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: GOWE05518-1

Season/Year: Summer 2017/18

Location: 'Quamby', Wongarbon, NSW

Collaborators: Steve Aughey

Keywords

GOWE055, Windmill grass, Double knock, Tank mixes, Herbicide resistance, Targa™, Paraquat, *Chloris truncata,* Wongarbon

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Take home messages

An unregistered herbicide (UnReg1) mixed with paraquat (PQ) provided more consistent levels of control of WMG than Targa™/Paraquat

Timing of both product combinations influences level of control. Soon after rain especially warrants more investigation.

Current main recommendation would be to use Targa™ fb paraquat as soon as possible after (a significant) rain, while delay use of UnReg1+PQ for a week or so after rain.

Background

Previous GOA research found that combining a specific unregistered herbicide (UnReg 1) with paraquat (PQ) can provide 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 tends to be variable. Inconsistency is thought to be related to rainfall timing and its effect on residual herbicide activity, however other factors are also likely to play a part, such as soil moisture, plant maturity 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 Targa™ followed by paraquat.

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[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

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Aim

Determine the effectiveness of controlling WMG by UnReg1+PQ herbicide mix or TfbPQ, via incremental changes to time passing since a 'growth' rain event before herbicide application.

Method

Two small scale split plot trials with three replications were established in summer 2017/18 at Wongarbon and Collie (see separate report). At both sites there was a uniform thick population of WMG, with some plants flowering. Good rain in early December (between 40-50 mm) ensured WMG was fresh at the initial herbicide application timing.

All treatments were applied in a water volume of 100 L/ha through AIXR110-015 (coarse) nozzles at 3 bar. A brownout score was conducted in January 2018 and a plant count was taken later in April.

Results were analysed using ASREML 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.

Initial herbicide treatments are listed in Table 1. Timings of double knocks 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		3/12/2017
Timing 1	2 days post rain	5/12/2017
Timing 2	6 days post rain	9/12/2017
Timing 3	10 days post rain	13/12/2017
Timing 4	14 days post rain	17/12/2017
Timing5	18 days post rain	21/12/2018
Brown Out Assessment		9/1/2018
Final plant count		9/11/2018

Rainfall

Paddock site of the trial contained an established population of windmill grass and had a history of WMG infestations. It is possible that rain in October (~69mm) germinated or activated existing WMG populations. When the initial applications were applied in early December WMG was flowering and nearing maturity. Rain in late November/early December may have been enough to trigger another flowering event.
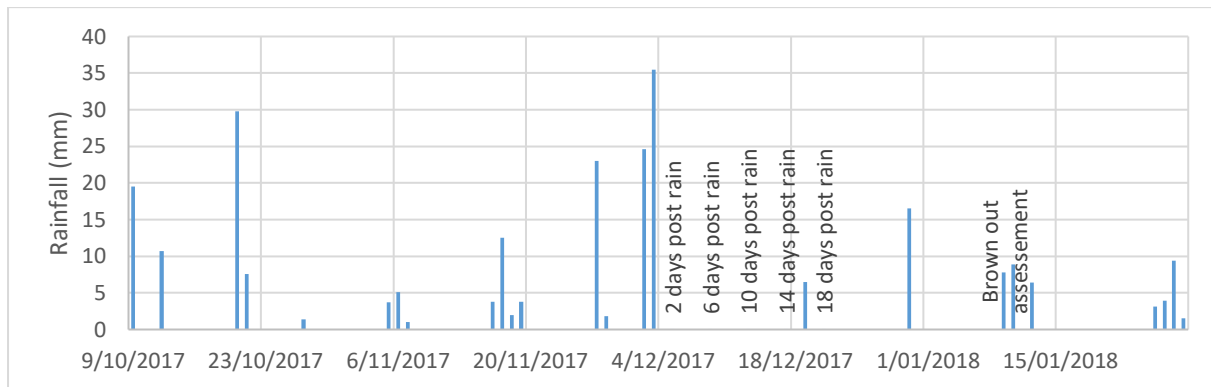
Figure 1. Application timings and rainfall (mm) recorded at "Geurie" approximately 16 km from the Wongarbon trial site.

Results

Full set of results is available in Appendix 1.

'Brown-out' assessment was conducted 35 days after application (DAA) with impact on WMG compared to unsprayed areas. 100% Brown-out signifies that WMG in those treatments had no green. 0% brown-out would correspond to no herbicide effect.

