GOA Trial Site Report

Impact of delaying the application of (i) unregistered 1[1] herbicide + paraquat and (ii) Targa™ with double knock of paraquat on the control of Windmill grass (*Chloris truncata*)

Trial Code: GOWE05519

Season/Year: Summer 2018/19

Location: 'North Parkes Mine', Parkes

Collaborators: Matthew Burkett

Keywords

GOWE055, Windmill grass, Double knock, Tank mixes, Herbicide resistance, Targa™, paraquat, *Chloris truncata,* Parkes

Take home messages

Apply knockdown herbicides to Windmill Grass (WMG) sooner after rain, rather than later.

Knockdown herbicide options used in this study may have some residual effect on WMG and should be further investigated.

Timing of both products influences level of control. Application timing of UnReg1+PQ, a potentially valuable new option, may be critical, and warrants more investigation.

Background

Previous GOA trials found that a combination of an unregistered herbicide (UnReg 1) plus paraquat (PQ) can provide very effective knockdown control of mature Windmill grass (WMG) *Chloris truncata* when used as a single pass, standalone treatment. Similarly, there is a minor use permit[2] for the use of Targa™ followed by a double knock of paraquat (TfbPQ) for WMG control in summer fallows. However, level of control tended to be variable. This inconsistency is thought to be because of application timing after rainfall and its effect on residual herbicide activity, combined with impact of soil moisture and plant stress.

One possible way to address herbicide performance variability, is to assess if application timing effectiveness is related to rainfall amount and timing. Also if subsequent WMG growth has any relationship to herbicide efficacy. Previous GOA research suggested that efficacy of glyphosate or Targa™ tended to decline 2-3 weeks after rain. Similar research has not been undertaken with UnReg 1+PQ, nor TfbPQ

DISCLAIMER

Following is a report on a scientific experiment. It may contain some herbicide treatments that are not registered for the situation, manner, or rate at which they are used in this trial. This document or

[1]Experimental 1 is a Group H herbicide registered for use in fallows but not registered for use on Windmill Grass (however is registered for Feathertop Rhodes Grass another Chloris species and Fleabane)

[2] Minor permit number PER13460 http://permits.apvma.gov.au/PER13460.PDF

anything else resulting from, construed or taken from this or by GOA or its representatives should not be taken as a suggestion, recommendation or endorsement of any unregistered herbicide uses.

Aim

Determine if the effectiveness of WMG control by UnReg1+PQ herbicide mix or Targa™ followed by paraquat, changes in relation to herbicide time after a 'growth' rain event.

Method

A small scale randomised complete block plot trial with three replications was established in summer 2018/19 at Parkes, NSW. There was a uniform WMG population, with several plants in the flowering stage. Good rain[3] in November (87mm) and 26 mm between the 11th and 14th December ensured WMG was fresh at initial time of application.

All treatments used a water volume of 100 L/ha through AIXR110-015 (coarse) nozzles at 3bar. Treatments were sprayed with herbicide between 20th December 2018 and 4th January 2019. On 5/2/2019 30 WMG 'buts' from each plot were assessed for presence of green shoots and level of 'control'. 11 months later, 8/11/2018, plant counts were taken, and level of 'control' calculated. On 13/5/2020 biomass reduction was assessed as follows: plots with no WMG had 100% reduction while plots with the heaviest WMG had 0% reduction.

Results were analysed using ASREML (Butler, 2017) for the analysis of variance and results compared by using a least significant difference (LSD) method with a 95% confidence interval. Any references to differences between treatments should be assumed statistically different unless otherwise stated.

The initial herbicide treatments are listed in Table 1 and timings of the applications are listed in

Table 2.

Table 1. Herbicides, rates and abbreviations

Unregistered product 1 (100 mL/ha) + paraquat (2000 mL/ha)	UnReg1+PQ
Targa™ (500 ml/ha) followed by paraquat (2000 mL/ha) applied at 8 days	TfbPQ

Table 2. Herbicide application and assessment dates

Event	Notes	Date
Rain	Approximately 26 mm	11-14/12/2018
Timing 1	6 days post rain	20/12/2018
Timing 2	10 days post rain	24/12/2018
Timing 3	14 days post rain	28/12/2018
Timing 4	17 days post rain	31/12/2018
Timing 5	21 days post rain	4/1/2019
First Assessment	47DAA*	5/2/2019
Second Assessment	323DAA*	8/11/2019
Third Assessment	510DAA*	13/5/2020

*Days after initial application

[3] Recorded at the Goonumbla (Avondale) Station (No# 50002) approximately 3/6 km from the trial site

Rainfall

Trial area contained an established population of WMG grass and had a history of WMG infestations. It is possible that November 2018 rain (>100mm) germinated or activated existing WMG populations and a further 26 mm in mid-December freshened WMG up. When initial herbicide applications were applied WMG was flowering and nearing maturity. 2019 was one of the driest years on record with only 229 mm recorded nearby the trial site. Drought was broken by good rain in February and March 2020, before the final assessment.

