



Comparison of spray quality (droplet size) on performance of various herbicides in fallow

Trial location: Mallowa, NSW

Weed target: Feathertop Rhodes grass (*Chloris virgata*) (FTR), Barnyard grass (*Echinochloa spp*) (BYG)

Crop: Fallow

Application: 100L/ha Rainwater 110015 AIXR @ 2 Bar 6km/hr 4 Reps

Application timings at this trial location

	Date	Weed size at Timing 1	Time	Wind	Temp	RH%	Delta T
Timing 1 (T1)	22/12/2025	2 cohorts 'Tillering' and 'Advanced'	8am	10kph S	30.5°C	83%	3.8
Timing 2 (T2)	23/12/2025		9am	6kph WSW	25°C	98%	0.4
Timing 3 (T3)	29/12/2025		8am	13kph SW	20°C	59%	5
Timing 4 (T4)	29/12/2025		3pm	4kph SSW	32°C	26%	14
Timing 5 (T5)	19/01/2026		9am	4kph W	27°C	50%	7.5

For the trial reported here, applications were applied at Timing 1. Double knock applications were made at Timing 3 and 5 respectively from the above table.

Site background

Summer grass weeds such as feathertop Rhodes and barnyard grasses become more difficult to control as weed size increases and as application conditions deteriorate.

Both feathertop Rhodes grass and barnyard grass were present at this site. Barnyard grass was believed to be predominantly *Echinochloa colona* (awnless barnyard grass) but some *Echinochloa crus-galli* (common barnyard grass) may also be present. For this publication we have referred to the population collectively as barnyard grass (*Echinochloa spp.*). There were two cohorts of each weed. Plots were scored individually for each species and assessments separated into 'tillering' (1-3 tiller) and 'advanced' (3 tiller to commencement of flowering) weed sizes at application.

All plots were crossed sprayed with 2.4 L/ha of paraquat (250 gai/L) to create a double knock for those trials and treatments where this was required. Two paraquat cross spray strips were applied, one at 7 days after the main application timing and the other at 28 days after the first application timing. This created a matrix of no double knock; and double knocks applied at either 7 or 28 days between treatments.

Soil moisture was adequate at the first application timing (local BOM sites report ~50mm 10 days prior to the first application timing). There was a 4-6mm rainfall event the night of the first application timing.

Treatments were assessed for initial brownout 16 days after the first application and scored for biomass reduction at 40 days after the initial application.

No formal resistance testing was conducted on this population, but it is expected that there will be some level of glyphosate resistance present in the feathertop Rhodes grass and 'probably' also in the barnyard grass.

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Comparison of different spray application set ups applied to feathertop Rhodes grass (FTR) and barnyard grass (BYG).

This trial was established to compare seven different herbicide combinations when applied with three different nozzles, delivering different spray quality and application volume. The nozzles chosen were selected to be able to compare Coarse versus Very Coarse versus Ultra Coarse at similar spray volume and also to compare results of a single nozzle (IDK120) at 64 versus 97 L/ha.

The nozzle arrangements were as follows

Nozzle & size	Colour	Pressure	Speed	Volume L/ha	Spray quality
AIXR 015	Green	2 bar	6 kph	97 L/ha	Coarse
IDK120 01	Orange	2 bar	4 kph	97 L/ha	Very Coarse
IDK120 01 (64)	Orange	2 bar	6 kph	64 L/ha	Very Coarse
TTI 015	Green	2 bar	6 kph	97 L/ha	Ultra Coarse

Treatment list

The following treatments were applied with each of the 4 nozzle arrangements above

Biffo 3.75 L/ha
Biffo 3.75 L/ha + Terrad'or 40 g/ha + 1% Hasten
Crucial 1.8 L/ha
Crucial 1.8 L/ha + 2,4-D amine 625 1L/ha
Crucial 1.8 L/ha + Terrad'or 40 g/ha + 1% Hasten
Paraquat 250 2.4 L/ha
Paraquat 250 2.4 L/ha + Terrad'or 40 g/ha + 1% Hasten
Untreated

All treatments had 2% liquid AMS added

Results

Full results for each weed species and both weed sizes is reported in the appendix.

