

Impact of initial fallow herbicide treatments on the efficacy of an unregistered 1¹ herbicide + paraquat when applied as a double knock to control Windmill grass (*Chloris truncata*)

Trial Code: GOWE04618-2
Season/Year: Summer 2017/18
Location: “Sheldons”, Collie and “Quamby”, Wongarbron
Collaborators: Dean Walton and Steve Aughey

Keywords

GOWE046, Windmill grass, Double knock, Tank mixes, Herbicide resistance, Paraquat, *Chloris truncata*, Narromine

Take home messages

Use of a combination of an unregistered herbicide (UnReg 1) plus paraquat (PQ) as a double knock (DK) to control windmill grass (WMG) was successful, regardless of DK timing.

In this trial application of the first knock herbicides did not appear to have any antagonistic effect on performance of the Unreg1 + PQ in controlling WMG

In previous trials this double knock strategy has not been successful, particularly in very hot dry conditions. It is recommended that this strategy only be used where WMG is actively growing with a reasonable moisture profile and relatively mild weather forecast.

Background

Previous GOA trials found that the combination of an unregistered herbicide (UnReg 1) plus paraquat (PQ) can provide very effective knockdown control for WMG when used as a single pass, standalone treatment. However, the relative narrow weed control spectrum of UnReg1+PQ highlights a possible shortcoming; control of the broader range of weeds often present in fallows alongside windmill grass (WMG).

One possible way to address this is to tank mix UnReg1+PQ with herbicides targeting other weeds applied as a single pass.

Another option is to use UnReg1+PQ as a double knock treatment following more conventional weed control herbicides, noting that paraquat is already well accepted as a common product of choice for double knocks. The concern with this approach is whether the herbicides applied in the first pass will affect the WMG efficacy of UnReg1+PQ. This trial has been designed to investigate this question.

¹Experimental 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)

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 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.

Aims

- Determine if effectiveness of WMG control by UnReg1+PQ, herbicide mix, is reduced when used as a DK following the application of a range of common fallow herbicide mixes applied in the first knock.
- Assess if there is any impact of timing of the double knock.

Method

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

All treatments were applied in a total 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 conducted 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.

The initial herbicide treatments are listed in **Table 1** while the timings of the double knocks are listed in Table 2.

Table 1. Herbicides and rates applied in the first application

Initial Treatment	Rate (mL or g/ha)
Untreated Control (UTC)	
Roundup® CT® + LVE Ester 680	2000 + 800
Roundup® CT® + Starane™ Advanced	2000 + 900
Roundup® CT®	2000
Roundup® CT® +Sharpen®	2000 + 26
Roundup® CT® + Amicide® Advance	2000 + 1600
Roundup® CT® + Ally®	2000 + 7
Roundup® CT® + Garlon™	2000 + 160
UnReg1 + paraquat*	100 + 2000

*This mix was also used as the double knock

Table 2. Herbicide application and assessment dates

	Collie	Wongarbon
Initial application	8/12/2017	5/12/2017
First double knock timing	12/12/2017	9/12/2017
Second double knock timing	16/12/2017	13/12/2017
Third double knock timing		17/12/2017
First assessment (brown out)	9/1/2018	9/1/2018
Final plant count	24/4/2018	

Rainfall

At both sites there was an established population of WMG with a history of WMG infestations. It is possible that rain in October (~115mm) activated existing populations that were flowering and nearing maturity when the initial applications were applied in early December. Rain in late November/early December may have been enough to trigger another flowering event.

