

# **Comparison of systemic herbicide and paraquat tank mixtures either applied under sunlight or evening conditions for control of glyphosate resistant sowthistle**

Tony Cook, Bill Davidson and Bec Miller,  
NSW DPI, Tamworth

## **Abstract**

The effectiveness of tank mixing systemic herbicide with paraquat applied at night to control glyphosate resistant sowthistle was investigated. Glyphosate resistant sowthistle was fully controlled by tank mixes of selected systemic herbicides and paraquat at the early flowering growth stage and there was no difference in control between day and night applications of these tank mixes.

## **Introduction**

Tank mixing a systemic herbicide with a fast acting knockdown herbicide such as paraquat is thought by many agronomists an incompatible combination. Under daylight condition the paraquat rapidly desiccates foliage and is likely to prevent translocation of the systemic herbicide. Therefore, the purpose of this experiment is to determine whether applying evening tank mixtures of systemic herbicides and paraquat can improve the control of glyphosate resistant sowthistle compared to daylight applications. The overall objective is to replace double knocking, which is time consuming, with a one-pass spray.

## **Aims**

- Can night spraying a tank mixture of hormonal herbicides and paraquat allow enough time for Group I, H or M to translocate sufficiently in sowthistle before paraquat desiccates foliage (when sunlight activates the paraquat)?
- To investigate whether tank mixing systemic herbicide with paraquat applied at night is a viable alternative to applying the same treatments in daytime.
- Does the effect of having paraquat based treatments applied at night allow for better brownout compared to daylight applications?
- Can the glyphosate be used in combination with paraquat to control glyphosate resistant plants? Or are other herbicide combinations preferred?

## **Materials and Methods**

Experiments were conducted at Tamworth Agricultural Institute. There were 10 treatments, 8 herbicide treatments + 2 untreated (Table 1) applied to early flowering glyphosate resistant sowthistle plants approximately 50 cm tall. The biotype used was a confirmed glyphosate resistant population named “Yellow” which was sourced from the Liverpool Plains district of northern NSW. There were 5 replicates per treatment and a total of 50 pots used (1 biotypes x 10 treatments x 5 replicates) with experiments performed in 8 inch square pots with 1 plant per pot.

Plants were grown in glasshouse most of the time, however 1 week prior to herbicide application they were placed outdoors to “harden-up”. Herbicide was applied using TT 110-01 nozzles with pressure of 2 bars with speed of application designed to deliver a water rate of 100 L/ha. Day applications were applied at 8:00am and night applications after sunset. After herbicide application the plants were taken back to the glasshouse for the duration of the

experiment. Biomass control % was estimated for the untreated controls, and treated plants 14, 28 and 56 days after treatment. Plant counts of survivors were taken at 28 and 56 days after treatment and destructive sampling of biomass for dry weight was taken at 56 days after treatment.

**Table 1:** Herbicide treatments and application timing

Herbicide	Rate/ha	Application timing
Untreated	Nil	Day
Untreated	Nil	Night
Amicide <sup>®</sup> Advance 700+ Paraquat	1L + 2L	Day
Amicide <sup>®</sup> Advance 700+ Paraquat	1L + 2L	Night
Tordon <sup>®</sup> 75-D+ Paraquat	700mL + 2L	Day
Tordon <sup>®</sup> 75-D+ Paraquat	700mL + 2L	Night
Glyphosate 450+ Paraquat	1.6L + 2L	Day
Glyphosate 450+ Paraquat	1.6L + 2L	Night
Velocity <sup>®</sup> + Paraquat	500mL + 2L	Day
Velocity <sup>®</sup> + Paraquat	500mL + 2L	Night

All treatments had Uptake<sup>®</sup> added at 0.5% v/v.