While all treatments also had a double knock of paraquat at 7 and 28 days after the initial application, these 'double knocks' are not useful in separation of treatment differences tested in this trial. Hence, we have concentrated on evaluation of the 40 day control score from the first application applied alone.

Similar to other trials applied at this site on this day, control of all herbicides was disappointing. There were five different modes of action included in this trial, so it is unlikely that resistance is the primary factor responsible for the below than expected results.

Control of the 'Advanced' weed size of both grass species was extremely poor, with many treatments failing to demonstrate any control over the untreated. 'Tillering' feathertop Rhodes grass achieved 10-28% biomass reduction. This poor level of overall control did not result in any significant difference between spray quality for any herbicide tested.

Across the herbicides tested, 25-57% reduction in biomass of 'Tillering' barnyard grass was achieved at the final assessment, allowing the following analysis to be conducted on this cohort of barnyard grass.

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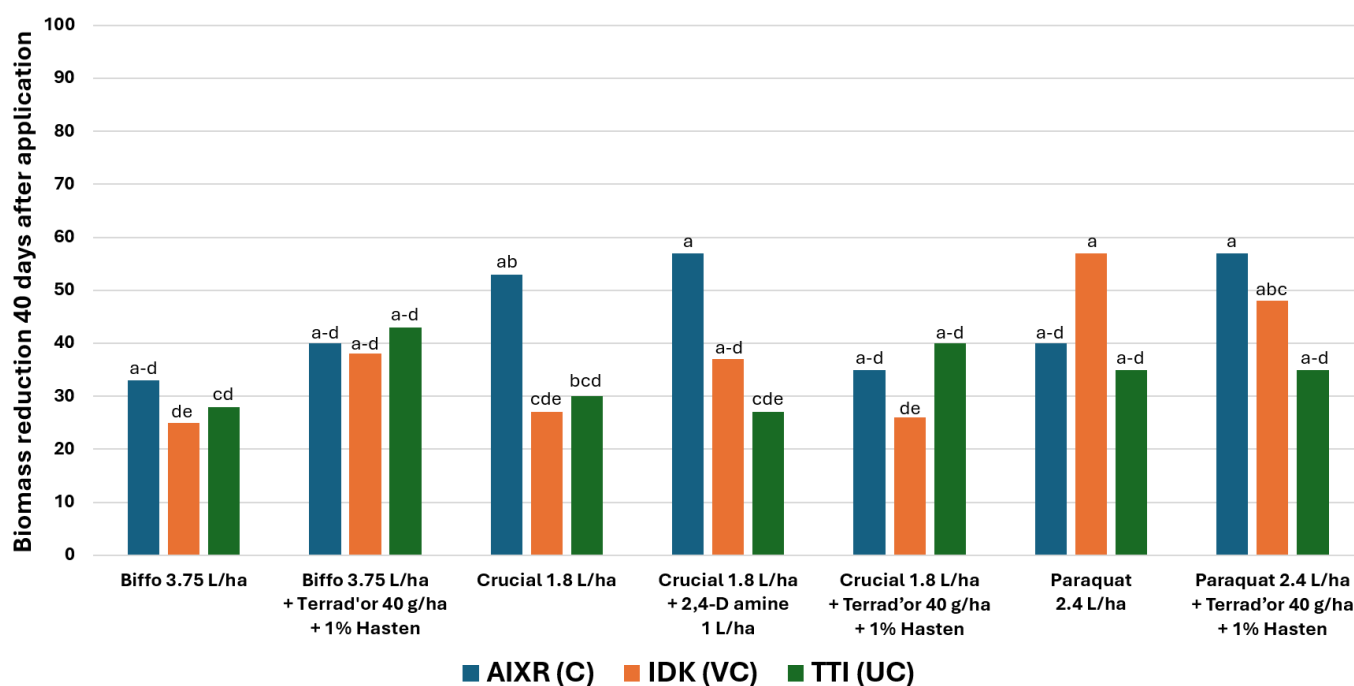
Spray quality

At the operating pressure used in the trial, the trial design allowed comparison of an AIXR nozzle (Coarse), IDK120 (Very Coarse) and TTI (Ultra Coarse) spray quality. The IDK 120 nozzle was an 01 size, so travel speed was reduced (6 kph to 4 kph) to deliver equivalent volume to the other 015 nozzles sizes.