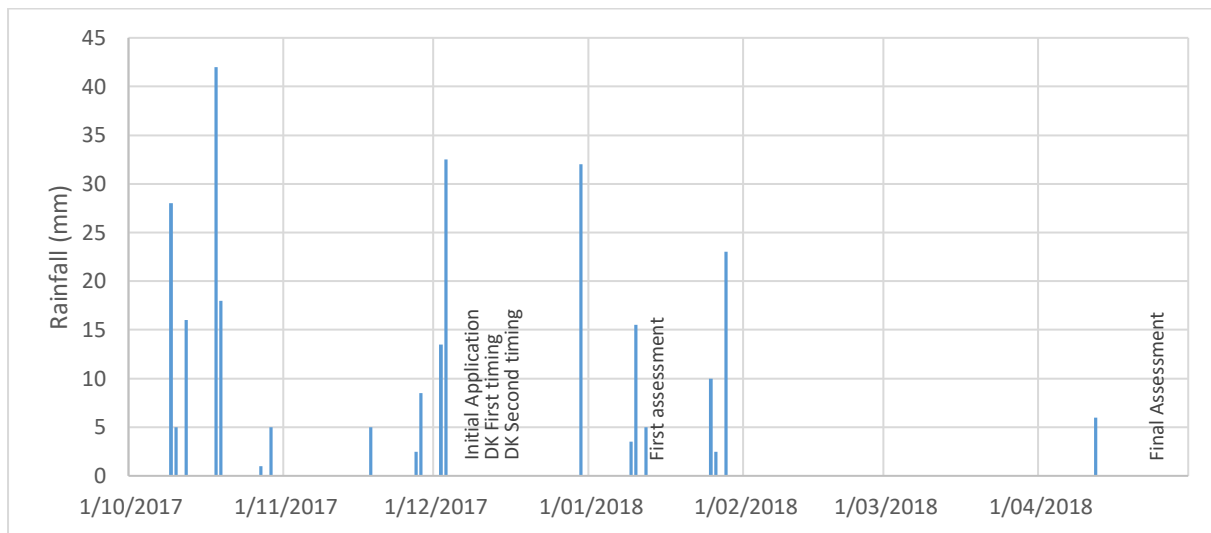


Figure 1. Rainfall (mm) recorded at "Sheldons" approximately 5 km from the trial site.

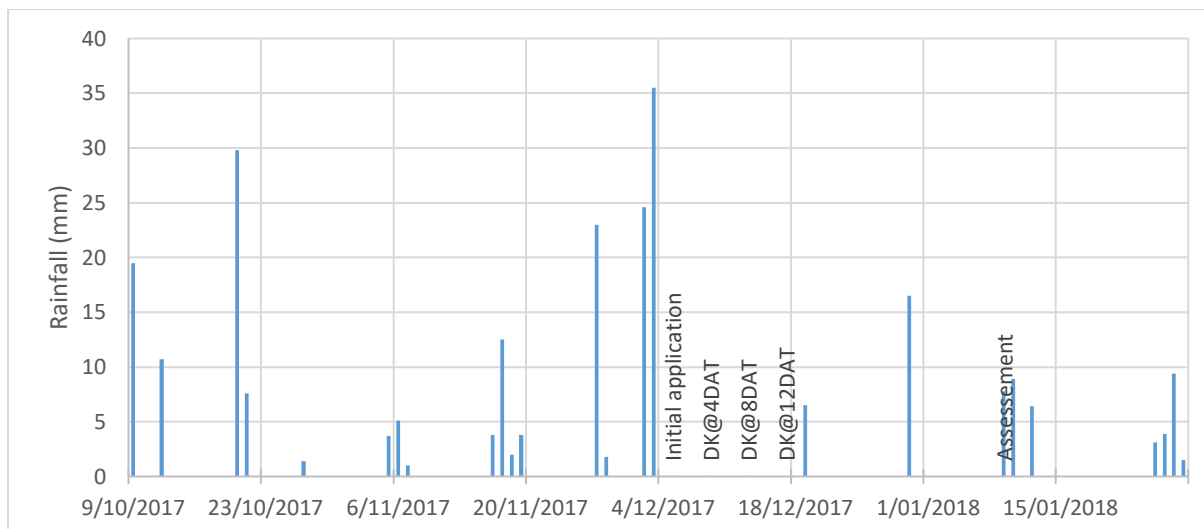


Figure 2. Rainfall (mm) recorded at “Geurie” approximately 16 km from the Wongarbron trial site.