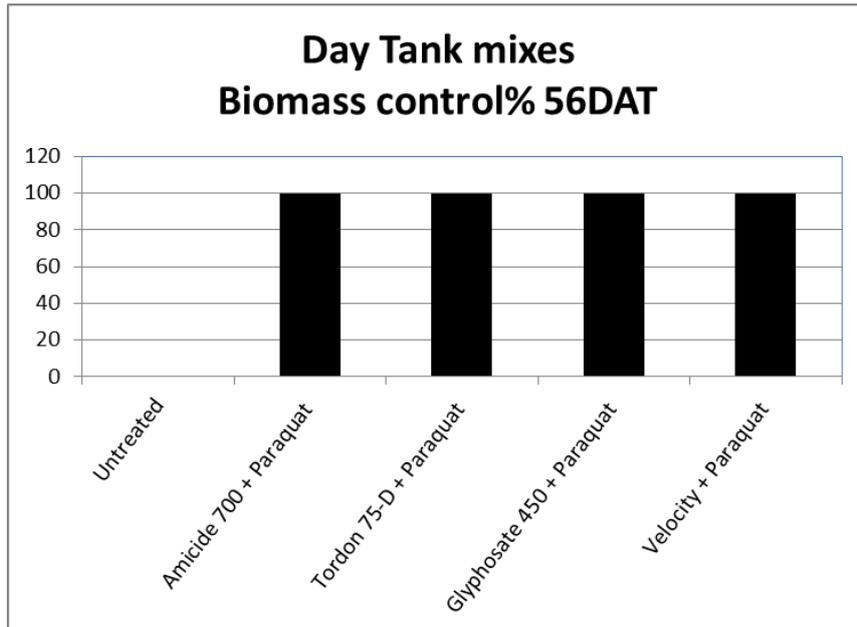
## Results and Discussion

At 56 days after treatment applications of hormonal herbicides and glyphosate mixed with paraquat gave 100% control (Figure 1). At the same timepoint, night applications of hormonal herbicides and glyphosate mixed with paraquat also gave 100% control (Figure 2).

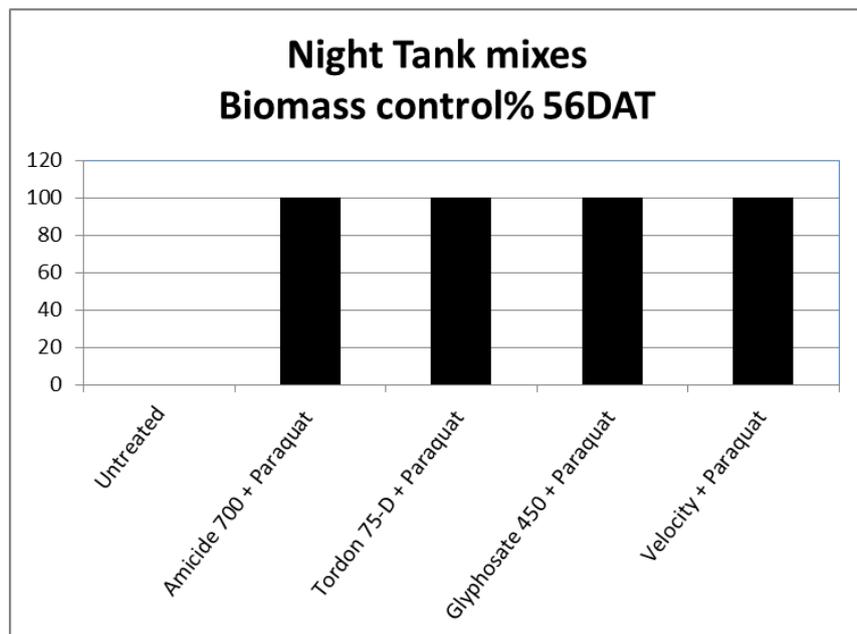
Assessments made 14 days after treatment on early brownout indicated that the combination of a Group M + Group H herbicides leads to rapid necrosis of sowthistle (Table 2, Figure 3).

Although glyphosate resistant, the sowthistle was controlled with a treatment containing glyphosate (+ paraquat) either as a double knock treatment or applied as an evening tank mixture. A further experiment will investigate whether this is primarily due the paraquat or a synergetic effect of the two herbicides.

A tank mix of paraquat and Velocity<sup>®</sup> seems to have excellent potential due to its excellent early brownout of weeds, irrespective of day or evening application. The brownout (speed of plant death) was faster than the other treatments examined in this study. This combination of a Group H herbicide mixed with paraquat compares with the effects reported when Balance<sup>®</sup> was mixed with paraquat in a similar experiment.



