L	Roundup Ready® PL 1.15 L + Clethodim 240 500 mL + Hasten® 1%	Roundup Ready® PL 1.15 L		Roundup Ready® PL 1.67 L
15	Pioneer 43Y29 RR	Propyzamide 1 L	Roundup Ready® PL 1.15 L	Roundup Ready® PL 1.15 L		
16	Pioneer 43Y29 RR	Propyzamide 1 L	Roundup Ready® PL 1.15 L			Roundup Ready® PL 1.67 L
17	Hyola 410 XX	Overwatch® 1.25 L	Roundup Ready® PL 1.15 L + Clethodim 240 500 mL + Hasten® 1%	Roundup Ready® PL 1.15 L		Roundup Ready® PL 1.67 L
18	ATR Bonito	Overwatch® 1.25 L		Clethodim 240 500 mL + Atrazine 1.1 kg + Hasten® 1%		

Results and Discussion

The dry start to the 2021 season resulted in a delayed germination of both canola crops and weed seeds until sufficient soil moisture was received, with crop emergence observed on May 20.

Despite the dry start, good rainfall was received over the trial period, allowing for continued weed germination throughout the season (Figure 1). This was particularly evident in treatments that did not

incorporate pre-emergent herbicides and only relied on post-emergent application for weed control only, allowing weeds to continually germinate in these treatments (Figure 2).

As a result of the delayed germination, patchy establishment occurred with crop growth stages ranging slightly across all plots. Where establishment was varied, increased weed germination was observed due to reduced crop competition. Timing of applications were made based on the most advanced plants using the variety Hyola 410 XX as a guide.

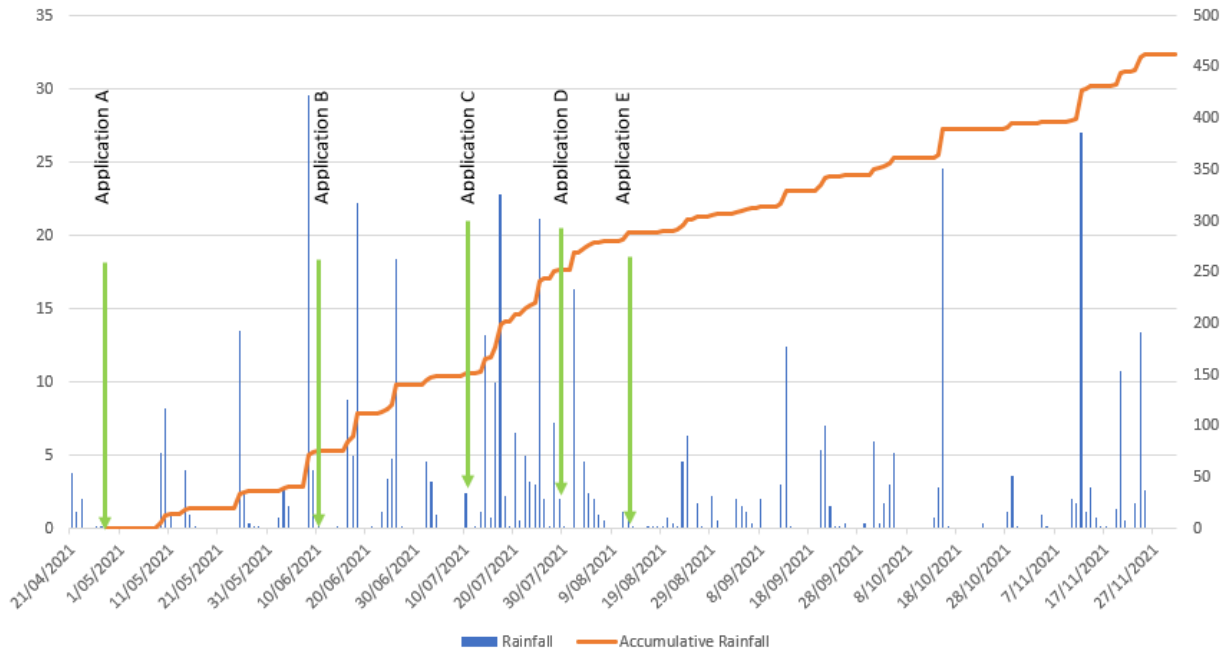


Figure 1. Rainfall records at Giles Corner 2021.

Weed control

The highest level of weed control was gained from treatments incorporating a pre-emergent herbicide, in addition to three in-crop applications of Roundup Ready® PL (Figure 2). Treatments 13,14 and 17 included either propyzamide (Group 3) or Overwatch® (Group 13) as a pre-emergent herbicide (Figure 2 and Appendix 1) and the highest number of modes of action (MOA), reducing the potential of annual ryegrass developing metabolic resistance to Group 1 (previously Group A) and 9 (previously Group M) herbicides.

