Sorghum Spray-Out Timing

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Key words

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NGA0002

Take home message

- The yield impact of spraying-out or desiccating sorghum crops too early can be extreme
- Identify the latest heads/tillers that you consider important to take to harvest
- Spray as early as practical after black layer formation in heads of that maturity
- Soil moisture 'benefit' can be significant but must be treated as secondary to managing the crop for optimum yield.

Background

Sorghum desiccation, or spray-out, with glyphosate, is a common practice for both NSW and QLD sorghum growers. Desiccation can be used to manipulate:

1. Time to harvest and assist in paddock harvest scheduling
2. Potential soil water available for the following crop by reducing late season transpiration losses
3. Increase the effective length of the fallow period to maximise future cropping opportunities
4. Desiccate late season weeds

Desiccating the crop too early can result in greater lodging particularly if harvest is then delayed, and may impact on both grain yield and quality. Desiccating too late however provides poor returns on the spray operation and may result in lost soil moisture and consequently impact on future planting options.

Sorghum growers and advisers in Qld have appeared more comfortable with optimal timing of sorghum spray-out, largely based on grain black layer (abscission zone) development. However industry feedback in northern NSW indicated that growers and advisers were frequently much more conservative in their spray-out timing. This project was developed to help better validate the impact of spray-out timing and consequently assist growers and advisers in their decision making.

Trial design

Nine trials were conducted during the 2007/08 and 2008/09. In 2007/08, two small plot trials were established on the Liverpool Plains in commercial sorghum paddocks. Paddocks were targeted where growers indicated they were at least four weeks from commercially planned desiccation. Plots consisted of 4 rows of 20 m length arranged in a completely randomised block design with 4 replications.

Both trials evaluated 5 desiccation timings, applied at ~weekly intervals. Glyphosate (Roundup® CT) was applied at 1.6 L/ha in all applications using a hand-boom.

Table 1. Timing of desiccation sprays 2007/08 (variety)

Application	Wandobah (MR43)	Pine Ridge (MR Buster)
Timing 1	27/3/08	27/3/08
Timing 2	3/4/08	3/4/08
Timing 3	10/4/08	10/4/08
Timing 4	18/4/08	18/4/08
Timing 5	29/4/08	30/4/08

In 2008/09, seven trials were established from Goondiwindi to Premer. Trial commencement was determined differently than in 2007/08. In 2007/08 we relied on growers and advisers to indicate when they believed they were ~four weeks from commercial spray-out. In 2008/09 the first application timing was made ~14 days after flowering (DAF) on the main heads. The trials evaluated 5 or 6 desiccation timings again applied at ~weekly intervals. Glyphosate (Roundup PowerMAX®) was applied at 2.0 L/ha in all applications using a hand-boom.

Table 2. Timing of desiccation sprays 2008/09 (variety)

Application	Goondi (86G56)	Goondi (MR43)	Premer (MR Buster)	Spring Ridge (MR43)	Millie (MR43)	Spring Ridge (86G56)	Pine Ridge (MR Buster)
14 DAF	22/12/08	19/2/09	24/2/09	9/3/09	10/3/09	-	23/3/09
21 DAF	29/12/08	26/2/09	3/3/09	16/3/09	17/3/09	23/3/09	30/3/09
28 DAF	5/1/09	4/3/09	10/3/09	23/3/09	24/3/09	30/3/09	8/4/09
35 DAF	12/1/09	12/3/09	17/3/09	30/3/09	31/3/09	8/4/09	17/4/09
42 DAF	19/1/09	19/3/09	24/3/09	6/4/09	7/4/09	-	27/4/09
49 DAF	27/1/09	25/3/09	-	-	15/4/09	26/4/09	-

Assessments

Grain samples were taken at each application to determine grain moisture. Although grain head moisture of ~25% has been determined as a useful guide to spray-out timing, this is an impractical tool for commercial use.