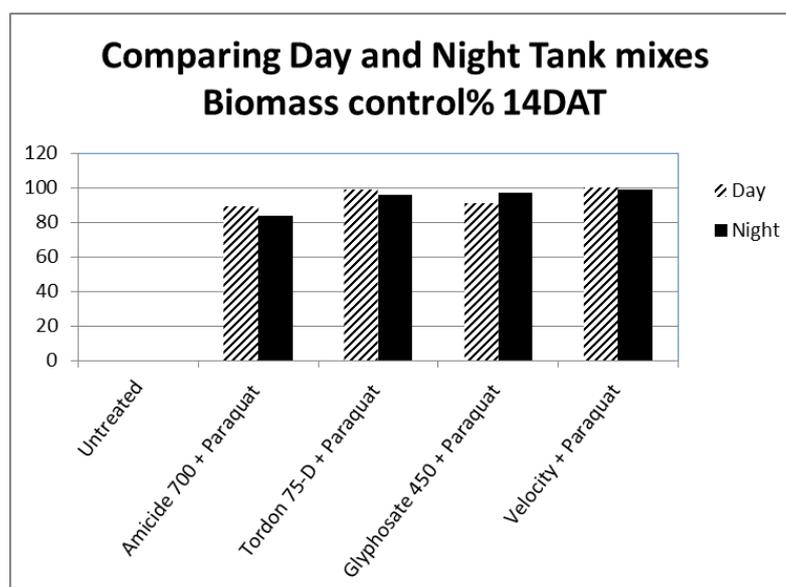
**Figure 1.** Biomass reduction (%) 56DAT for day tank mixes on GR sowthistle.



**Figure 2.** Biomass reduction (%) 56DAT for day tank mixes on GR sowthistle.

**Table 2.** Initial brownouts (estimate of biomass reduction) between daylight and night applications of paraquat + systemic tank mixtures on GR sowthistle 14 DAT

Herbicide	Rate/ha	Application timing	Biomass reduction (%) 14DAT
Untreated	Nil	Day	0
Untreated	Nil	Night	0
Amicide <sup>®</sup> Advance 700+ Paraquat	1L + 2L	Day	89
Amicide <sup>®</sup> Advance 700+ Paraquat	1L + 2L	Night	84
Tordon <sup>®</sup> 75-D+ Paraquat	700mL + 2L	Day	99
Tordon <sup>®</sup> 75-D+ Paraquat	700mL + 2L	Night	96
Glyphosate 450+ Paraquat	1.6L + 2L	Day	91
Glyphosate 450+ Paraquat	1.6L + 2L	Night	97
Velocity <sup>®</sup> + Paraquat	500mL + 2L	Day	100
Velocity <sup>®</sup> + Paraquat	500mL + 2L	Night	99
		<b>Lsd 0.05</b>	<b>6.34</b>



**Figure 3.** Comparing the initial brownouts (estimate of biomass reduction) between daylight and night applications of paraquat + systemic tank mixtures on GR sowthistle 14 DAT (lsd 0.05 = 6.34).

Glyphosate resistant sowthistle has the potential to become problematic in no-till cropping systems, due to its prolific production of wind-blown seed. This may lead to loss of glyphosate as a reliable form of weed control in fallows. Tank mixing systemic herbicides with paraquat has potential as a tactic for controlling glyphosate resistant sowthistle, whilst alleviating the need for costly double knock applications. In this experiment, the tank mixing of glyphosate with paraquat did control resistant plants. However, other systemic herbicides are preferred, especially Velocity<sup>®</sup> or Tordon<sup>®</sup> 75-D. There is some evidence to suggest that the paraquat + 2,4-D amine tank mix has some minor incompatibility.

Results from this report indicate night applications of tank mixtures (systemic herbicide and paraquat) to be highly effective. However, this experiment suggests that applying these tank mixtures under daylight conditions is just as effective. This research needs to be undertaken under field conditions. There was no apparent advantage of rapid brownout after applying paraquat in the evening. However, when mixed with Velocity<sup>®</sup>, full control of glyphosate resistant sowthistle plants was fastest.

### **Acknowledgements**

This project is funded by NSW DPI and GRDC under the project code UA00124.