The use of a spray program that only utilised in-crop post-emergent herbicides provided an effective level of weed control but whilst not been significantly different, offered a reduced level of control compared to the full spray programs (treatments 13,14 and 17).

Roundup Ready® and TruFlex®

The 2021 season saw a dry start and staggered germination, resulting in gaps in the crop (Figure 3). TruFlex® varieties that received the later application of Roundup Ready® PL at first flower (E) provided a higher level of weed control.

Yield differences between the Roundup Ready® and TruFlex® traits was not significantly different, with weed control providing more influence on yield than variety.

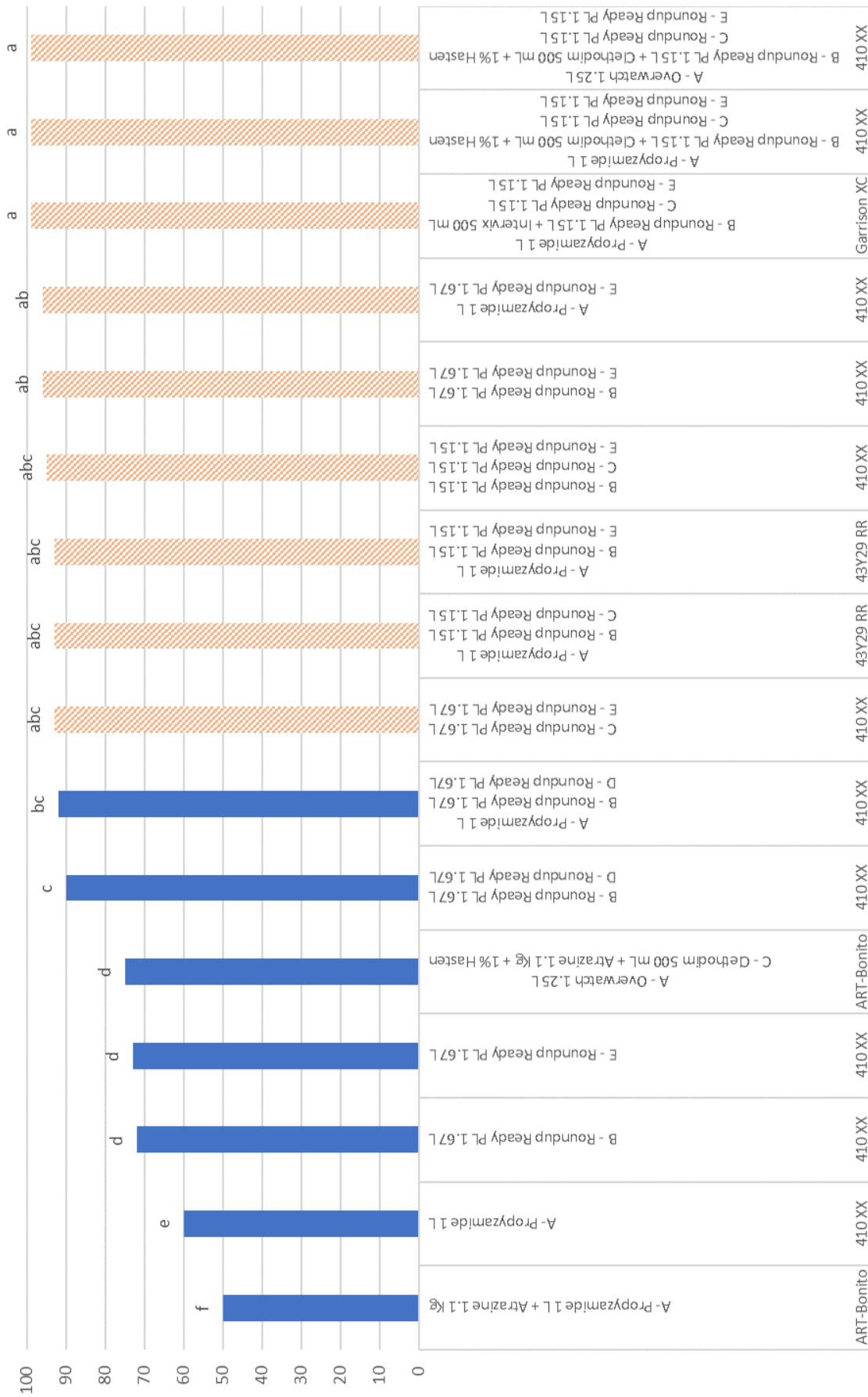


Figure 2. Annual ryegrass control (%) for selected treatments at Giles Corner.

Treatment 16, that included an application of Roundup Ready® PL at first flower on a Roundup Ready® variety, is an off-label application and whilst no significant difference was measured, in many trials this timing has impacted yield and increased crop phytotoxicity and is not recommended.