Results

The full set of results is available in Appendix 1.

Time of application of UnReg1+paraquat

There were 3 and 4 application timings of UnReg1+paraquat at Collie and Wongarbron respectively. These timing corresponded to an initial treatment and either 2 or 3 subsequent ‘double knock’ applications 4 days apart. At both sites initial application resulted in a lower level brownout than any of the delayed applications (Figure 3).

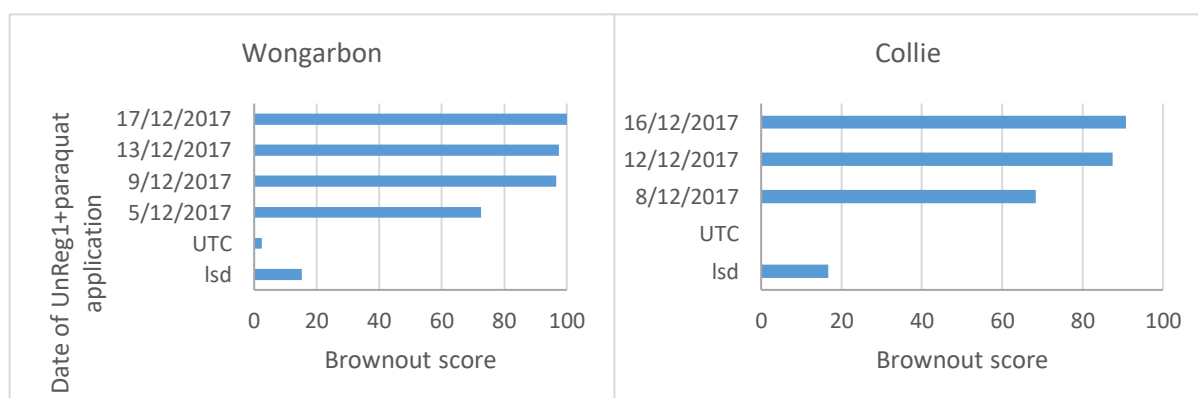


Figure 3. Brownout scores at Wongarbron (left) and Collie (right), after initial and delayed applications of UnReg1+paraquat (assessed 35 and 42 days respectively).

Effect of the initial treatment on the efficacy of UnReg1+paraquat

At both sites there was no significant reduction in the levels of WMG control by application of an initial herbicide followed by a ‘double knock’ of UnReg1+paraquat (Figure 4).

