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Comparing tank mixes of post-emergence herbicides on awnless barnyard grass (NSW pot experiment 2015)

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Key findings

Tank mixing systemic herbicides and paraquat appears to be an effective tactic to control mid to late tillering awnless barnyard grass (BYG).

Tank mixes could be a viable alternative to double knocking for BYG control, although further investigation is needed.

Research questions

1. How effective are herbicide tank mixes for the control of BYG?
2. How do herbicides applied as single treatments compare with tank mixing with paraquat?
3. Is there potential for tank mix treatments with paraquat to replace the current standard practice of double knocking to control BYG?

Aims

The main aim of this experiment was to determine whether combining (i.e. tank mixing) some herbicides with paraquat provided additive or synergistic post-emergence control of awnless barnyard grass (BYG) compared with standard singular herbicide treatments such as atrazine, simazine, terbuthylazine, haloxyfop or Balance®. This data could possibly support an additional use pattern that allows tank mixing with paraquat to control established BYG plants. The commercial implication of finding a suitable tank mix treatment which maintains excellent control of fallow BYG infestations would be a single pass control strategy. This would alleviate the current need for a time consuming double knock approach to BYG control. Furthermore, using these new treatments will lessen glyphosate use, reducing selection pressure for glyphosate resistance.

Methods

Site

- Tamworth: Tamworth Agricultural Institute glasshouse

Treatments

- Eleven herbicide treatments + one untreated control

Growth stages

- Late tillering (15 tillers) to inflorescence emergence (Z50–59)

Pot size and design

- 8 cm square pots one plant per pot, thinned down from two plants
- Randomised complete block design of 12 treatments × six replicates (72 pots)
- Pots moved outside for two weeks before herbicide application to simulate plants grown under field conditions.

Herbicide application

- Herbicides were applied with a hand-held boom sprayer; water volume of 100 L/ha for all herbicides. Uptake™ spray oil (0.5% v/v) used with all treatments.

Herbicide timing

- Herbicides treatments applied 30/11/2015: temperature 29 °C, wind 3 km/h, relative humidity 42%.

Measurements

- Brownout score 3 days after treatment (DAT; rating system 0–10 where 0 = alive and green and 10 = brown and completely dead)
- Biomass control % (visual estimate) compared with untreated treatment at 14, 28 and 42 DAT
- Plant counts of survivors 42 DAT
- Destructive sampling of green biomass 42 DAT (dry weight).

Treatments

Table 1. *Herbicide treatments*

Trt. No.	Herbicide and rate per hectare	Tank mix or single application
1	Untreated	
2	Balance® 100 g	Single
3	Balance® 100 g + Paraquat (250 g/L) 2 L	Tank mix
4	Atrazine (500 g/L) 6 L	Single
5	Atrazine (500 g/L) 6 L + Paraquat (250 g/L) 2 L	Tank mix
6	Simazine (500 g/L) 3 L	Single
7	Simazine (500 g/L) 3L+ Paraquat (250 g/L) 2 L	Tank mix
8	Terbuthylazine (750 g/kg) 1 kg	Single
9	Terbuthylazine (750 g/kg) 1 kg + Paraquat (250 g/L) 2 L	Tank mix
10	Haloxyfop (520 g/L) 300 mL	Single
11	Haloxyfop (520 g/L) 300 mL + Paraquat (250 g/L) 2 L	Tank mix
12	Paraquat (250 g/L) 2 L	Single
Note: All treatments applied at 100 L/ha with TT 110-01 nozzles. All treatments had Uptake™ added at 0.5% v/v		

Results

Initial brownout scores indicate that there was some antagonism of paraquat with Balance®, haloxyfop and atrazine with significantly lower brownout of BYG compared with the paraquat only treatment (Figure 1).

All tank mix treatments resulted in excellent control of mid-late tillering BYG with control levels of 97–100% at 28 DAT (Figure 2) with no or very little green biomass remaining by 42 DAT (Figure 3). Paraquat applied as a standalone treatment gave excellent control of 96% at 28 DAT. The remaining standalone treatments did not reach commercially acceptable levels of control (Figure 2 and 3).

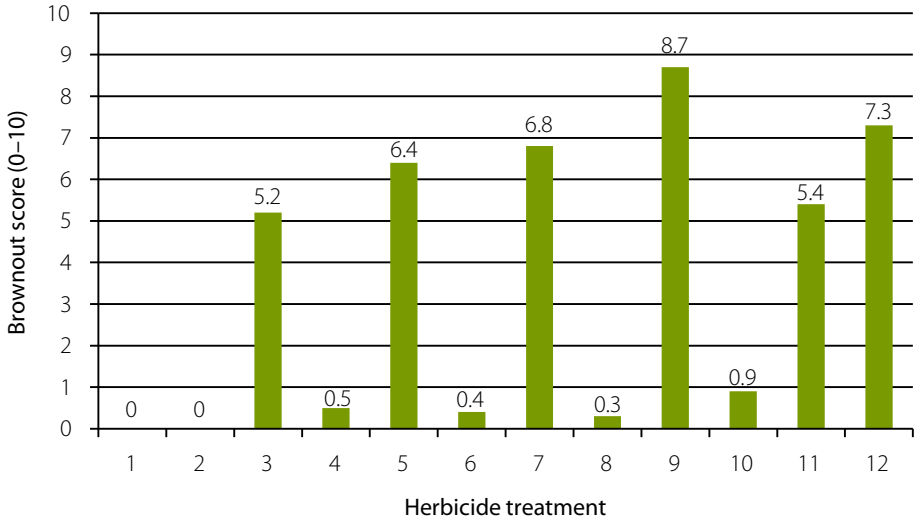

Figure 1. *Brownout score (0–10) three days after application of single herbicides or tank mixes with paraquat tank on awnless barnyard grass*
LSD (0.05) = 0.5