Impact of pre-emergent herbicides

Overwatch® provided an increased level of weed control (4%) compared to propyzamide applied pre-emergent and prior to the 2 – 4 leaf application. No significant differences were observed between the pre-emergent herbicides after post-emergent herbicide where applied.

Overwatch® produced a level of crop effect, bleaching of young canola leaves (Figure 3) in both varieties treated. Hyola 410 XX recovered 84 days after application A (84 DAA), whereas symptoms in ATR Bonito were still evident at this stage. No crop vigour difference was observed following the use of Overwatch® in this trial.

TruFlex® and Roundup Ready® canola varieties were both suitable options when used with an effective spray program for the control of in-crop weeds in this trial.

The use of a pre-emergent herbicide is a vital tool to be used in either a TruFlex® or Roundup Ready® canola crops to increase the level of weed control gained.

Whilst Overwatch® displayed some level of crop effect, the crop recovered, and no yield penalty was received. Crop vigour played a role in recovery times from any herbicide crop effect, the more vigour the variety had, the more rapid the recovery time.

The use of pre-emergent herbicides in conjunction with an early tank mix of Roundup Ready® PL and Clethodim or Intervix® at the 2 – 4 leaf crop stage provided the most effective post-emergent weed control and may reduce the potential of developing metabolic resistance to these groups of herbicides.



Figure 3. (L-R) Staggered crop emergence at 65 DAA and Overwatch® phytotoxicity on Hyola 410 XX seeding at 65 DAA.

Acknowledgements:

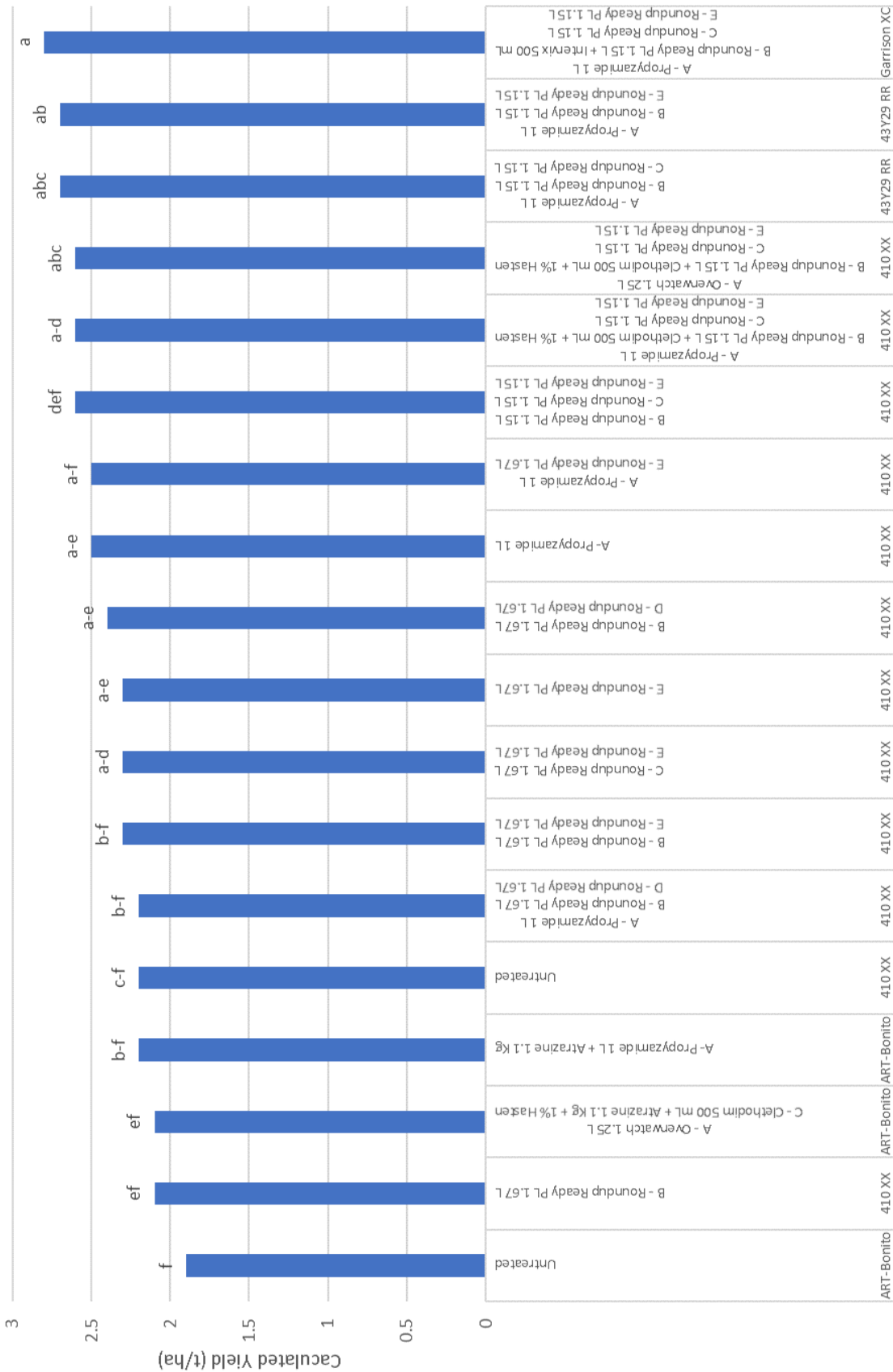
Mid North High Rainfall Zone group for allowing this trial to be conducted on their trial site and SARDI for assisting in seeding and harvest of the trial.