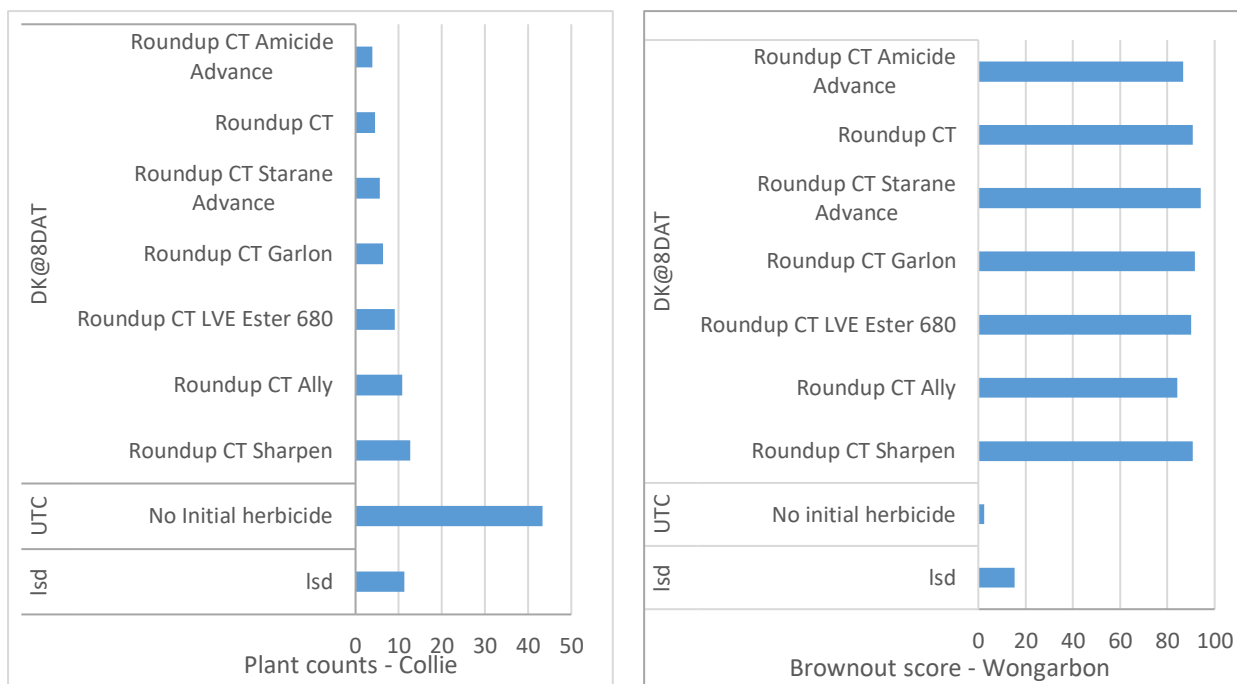


Figure 4. Plant counts 137 DAT at Collie and Brownout score 32 DAT at Wongarbron for various herbicide options followed by a double knock of UnReg1+paraquat@8 days.

Discussion

Conditions at initial herbicide timing were close to ideal. WMG plants were actively growing following recent rainfall and the weather was not too hot.

In neither trial did the application of an initial herbicide (first knock) appear to reduce the efficacy of WMG control when using UnReg1+paraquat in a double knock strategy.

Previous research conducted by GOA² found that targeting WMG as a secondary weed and attempting to control it with UnReg1+paraquat as the DK component for the primary target weed was not a reliable strategy. The delay in application (of about a week) tended to be the difference between spraying stressed and non-stressed plants, at times resulting in very poor control. In these trials climatic conditions were reasonably mild and good rainfall prior to the initial application may have contributed to the plants susceptibility even when application of UnReg1+paraquat was delayed by up to 12 days.

UnReg1+paraquat applied at the initial timing resulted in levels of control not as good as any of the later application timings (double knocks). At the initial timing WMG at both sites was flowering, and appeared to be fresh. A possible explanation for poorer than expected result for the initial application is that rain in October greened up established WMG plants and they had matured by the time of the next significant rainfall at the start of December. Time between the rain and the initial application may

² [Windmill grass control- a novel herbicide mixture for use as a double knock- Narromine 2016](#)
[Windmill grass control- a novel herbicide mixture for use as a double knock- Kickabil 2016](#)

not have been sufficient to allow plants to fully shift from a semi dormant state into full vegetative. Further research may be warranted to test this theory.

Conclusion

There was a significant difference in levels of control of UnReg1+paraquat between initial application timing and subsequent timings (DKs). This may warrant further research to understand biological mechanisms influencing WMG susceptibility to UnReg1 and herbicides more generally.

The use of UnReg1 + PQ in this trial achieved reasonable WMG control when used as a DK. Delaying the DK did not reduce its effectiveness (notwithstanding the observation made above).

The application of a range of common fallow herbicide mixes did not significantly reduce WMG control of the subsequent application of UnReg1+paraquat.