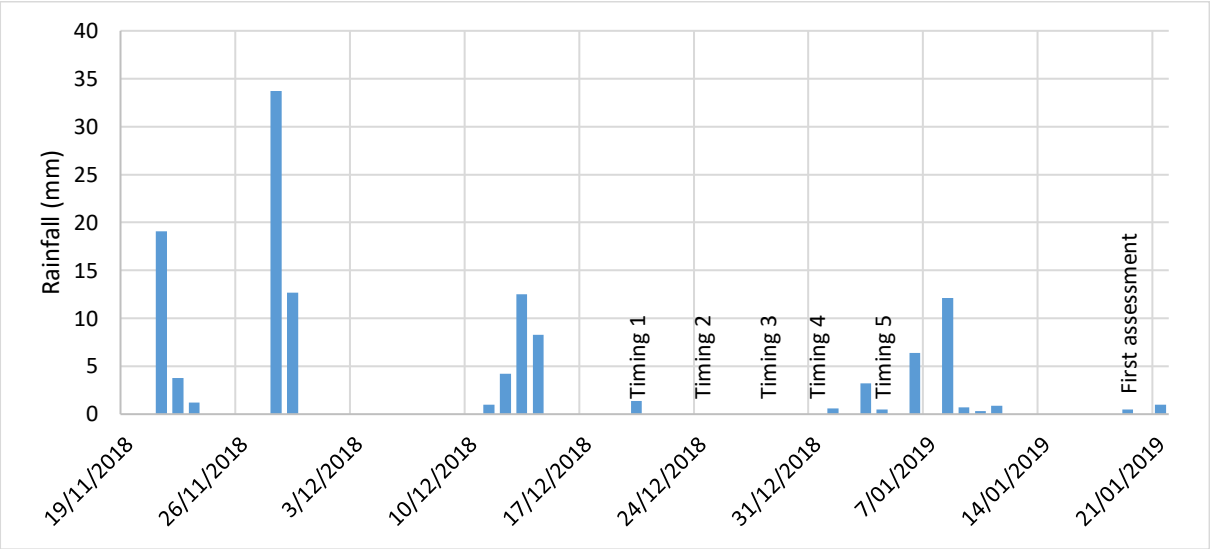

Figure 1. Rainfall (mm) recorded at the Goonumbla (Avondale) Station (No# 50002) approximately 3 km from the trial site from the trial site.

Results

The full set of results is available in Appendix 1.

Control: Levels of control assessed 47DAA for both products was better than untreated control (UTC) regardless of timing (Figure 2) and was generally greater than 90%. However exceptions were TfbPQ applied 17DAA (65%) and UnReg1+PQ applied 10 days post rain (83%).