Plots were scored visually for leaf brown-out and also using a hand-held GreenSeeker to measure crop reflectance as NDVI for all Liverpool Plains trials. Digital photos were taken at each of the desiccation timing to indicate grain maturity. Plots were harvested using a small plot harvester with grain yield, protein, screenings, hectolitre weights and grain size measured. Soil cores were taken from each plot shortly after harvest with soil moisture determined gravimetrically.

In 2007, one trial site was ready for desiccation even when the trial commenced. Consequently there was no impact on yield or grain quality from any timing. Data for both 2007 trials are found in the individual trial results.

Yield impact

The figure below shows the yield of each spray-out timing as a % of the final desiccation timing yield. 'Safe' timings would have an average yield close to 100%.

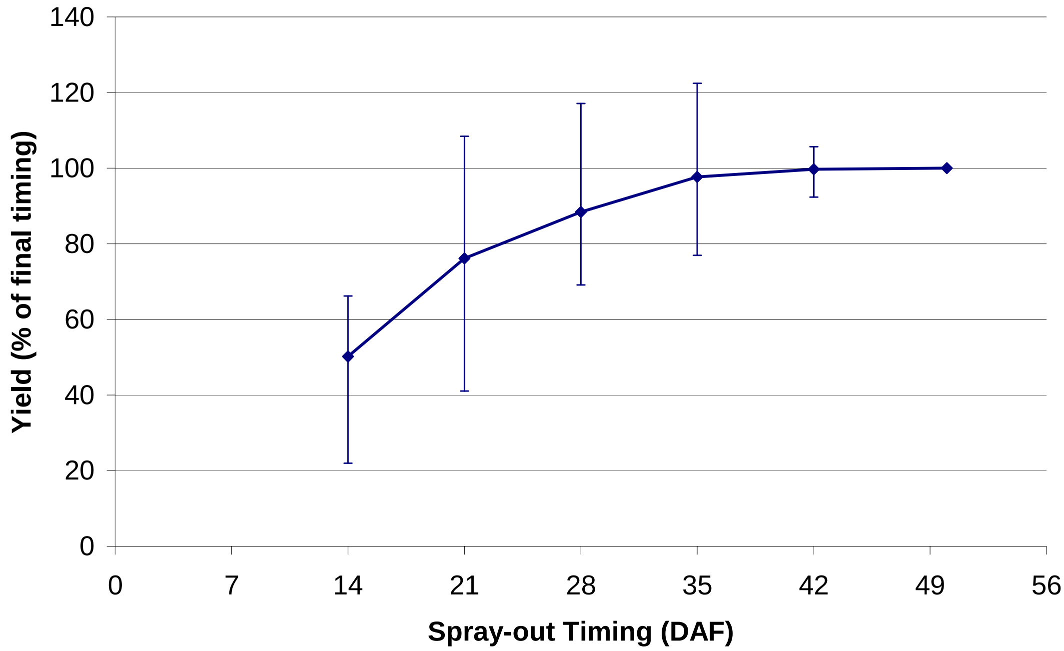

Figure 1 Sorghum yield (%) compared to final spray-out timing in 2008 (mean of 7 trials) ***Range bar shows maximum and minimum % yields with the individual points showing average yield.***

Key messages - yield

- 14 DAF timing resulted in dramatic yield losses in all trials with a 50% mean loss
- 21 DAF was also totally unacceptable with mean losses >20%
- 28 DAF resulted in significant yield losses in 3 of the 7 trials with a yield reduction of ~10%
- 35 DAF resulted in only one significant yield reduction (in a trial with larger numbers of late maturing heads) with an average yield ~2% lower than the final desiccation timing

Grain Quality and Sprayout Timing

Sprayout timed 14 DAF resulted in increased grain screenings at all sites. When applied 21 DAF timing significantly increased screenings at 4 of 6 sites. There was no significant impact on screenings from application at 28 DAF or later.

There were large decreases in test weight at the 14 DAF timing. Test weight was unaffected when desiccation occurred at 28 DAF or later.