Acknowledgements

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Appendix 1. Data sets

Table 3. Brownout scores 35 days after application, Wongarbron

DK_Timing	Description	Brownout score	LSD
DK@12DAT	Balance Paraquat	100	a
DK@12DAT	No initial herbicide	100	a
DK@12DAT	Roundup CT	88	abcde
DK@12DAT	Roundup CT Ally	87	abcdef
DK@12DAT	Roundup CT Amicide Advance	88	abcdef
DK@12DAT	Roundup CT Garlon	88	abcde
DK@12DAT	Roundup CT LVE Ester 680	93	abcde
DK@12DAT	Roundup CT Sharpen	94	abcd
DK@12DAT	Roundup CT Starane Advance	98	abc
DK@4DAT	Balance Paraquat	99	ab
DK@4DAT	No initial herbicide	97	abcd
DK@4DAT	Roundup CT	92	abcde
DK@4DAT	Roundup CT Ally	83	def
DK@4DAT	Roundup CT Amicide Advance	83	cdef
DK@4DAT	Roundup CT Garlon	93	abcd
DK@4DAT	Roundup CT LVE Ester 680	91	abcde
DK@4DAT	Roundup CT Sharpen	83	cdef
DK@4DAT	Roundup CT Starane Advance	78	ef
DK@8DAT	Balance Paraquat	100	a
DK@8DAT	No initial herbicide	98	abcd
DK@8DAT	Roundup CT	91	abcde
DK@8DAT	Roundup CT Ally	84	bcdef
DK@8DAT	Roundup CT Amicide Advance	87	abcdef
DK@8DAT	Roundup CT Garlon	92	abcde
DK@8DAT	Roundup CT LVE Ester 680	90	abcde
DK@8DAT	Roundup CT Sharpen	91	abcde
DK@8DAT	Roundup CT Starane Advance	94	abcd
No DK	Balance Paraquat	73	f
No DK	No initial herbicide	3	h
No DK	Roundup CT	15	gh
No DK	Roundup CT Ally	25	g
No DK	Roundup CT Amicide Advance	24	g
No DK	Roundup CT Garlon	14	gh
No DK	Roundup CT LVE Ester 680	17	gh
No DK	Roundup CT Sharpen	9	h
No DK	Roundup CT Starane Advance	11	gh
	Isd	15	

Table 4. Brownout scores (32 DAT) and plant counts (137 DAT), Collie.

DK_Timing	Description	Brownout Score	Groups	Plant counts (per m2)	Groups1
DK@4DAT	No Initial herbicide	88	abcd	6	efg
DK@4DAT	Roundup CT	83	abcde	8	efg
DK@4DAT	Roundup CT Ally	77	bcde	10	efg
DK@4DAT	Roundup CT Amicide Advance	88	abc	8	efg
DK@4DAT	Roundup CT Garlon	72	de	10	efg
DK@4DAT	Roundup CT LVE Ester 680	83	abcde	6	efg
DK@4DAT	Roundup CT Sharpen	82	bcde	5	efg
DK@4DAT	Roundup CT Starane Advance	76	cde	10	efg
DK@4DAT	UnReg1 Paraquat	98	a	0	g
DK@8DAT	No Initial herbicide	91	abc	6	efg
DK@8DAT	Roundup CT	90	abc	5	efg
DK@8DAT	Roundup CT Ally	81	abcde	11	defg
DK@8DAT	Roundup CT Amicide Advance	85	abcde	4	efg
DK@8DAT	Roundup CT Garlon	83	abcde	6	efg
DK@8DAT	Roundup CT LVE Ester 680	74	cde	9	efg
DK@8DAT	Roundup CT Sharpen	78	bcde	13	cdef
DK@8DAT	Roundup CT Starane Advance	84	abcde	6	efg
DK@8DAT	UnReg1 Paraquat	93	ab	1	fg
No DK	No Initial herbicide	0	f	43	a
No DK	Roundup CT	8	f	26	b
No DK	Roundup CT Ally	7	f	27	b
No DK	Roundup CT Amicide Advance	9	f	23	bcd
No DK	Roundup CT Garlon	0	f	29	b
No DK	Roundup CT LVE Ester 680	3	f	25	bc
No DK	Roundup CT Sharpen	0	f	41	a
No DK	Roundup CT Starane Advance	0	f	40	a
No DK	UnReg1 Paraquat	68	e	15	cde
	Isd	17		11	