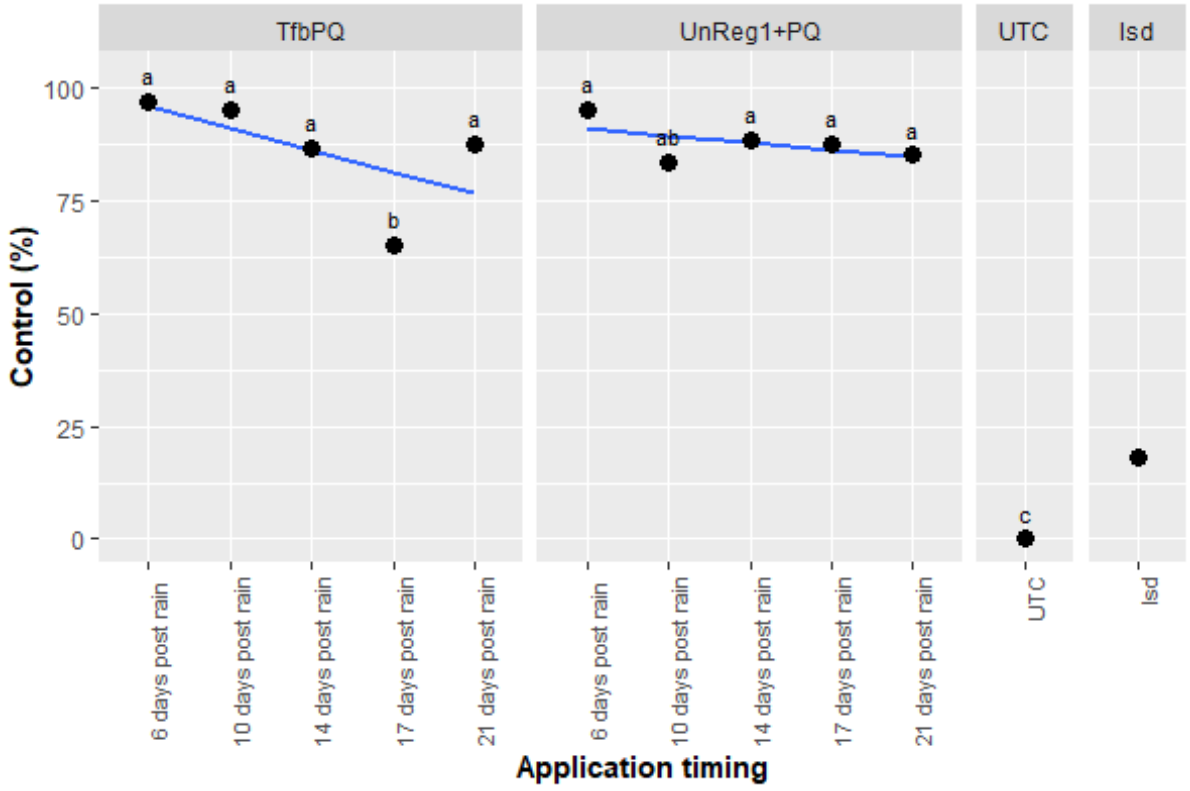

Figure 2. Windmill Grass control (%), assessed 47 DAA.

When assessed 323DAA all treatments were better than the untreated. Two treatments had greater than 90% control, TfbPQ applied 6 and 10 days after rain respectively (Figure 3).