At 97 L/ha spray volume, there was no difference between spray quality for the glufosinate (Biffo and Biffo + Terrad'or) or paraquat (Paraquat and Paraquat + Terrad'or) products. (The addition of Terrad'or to either Biffo, Crucial or paraquat did not improve control).

For glyphosate, there was a trend for better performance when applied as a Coarse spray quality, although this was not always significant. Note that while the Coarse spray quality delivered the numerically highest control for the Crucial + 2,4-D, all 2,4-D must be applied commercially with a spray quality of at least Very Coarse (for spray drift management).

'Tillering' barnyard grass (comparison of 3 spray qualities @ 97 L/ha)



Application volume

The trial design also allowed a comparison of the same nozzle and pressure (and therefore spray quality), but with different application volumes, which was achieved by varying application speed.

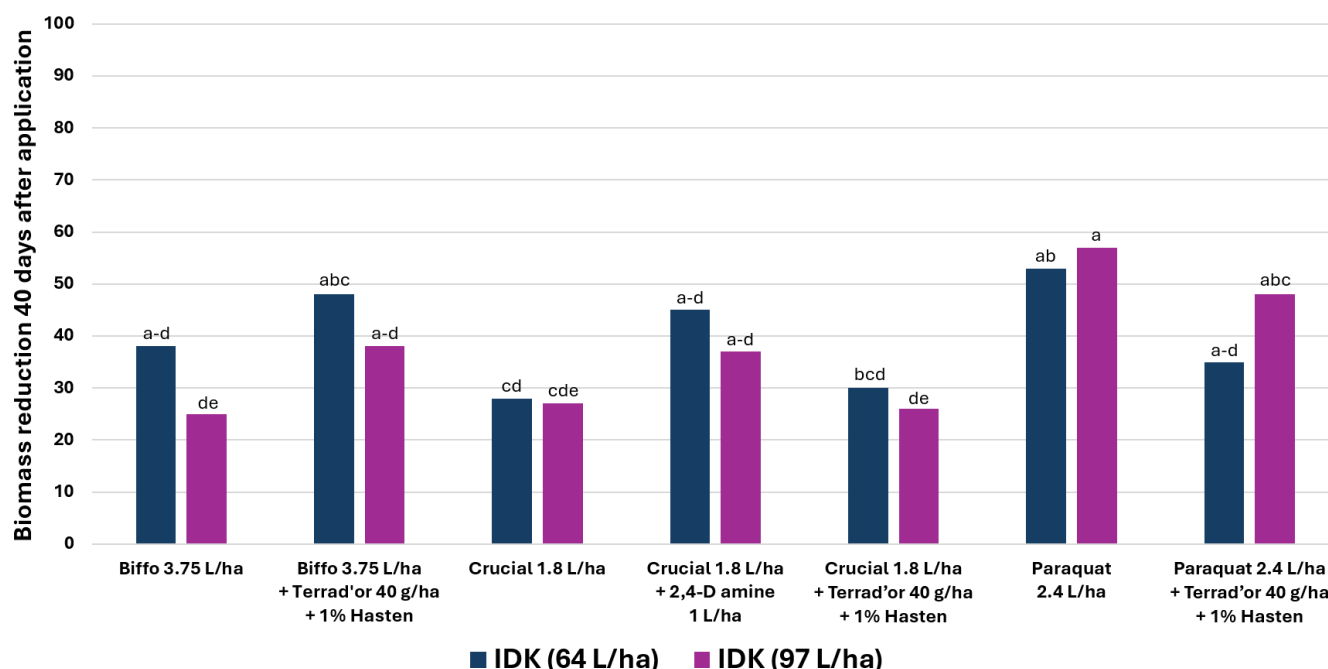
As can be seen from the graph below for 'Tillering' barnyard grass, there was no significant difference for any herbicide treatment when application volume was varied from 64 to 97 L/ha.

However, it should be noted that weed size in this trial was adequate for droplet capture. Commonly response to water rate is mostly seen on very small grass weeds i.e. 1-2 leaf, where there may be inadequate leaf area for droplet capture with the combination of low water volumes and large droplet size.