Where TfbPQ was applied 'Brown Out' ranged from 44-69% for the 10 and 14 day treatments, respectively. For UnReg1+PQ scores ranged from 38-100% for the 2 and 10-18 treatments, respectively. There was no difference in Brown out of the UnReg1+PQ between 6-18 days post rain treatments (Figure 2).
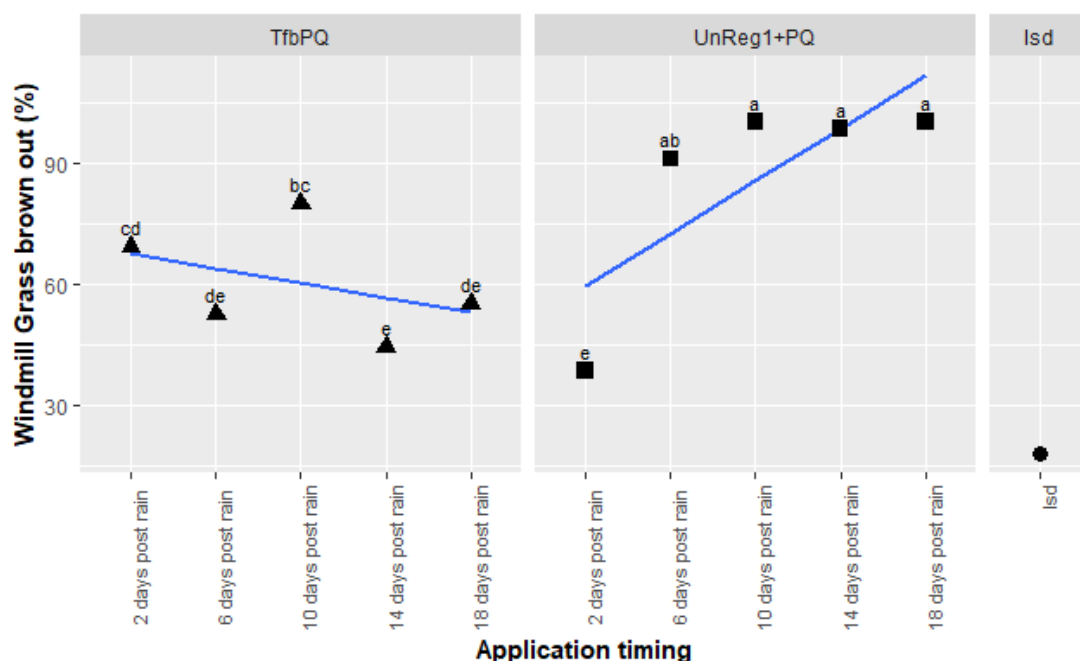

Figure 2. Brownout scores after initial application at Wongarbon (assessed 35 and 42 days respectively).

Longer term efficacy of UnReg1+paraquat

Surviving WMG plants were counted November 2018 (339DAA), and differences were observed in treatment populations. Best performing treatments contained less than 1 plant/m², while the poorest had 15 plants/m². There were differences between application timings. 10 days post rain proved to be the best result for TfbPQ (1.7 plants/m²) while 6 days post rain timing contained the most WMG (15 plants/ m²).