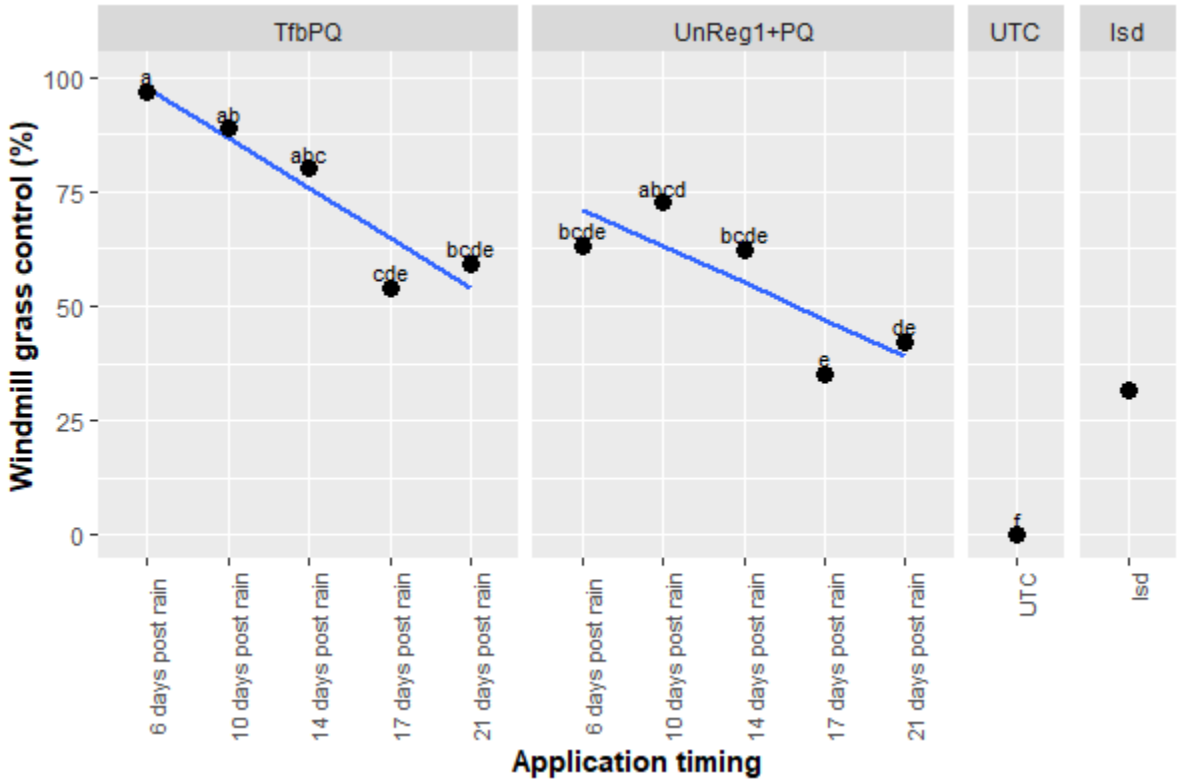

Figure 3. Windmill Grass control (%), assessed 323 DAA.

Biomass reduction: was assessed 510DAA (**Error! Reference source not found.**). The treatment effects followed similar trends to the previous assess, giving some confidence that the effects had carried through. Only one treatment had a biomass reduction of greater than 90%, TfgPQ applied 6 days post rain. 17 and 21 days post rain application of TfbPQ had significantly less biomass reduction than 6 days post rain treatment (Figure 4). All treated plots were significantly different to the UTC.

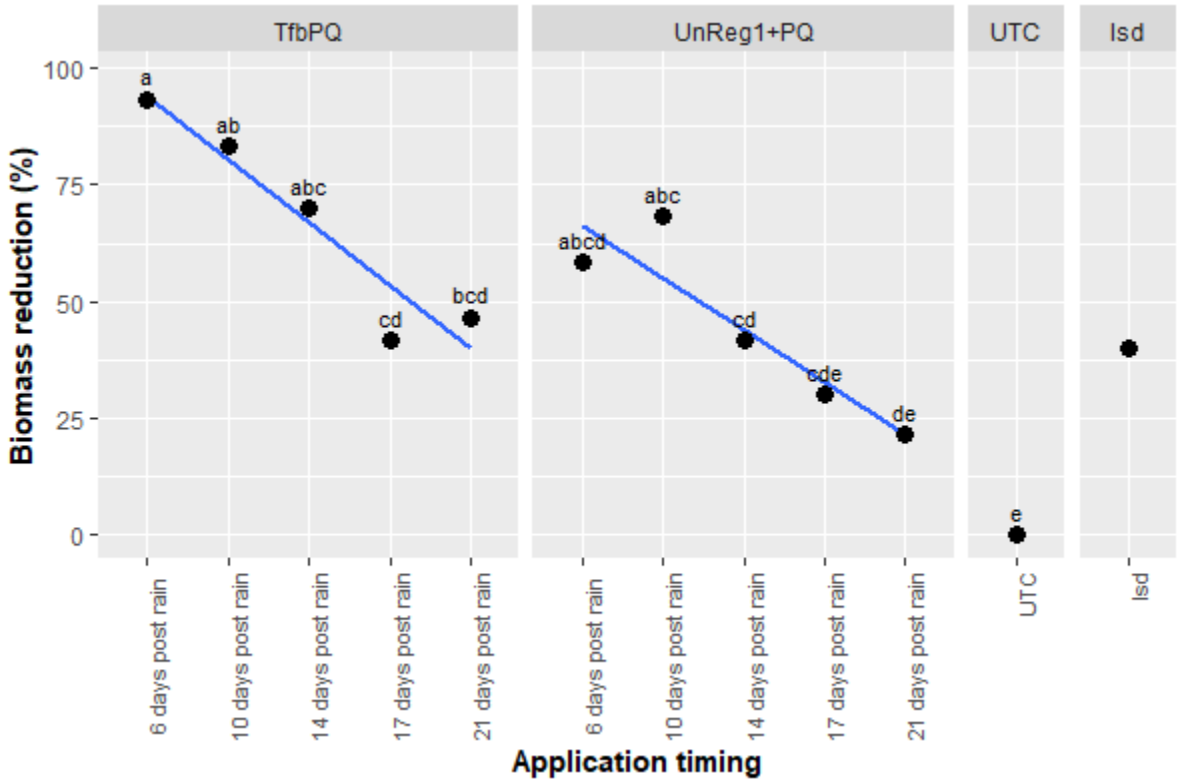

Figure 4. Windmill Grass control (%), assessed 510 DAA.