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'Tillering' barnyard grass (IDK120 nozzle (VC) at 64 or 97 L/ha)



Caution: Low confidence in treatment differentiation from this trial. Due to the poor level of control of all herbicides in this trial, care should be taken when interpreting results.

Herbicides used in this trial

Biffo® (200 g/L glufosinate)
Crucial® (600g/L glyphosate)
Terrad'or® (700 g/kg tiafenacil)
2,4-D amine (625 g/L 2,4-D)
Paraquat® (250 g/L paraquat)
Hasten spray oil

® Registered trademark

Disclaimer: This document is based on the results from individual trials. Variability in product performance is expected across trials and environments. Different outcomes are possible under different trial situations; brand of herbicide applied; environmental conditions before, at and following application; sprayer setup; adjuvant choice; water quality and spray volume; weed size and weed stress; and herbicide resistance status of the population. Trials seek to build on current knowledge – therefore this summary may contain experimental use patterns that are currently not specifically labelled for all of the weed(s) targeted in the trial, or treatments applied at a weed growth stage or application timing that may differ to the product label. In some circumstances, inclusion of a particular treatment is included to demonstrate why this product should not be used in that particular situation. Any research with unregistered agricultural chemicals or of unregistered products, rates or use patterns reported in this document does not constitute a recommendation for that particular use by the authors or the authors' organisations. All agricultural chemical applications must accord with the currently registered label for that particular agricultural chemical, crop and region.

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Appendix

DK = Double knock of 2.4 L/ha paraquat 250 applied 7 or 28 days after the initial application.

Results highlighted in blue had less than 3 replicates included in the average, due to no plants available to be assessed in the remaining replicates. These results should be viewed with caution.

Tillering feathertop Rhodes grass (*Chloris virgata*)

All herbicide rates per hectare				Brownout 16 DAA		Biomass reduction 40DAA1				
						Alone		DK @7DAA		DK @28DAA
AIXR 015 (Coarse @ 97 L/ha)										
1	Biffo (3.75)	20	efg	20	abc	23	a-d	30	a-e	
2	Biffo (3.75) + Terrad’or (40 g) + 1% Hasten	25	c-g	18	a-d	23	a-d	20	b-e	
3	Crucial (1.8 L)	18	efg	28	a	50	a	38	abc	
4	Crucial (1.8 L) + 2,4-D amine 625 (1 L)	23	c-g	10	cd	23	bcd	43	ab	
5	Crucial (1.8 L) + Terrad’or (40 g) + 1% Hasten	23	d-g	17	a-d	25	a-d	17	cde	
6	Paraquat 250 (2.4 L)	23	c-g	13	a-d	37	a-d	30	a-e	
7	Paraquat 250 (2.4L) + Terrad’or (40g) + 1% Hasten	28	b-f	15	a-d	48	ab	33	a-d	
8	Untreated									
TTI 015 (Ultra Coarse @ 97 L/ha)										
9	Biffo (3.75)	33	a-e	10	cd	33	a-d	33	a-d	
10	Biffo (3.75) + Terrad’or (40 g) + 1% Hasten	28	b-f	15	a-d	17	d	27	a-e	
11	Crucial (1.8 L)	10	gh	15	a-d	20	cd	20	b-e	
12	Crucial (1.8 L) + 2,4-D amine 625 (1 L)	13	fgh	18	a-d	27	a-d	43	ab	
13	Crucial (1.8 L) + Terrad’or (40 g) + 1% Hasten	20	efg	23	abc	40	a-d	33	a-d	
14	Paraquat 250 (2.4 L)	30	a-f	10	cd	20	cd	7	e	
15	Paraquat 250 (2.4L) + Terrad’or (40g) + 1% Hasten	33	a-e	10	cd	48	ab	35	abc	
16	Untreated									
IDK 120 (Very Coarse @ 64 l/ha)										
17	Biffo (3.75)	30	a-f	15	a-d	20	cd	25	b-e	
18	Biffo (3.75) + Terrad’or (40 g) + 1% Hasten	20	efg	10	bcd	28	a-d	23	b-e	
19	Crucial (1.8 L)	13	fgh	17	a-d	13	d	27	a-e	
20	Crucial (1.8 L) + 2,4-D amine 625 (1 L)	10	gh	18	a-d	28	a-d	23	b-e	
21	Crucial (1.8 L) + Terrad’or (40 g) + 1% Hasten	13	fgh	20	abc	30	a-d	27	a-e	
22	Paraquat 250 (2.4 L)	40	a-d	23	abc	27	a-d	27	a-e	
23	Paraquat 250 (2.4L) + Terrad’or (40g) + 1% Hasten	20	efg	23	abc	40	a-d	43	ab	
24	Untreated									
IDK 120 (Very Coarse @ 97 l/ha)										
25	Biffo (3.75)	27	b-g	10	cd	23	a-d	20	b-e	
26	Biffo (3.75) + Terrad’or (40 g) + 1% Hasten	43	ab	20	abc	43	a-d	30	a-e	
27	Crucial (1.8 L)	23	c-g	30	a	47	abc	50	a	
28	Crucial (1.8 L) + 2,4-D amine 625 (1 L)	10	gh	23	abc	40	a-d	37	abc	
29	Crucial (1.8 L) + Terrad’or (40 g) + 1% Hasten	23	c-g	13	a-d	23	a-d	30	a-e	
30	Paraquat 250 (2.4 L)	40	abc	25	ab	40	a-d	10	ae	
31	Paraquat 250 (2.4L) + Terrad’or (40g) + 1% Hasten	45	a	13	bcd	43	a-d	38	abc	
32	Untreated									