For UnReg1+PQ application 2 and 14 days post rain had the highest counts of WMG (6.2 and 2.5 plants/ m²) while applications at 6, 10, and 18 days were significantly lower with counts of 0.3, 0.3 and 0.8 plants/m2 respectively (Figure 3).
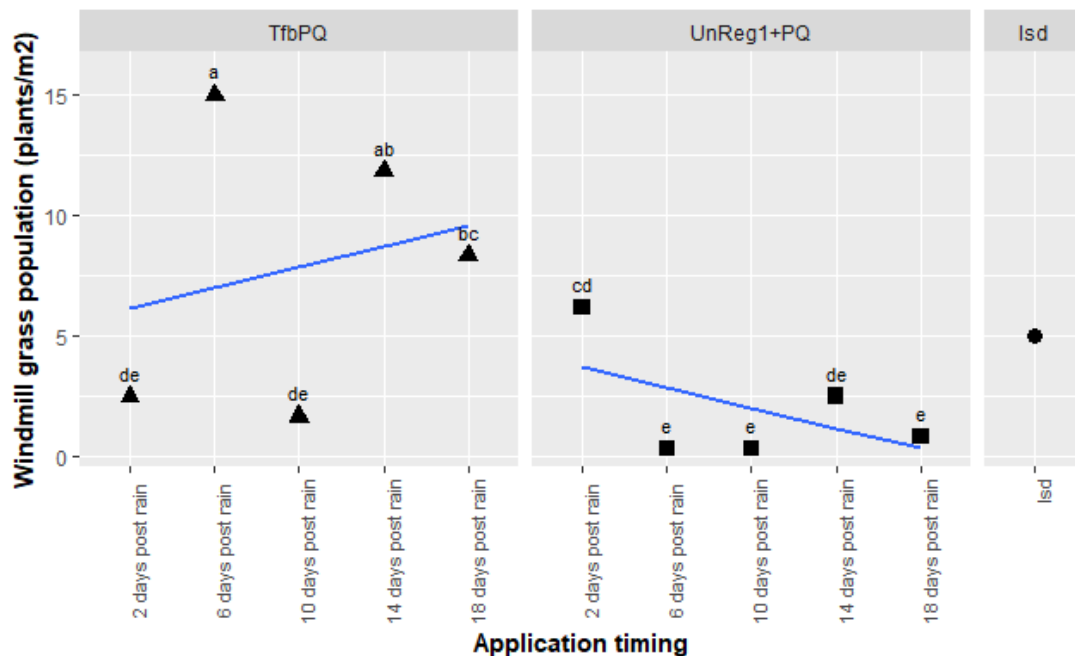

Figure 3. Plant counts 339 DAA at Wongarbon for the various application timings.

Discussion

Conditions at initial timing were close to ideal. WMG plants were actively growing following rainfall and temperatures were mild.

With the exception of the earliest application timing, high levels of Brown Out were achieved by UnReg1+PQ mix. This pattern followed through to when assessed 11 months later in the subsequent spring where these treatments had low WMG populations.

Brown out achieved by TfbPG, regardless of timing, was less than the best UnReg1+PQ timings (10, 14 and 18 days post rain), and it tended to have a higher degree of variability. Variability was even more apparent 11 months later in plant counts. The 2 and site 10 days post rain TfbPQ treatments had final counts as good as the best UnReg1+PQ treatments. However the remaining timings had considerably higher residual WMG infestations.

Application of UnReg1+PQ 2 days post rain was not as effective as subsequent timings. However, at subsequent timings UnReg1+PQ proved a more reliable option than TfbPQ. There was also a weak trend towards declining performance over time from TfbPQ.

Performance of both products over time suggests that timing is important, though, it is not clear whether this is caused by plant maturity, moisture stress or other factors. Results suggest that if using TfbPQ then application soon after rain may give better results, while if using UnReg1+PQ delaying application for a period, ~1 week, may give better results (It maybe that paraquat component of the UnReg1+PQ that renders the earlier application less effective when compared to TfbPQ at the same timing, where paraquat application is delayed).

Conclusion

UnReg1+PQ provided more consistent levels of control than Targa™/Paraquat

Timing of both products influences the level of control. UnReg1+PQ, in contradiction to Targa™/Paraquat is important, particularly soon after rain, and warrants more investigation.

Current recommendation would be to use TfbPQ as soon as possible after (a significant) rain, while delay the use of UnReg1+PQ for a week or so.

Acknowledgements

Appendix 1. Data sets

Table 3. Data, Wongarbon

Timing	Product	WMG Counts (339 DAA) (plants/m2)		Brown Out (35 DAA) (score)	
		p.v.[1]	lsd[2]	p.v.[1]	lsd[2]
2 days post rain	TfbPQ	2.5	de	69.2	cd
2 days post rain	UnReg1+PQ	6.2	cd	38.3	e
6 days post rain	TfbPQ	15.0	a	52.5	de
6 days post rain	UnReg1+PQ	0.3	e	90.8	ab
10 days post rain	TfbPQ	1.7	de	80.0	bc
10 days post rain	UnReg1+PQ	0.3	e	100.0	a
14 days post rain	TfbPQ	11.8	ab	44.2	e
14 days post rain	UnReg1+PQ	2.5	de	98.3	a
18 days post rain	TfbPQ	8.3	bc	55.0	de
18 days post rain	UnReg1+PQ	0.8	e	100.0	a
lsd	lsd	5.0		17.6	

[1] predicted value

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