Discussion

High levels of WMG control were achieved with both products when assessed 1.5 months after application. There was little differentiation in performance of both products and timing of herbicide application, with a couple of exceptions (that are difficult to explain). While statistically not significant there was a weak trend towards lower levels of control with delayed applications. This trend appears to strengthen with later assessments, suggesting that application sooner after rain may result in more consistent levels of control over the longer term.

Only a meagre 224 mm of rain fell on the trial from the time it was established till assessment at 323DAA, probably the driest such period on record. And rain that did fall tended to be in small amounts, with no real 'wet periods'. It is unlikely that there was enough rain to germinate windmill grass during this time, with efficacy most likely relating to WMG buts present at time of treatment application.

From February to May 2020 there was close to 260 mm, an above average wet period. A substantial re-establishment of WMG was observed in the surrounding paddock with significant biomass by May. Biomass reduction in the trial, observed at 510DAA (13/5/2020) assessment, was unable to differentiated between established WMG plants carried over (from initial spraying time), or from new germinations. Hence, any differences in biomass could be either as a result of the initial reduction in the original populations or influencing re-establishment or both.

Assessments conducted at 323 and 510DAA (11 and 17 months respectively) exceed normal timeframes for plot type herbicide trials. Data was collected as more of a 'guide' and collection of useful information than for a definitive outcome. Observed treatment differences are possibly due to

residual aspects of both herbicides. 2019 was a very dry year. From time of application (December 2018) till the drought broke (February 2020) there was only 262 mm. The UnReg1 label has various recommendations in regards to plant back intervals, ranging from 10 weeks to 21 months and 100 to 500 mm. Label advice notes 'prolonged dry periods' and 'heavy rainfall after an extended dry period' extend or reactivating the product. This advice suggest UnReg1 can persist in the soil for extended periods under some seasonal conditions, and this trial supports these likely situations. The recommendations for Targa™ is limited to "DO NOT plant cereal crops into the treated area for a period of 18 weeks after application", somewhat longer than for UnReg1 for similar crops. These warnings also tend to suggest that this product may have some residual activity.

At the time of trial establishment, the surrounding paddock was ploughed specifically to control WMG. 2019 was a very dry year and it was observed that cultivation successfully controlled the existing population. When the final assessment was conducted in May 2020 there had been drought breaking rains (~260 mm) in the preceding months causing a significant reinfestation. This observation reiterates the difficulties with controlling WMG.

Given control over the existing population provided by cultivation and the longer-term control provided by residual herbicides, investigations that combine these options could be highly rewarding.

Conclusion

Apply knockdown herbicides to WMG sooner after rain, rather than later.

These knockdown herbicides may have some residual effect on WMG and should be further investigated.

Acknowledgements

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Appendix 1. Data sets

Table 3. Data, Parkes

		Control (47DAA)		Control (323DAA)		Biomass Reduction (510DAA)	
		(%)					
Timing	Product	p.v.[1]	lsd[2]	p.v.[1]	lsd[2]	p.v.	lsd
6 days post rain	TfbPQ	96.7	a	96.8	a	93.3	a
6 days post rain	UnReg1+PQ	95.0	a	63.2	bcd	58.3	abcd
10 days post rain	TfbPQ	95.0	a	88.8	ab	83.3	ab
10 days post rain	UnReg1+PQ	83.3	ab	72.5	abc	68.3	abc
14 days post rain	TfbPQ	86.7	a	80.0	abc	70.0	abc
14 days post rain	UnReg1+PQ	88.3	a	62.3	bcd	41.7	cd
17 days post rain	TfbPQ	65.1	b	54.1	cd	41.7	cd
17 days post rain	UnReg1+PQ	87.6	a	35.3	d	30.0	de
21 days post rain	TfbPQ	87.6	a	59.2	bcd	46.7	bcd
21 days post rain	UnReg1+PQ	85.0	a	42.2	d	21.7	de
	UTC	0.0	c	0.0	e	0.0	e
lsd	lsd	18.3		31.5		40.2	

[1] predicted value

[2] values with the same letter for each variable are not significantly different

Bibliography

Butler, D. G. (2017). *ASReml-R.* Hemel Hempstead, HP1 1ES, UK: VSN International Ltd.