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Tillering barnyard grass (*Echinochloa* spp.)

		Brownout 16 DAA		Biomass reduction 40DAA1					
				Alone		DK @7DAA		DK @28DAA	
AIXR 015 (Coarse @ 97 L/ha)									
1	Biffo (3.75)	17	d-g	33	a-d	40	b	55	ab
2	Biffo (3.75) + Terrad’or (40 g) + 1% Hasten	25	b-f	40	a-d	60	ab	55	ab
3	Crucial (1.8 L)	10	efg	53	ab	63	ab	48	ab
4	Crucial (1.8 L) + 2,4-D amine 625 (1 L)	27	b-f	57	a	67	ab	77	a
5	Crucial (1.8 L) + Terrad’or (40 g) + 1% Hasten	25	b-f	35	a-d	48	ab	57	ab
6	Paraquat 250 (2.4 L)	17	d-g	40	a-d	60	ab	53	ab
7	Paraquat 250 (2.4L) + Terrad’or (40g) + 1% Hasten	43	ab	57	a	45	ab	53	ab
8	Untreated								
TTI 015 (Ultra Coarse @ 97 L/ha)									
9	Biffo (3.75)	33	a-d	28	cd	50	ab	53	ab
10	Biffo (3.75) + Terrad’or (40 g) + 1% Hasten	23	c-f	43	a-d	50	ab	47	ab
11	Crucial (1.8 L)	10	efg	30	bcd	48	ab	53	ab
12	Crucial (1.8 L) + 2,4-D amine 625 (1 L)	13	d-g	27	cde	45	ab	77	a
13	Crucial (1.8 L) + Terrad’or (40 g) + 1% Hasten	25	b-f	40	a-d	67	ab	60	ab
14	Paraquat 250 (2.4 L)	27	b-f	35	a-d	60	ab	55	ab
15	Paraquat 250 (2.4L) + Terrad’or (40g) + 1% Hasten	40	abc	35	a-d	70	ab	50	ab
16	Untreated								
IDK 120 (Very Coarse @ 64 l/ha)									
17	Biffo (3.75)	20	def	38	a-d	55	ab	40	b
18	Biffo (3.75) + Terrad’or (40 g) + 1% Hasten	20	c-f	48	abc	63	ab	73	ab
19	Crucial (1.8 L)	17	d-g	28	cd	53	ab	67	ab
20	Crucial (1.8 L) + 2,4-D amine 625 (1 L)	10	fg	45	a-d	53	ab	55	ab
21	Crucial (1.8 L) + Terrad’or (40 g) + 1% Hasten	20	def	30	bcd	45	ab	50	ab
22	Paraquat 250 (2.4 L)	48	a	53	ab	63	ab	70	ab
23	Paraquat 250 (2.4L) + Terrad’or (40g) + 1% Hasten	28	b-f	35	a-d	53	ab	73	ab
24	Untreated								
IDK 120 (Very Coarse @ 97 l/ha)									
25	Biffo (3.75)	28	b-f	25	de	67	ab	38	b
26	Biffo (3.75) + Terrad’or (40 g) + 1% Hasten	30	a-e	38	a-d	58	ab	57	ab
27	Crucial (1.8 L)	20	def	27	cde	70	ab	77	a
28	Crucial (1.8 L) + 2,4-D amine 625 (1 L)	10	efg	37	a-d	47	ab	55	ab
29	Crucial (1.8 L) + Terrad’or (40 g) + 1% Hasten	30	b-e	26	de	40	b	73	ab
30	Paraquat 250 (2.4 L)	50	a	57	a	80	a	75	ab
31	Paraquat 250 (2.4L) + Terrad’or (40g) + 1% Hasten	48	a	48	abc	67	ab	60	ab
32	Untreated								