Appendix

Appendix 1. Annual ryegrass control (%) for treatments trialed.

Variety	Spray program	Mode of Action in spray program	11-June 2021 2 to 4 Leaf (B)		10-July-2021 6 Leaf (C)		30-July-2021 8 Leaf (D)			26-August- 2021 120 DAA	
ART-Bonito	Untreated		0	c	0	h	0	i	h	0	g
ART-Bonito	A- propyzamide 1 L + atrazine 1.1 Kg	Group 3 & 5	95	ab	78	e	53	h	g	50	f
410 XX	Untreated		0	c	0	h	0	i	h	0	g
410 XX	A- propyzamide 1 L	Group 3	93	b	65	g	60	g	f	60	e
410 XX	B - Roundup Ready PL 1.67 L D - Roundup Ready PL 1.67L	Group 9	0	c	92	c	72	f	ab	90	c
410 XX	A - propyzamide 1 L B - Roundup Ready PL 1.67 L D - Roundup Ready PL 1.67L	Group 3 & 9	93	b	93	bc	90	c	b	92	bc
410 XX	B - Roundup Ready PL 1.67 L	Group 9	0	c	90	cd	80	e	d	72	d
410 XX	B - Roundup Ready PL 1.15 L C - Roundup Ready PL 1.15 L E - Roundup Ready PL 1.15 L	Group 9	0	c	87	d	95	b	ab	95	ab
410 XX	C - Roundup Ready PL 1.67 L E - Roundup Ready PL 1.67 L	Group 9	0	c	0	h	97	ab	ab	93	bc
410 XX	B - Roundup Ready PL 1.67 L E - Roundup Ready PL 1.67 L	Group 9	0	c	90	cd	63	g	e	96	ab
410 XX	A - propyzamide 1 L E - Roundup Ready PL 1.67 L	Group 3, 9	93	b	73	f	50	h	g	96	ab
410 XX	E - Roundup Ready PL 1.67 L	Group 9	0	c	0	h	0	i	h	73	d
Garrison XC	A - propyzamide 1 L B - Roundup Ready PL 1.15 L + Intervix 500 mL C - Roundup Ready PL 1.15 L E - Roundup Ready PL 1.15 L	Group 2, 3 & 9	95	ab	96	ab	99	a	a	99	a
410 XX	A - propyzamide 1 L B - Roundup Ready PL 1.15 L + clethodim 500 mL + 1% Hasten C - Roundup Ready PL 1.15 L E - Roundup Ready PL 1.15 L	Group 1, 3 & 9	93	b	96	ab	99	a	a	99	a
43Y29 RR	A - propyzamide 1 L B - Roundup Ready PL 1.15 L C - Roundup Ready PL 1.15 L	Group 3, 9	93	b	96	ab	99	a	a	93	bc
43Y29 RR	A - propyzamide 1 L B - Roundup Ready PL 1.15 L E - Roundup Ready PL 1.15 L	Group 3, 9	92	b	96	ab	83	de	c	93	bc
410 XX	A - Overwatch 1.25 L B - Roundup Ready PL 1.15 L + clethodim 500 mL + 1% Hasten C - Roundup Ready PL 1.15 L E - Roundup Ready PL 1.15 L	Group 1, 3 & 9	97	a	99	a	99	a	a	99	a
ART-Bonito	A - Overwatch 1.25 L C - clethodim 500 mL + atrazine 1.1 Kg + 1% Hasten	Group 1, 5 & 13	97	a	96	ab	84	d	c	75	d
	LSD P=.05		3.1		3.4		3.8			3.9	
	Standard Deviation		1.9		2		2.3			2.4	
	CV		3.53		2.92		3.37			3.11	

Values with the same letters are not significantly different.



Appendix 2. Yields (t/ha) for all treatments trialed at Giles Corner in 2021.