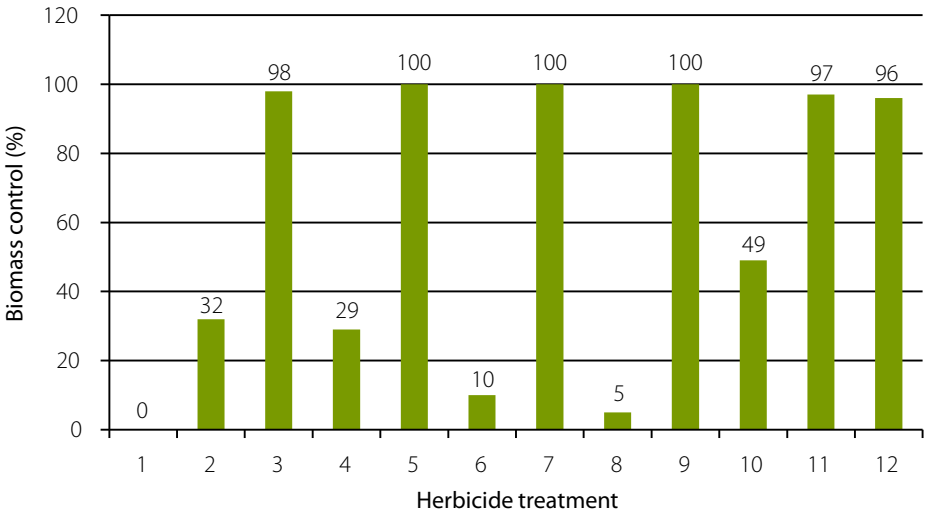

Figure 2. *Biomass control score (%) 28 days after application of single herbicides or tank mixes with paraquat on awnless barnyard grass*
LSD (0.05) = 5

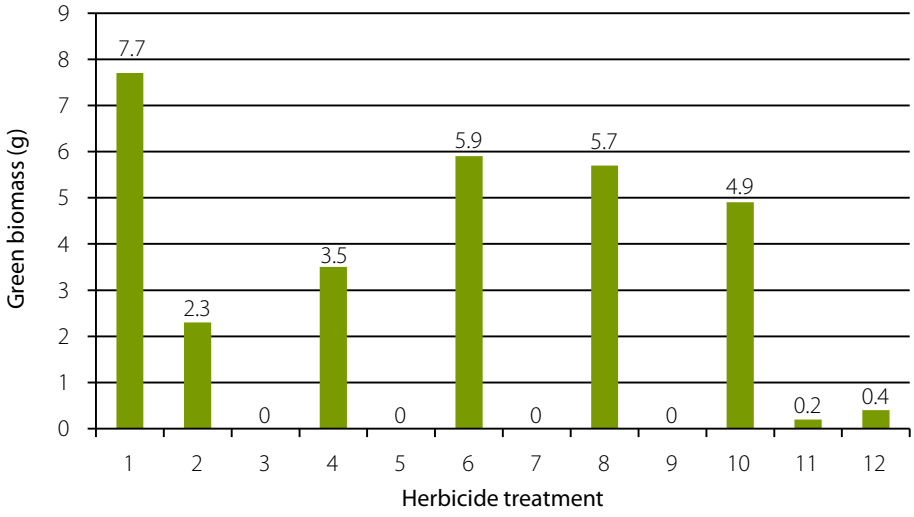

Figure 3. *Green biomass (g) 42 days after application of single herbicides or tank mixes with paraquat on awnless barnyard grass*
LSD (0.05) = 1.2

Plate 1. *Balance® 100 g/ha compared to Balance® 100 g/ha + Paraquat 2 L/ha at 42 DAT*

Summary

Tank mixing systemic herbicides and paraquat appears to be an effective tactic to control mid to late tillering BYG. All of the tank mix treatments with paraquat performed at high levels of efficacy, whilst paraquat applied as a single treatment was comparable with these tank mixtures.

It is difficult to conclude that paraquat had a synergistic effect with the herbicides that were used in this experiment, as a single application of paraquat was not significantly different from the mixtures.

These results indicate that tank mixes with paraquat applied as a single spray could be a viable alternative for BYG control which would have the benefit of savings on the extra costs and time associated with sequential applications with double knock strategies. This will need to be confirmed under field conditions and compared with standard double knock treatments. In addition, the robustness of herbicide treatments should be determined when applied over a range of BYG growth stages.

Acknowledgements

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