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Advanced feathertop Rhodes growth (*Chloris virgata*)

		Brownout 16 DAA		Biomass reduction 40DAA1					
				Alone		DK @7DAA		DK @28DAA	
AIXR 015 (Coarse @ 97 L/ha)									
1	Biffo (3.75)	20	c-h	0	cd	20	ab	10	cde
2	Biffo (3.75) + Terrad’or (40 g) + 1% Hasten	20	d-h	15	a	15	ab	25	a-e
3	Crucial (1.8 L)	15	fgh	10	a-d	7	b	30	a-e
4	Crucial (1.8 L) + 2,4-D amine 625 (1 L)	10	ghi	13	ab	13	ab	35	a-e
5	Crucial (1.8 L) + Terrad’or (40 g) + 1% Hasten	15	fgh	8	a-d	20	ab	17	b-e
6	Paraquat 250 (2.4 L)	17	e-h	0	cd	23	ab	10	e
7	Paraquat 250 (2.4L) + Terrad’or (40g) + 1% Hasten	30	a-d	8	a-d	20	ab	50	ab
8	Untreated								
TTI 015 (Ultra Coarse @ 97 L/ha)									
9	Biffo (3.75)	33	abc	0	cd	10	ab	20	b-e
10	Biffo (3.75) + Terrad’or (40 g) + 1% Hasten	20	d-h	10	abc	15	ab	13	cde
11	Crucial (1.8 L)	10	ghi	10	a-d	10	ab	30	a-e
12	Crucial (1.8 L) + 2,4-D amine 625 (1 L)	10	hi	8	a-d	10	ab	55	a
13	Crucial (1.8 L) + Terrad’or (40 g) + 1% Hasten	25	b-g	5	a-d	13	ab	23	a-e
14	Paraquat 250 (2.4 L)	30	a-e	8	a-d	18	ab	18	b-e
15	Paraquat 250 (2.4L) + Terrad’or (40g) + 1% Hasten	33	abc	10	a-d	30	ab	10	e
16	Untreated								
IDK 120 (Very Coarse @ 64 l/ha)									
17	Biffo (3.75)	10	ghi	0	cd	13	ab	13	cde
18	Biffo (3.75) + Terrad’or (40 g) + 1% Hasten	20	c-h	10	abc	20	ab	20	a-e
19	Crucial (1.8 L)	13	fgh	5	a-d	15	ab	43	abc
20	Crucial (1.8 L) + 2,4-D amine 625 (1 L)	10	hi	8	a-d	17	ab	20	b-e
21	Crucial (1.8 L) + Terrad’or (40 g) + 1% Hasten	20	d-h	7	a-d	20	ab	20	b-e
22	Paraquat 250 (2.4 L)	40	a	13	ab	20	ab	40	a-d
23	Paraquat 250 (2.4L) + Terrad’or (40g) + 1% Hasten	28	a-e	0	cd	20	ab	17	b-e
24	Untreated								
IDK 120 (Very Coarse @ 97 l/ha)									
25	Biffo (3.75)	25	b-f	5	a-d	10	ab	20	b-e
26	Biffo (3.75) + Terrad’or (40 g) + 1% Hasten	25	b-f	0	cd	20	ab	23	a-e
27	Crucial (1.8 L)	17	e-h	0	cd	33	a	40	a-d
28	Crucial (1.8 L) + 2,4-D amine 625 (1 L)	10	ghi	0	cd	23	ab	37	a-e
29	Crucial (1.8 L) + Terrad’or (40 g) + 1% Hasten	15	fgh	4	bcd	10	ab	33	a-e
30	Paraquat 250 (2.4 L)	37	ab	13	ab	35	a	25	a-e
31	Paraquat 250 (2.4L) + Terrad’or (40g) + 1% Hasten	40	a	8	a-d	20	ab	10	de
32	Untreated								

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Advanced barnyard grass (*Echinochloa* spp.)