Soil water impact

Soil water was measured at each site by taking cores from each plot shortly after harvest. Soil water contents were compared to those of the final desiccation timing at each site. The largest water savings were from early application timings but were associated with unacceptable yield losses. There was some inconsistency in soil moisture benefit, especially with 86G56. Spray-out timing at 35 DAF or later, the average soil moisture benefit was less than 10 mm with 24 mm the largest benefit measured.

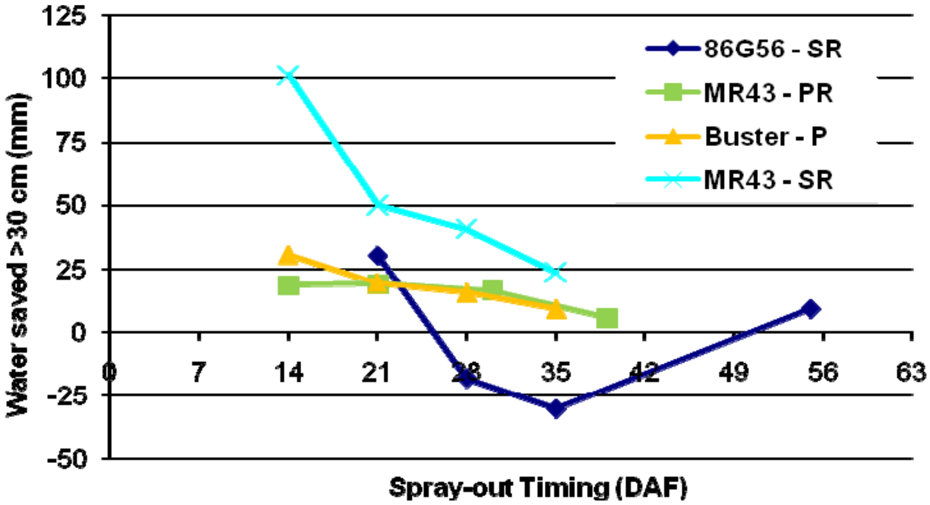

Figure 2. Soil moisture saved below 30 cm from sites on the Liverpool Plains in 2008

Most of the water that was remaining in the profile though was deeper in the profile (below 30 cm). This soil water is significantly more valuable to the next crop in the sequence as it is used later in the season and results in higher water use efficiency at this time. Timing spray-out correctly may save some water in the profile but it also commences the fallow period sooner, stopping unproductive water use from weeds and regrowing sorghum.

Tools to schedule spray-out timing

Spray-out timing can safely commence after grain physiological maturity. In sorghum grain moisture of ~25% often coincides with this stage. Unpresented data from these trials would support that average grain/head moisture of 25-30% is a suitable point to schedule desiccation. However this tool has only experimental not practical value.

In 2008 the rule of thumb recommended by seed companies of roughly timing spray-out 35 days after flowering (DAF) was evaluated. This certainly proved useful but is likely to be impacted by operator assessment of maturity, tiller or head synchronicity, environmental conditions and possibly unexpected differences in variety maturity.

The 35 DAF approach appears to be a very useful starting point to 'mark the calendar' and from there commence field inspection.

Black layer (abscission layer) formation in field was shown to be the best tool to safely schedule spray-out timing. Using this tool ensures a grower can determine their own risk approach and modify by variety and paddock as necessary. Assessment in a uniform solid plant crop is rarely a problem but is more challenging when there are multiple tiller maturities and increased paddock variability.

The experience from these trials suggest the most practical approach is to identify heads of the latest maturity which are considered ‘economic to take to harvest’. Inspect grain about 2/3 of the way down the head and ensure black layer formation has occurred. Although there will still be some grain below this point that are less mature, timing at this stage will ensure negligible yield or grain quality impact but maximize the opportunity for soil moisture retention and consequently minimise the recropping period. By waiting for every grain in late maturing heads to reach black layer the approach will be too conservative.

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