		Brownout 16 DAA		Biomass reduction 40DAA1					
				Alone		DK @7DAA		DK @28DAA	
AIXR 015 (Coarse @ 97 L/ha)									
1	Biffo (3.75)	20	d-h	0	cd	20	ab	10	cde
2	Biffo (3.75) + Terrad’or (40 g) + 1% Hasten	20	c-h	15	a	15	ab	25	a-e
3	Crucial (1.8 L)	15	fgh	10	a-d	7	b	30	a-e
4	Crucial (1.8 L) + 2,4-D amine 625 (1 L)	10	ghi	13	ab	13	ab	35	a-e
5	Crucial (1.8 L) + Terrad’or (40 g) + 1% Hasten	15	fgh	8	a-d	20	ab	17	b-e
6	Paraquat 250 (2.4 L)	17	e-h	0	cd	23	ab	10	e
7	Paraquat 250 (2.4L) + Terrad’or (40g) + 1% Hasten	30	a-d	8	a-d	20	ab	50	ab
8	Untreated								
TTI 015 (Ultra Coarse @ 97 L/ha)									
9	Biffo (3.75)	33	abc	0	cd	10	ab	20	b-e
10	Biffo (3.75) + Terrad’or (40 g) + 1% Hasten	20	d-h	10	abc	15	ab	13	cde
11	Crucial (1.8 L)	10	ghi	10	a-d	10	ab	30	a-e
12	Crucial (1.8 L) + 2,4-D amine 625 (1 L)	10	hi	8	a-d	10	ab	55	a
13	Crucial (1.8 L) + Terrad’or (40 g) + 1% Hasten	25	b-g	5	a-d	13	ab	23	a-e
14	Paraquat 250 (2.4 L)	30	a-e	8	a-d	18	ab	18	b-e
15	Paraquat 250 (2.4L) + Terrad’or (40g) + 1% Hasten	33	abc	10	a-d	30	ab	10	e
16	Untreated								
IDK 120 (Very Coarse @ 64 l/ha)									
17	Biffo (3.75)	10	ghi	0	cd	13	ab	13	cde
18	Biffo (3.75) + Terrad’or (40 g) + 1% Hasten	20	c-h	10	abc	20	ab	20	a-e
19	Crucial (1.8 L)	13	fgh	5	a-d	15	ab	43	abc
20	Crucial (1.8 L) + 2,4-D amine 625 (1 L)	10	hi	8	a-d	17	ab	20	b-e
21	Crucial (1.8 L) + Terrad’or (40 g) + 1% Hasten	20	d-h	7	a-d	20	ab	20	b-e
22	Paraquat 250 (2.4 L)	40	a	13	ab	20	ab	40	a-d
23	Paraquat 250 (2.4L) + Terrad’or (40g) + 1% Hasten	28	a-e	0	cd	20	ab	17	b-e
24	Untreated								
IDK 120 (Very Coarse @ 97 l/ha)									
25	Biffo (3.75)	25	b-f	5	a-d	10	ab	20	b-e
26	Biffo (3.75) + Terrad’or (40 g) + 1% Hasten	25	b-f	0	cd	20	ab	23	a-e
27	Crucial (1.8 L)	17	e-h	0	cd	33	a	40	a-d
28	Crucial (1.8 L) + 2,4-D amine 625 (1 L)	10	ghi	0	cd	23	ab	37	a-e
29	Crucial (1.8 L) + Terrad’or (40 g) + 1% Hasten	15	fgh	4	bcd	10	ab	33	a-e
30	Paraquat 250 (2.4 L)	37	ab	13	ab	35	a	25	a-e
31	Paraquat 250 (2.4L) + Terrad’or (40g) + 1% Hasten	40	a	8	a-d	20	ab	10	de
32	Untreated								

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