

# Time of Sowing by Variety

Richard Saunders, Rural Solutions SA

MSF sites at Waikerie and Karoonda, SA

## Key messages:

- Significant differences were found between yield performance of varieties at both sites and also time of sowing at Karoonda.
- No interaction between varieties and time of sowing at either site.
- Season rainfall was a significant influence in trial yield results and also response of time of sowing

## Aims:

- To assess possible effects of time of sowing (TOS) on wheat varieties with different maturities. It was expected that there would be significant differences between varieties and times of sowing and that there may also be an interaction between time of sowing and variety performance.

## Background:

At pre-season harvest report and planning meetings, Mallee growers expressed an interest in variety performance particularly the apparent differences in variety performance depending on sowing times.

## About the trial:

Trials were sown at two locations, Waikerie and Karoonda

Varieties were Axe, (short season maturity), Gladius (mid season) and Yitpi (long season). Three times of sowing were used and it was initially hoped to have about two weeks between sowings. At Waikerie, trials were sown on the 4<sup>th</sup> of May, the 21<sup>st</sup> of May and the 8<sup>th</sup> of June. At Karoonda, sowing dates were the 11<sup>th</sup> of May, the 12<sup>th</sup> of June and the 29<sup>th</sup> of June. Fertiliser was applied at 58 kg/ha of DAP across all treatments and the sowing rate was 50 kg/ha. The CSIRO seeder was used at both trial sites and is configured for 7 rows at 23 cm (9 inch) spacing, Plot size was 60 and 100 m at Waikerie and Karoonda respectively.

## Assessments:

The collection of data at the trial site included:

- Grain yield data
- Visual assessment of disease and growth

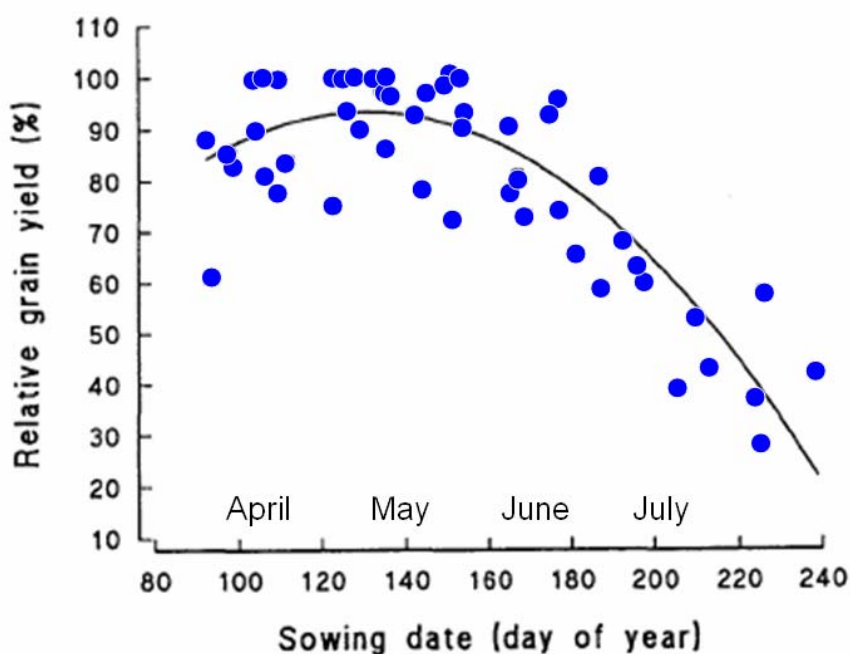
## Results:

Grain yield, quality and water use efficiency results are shown in tables 1, 2 and 3 below.

## Discussion

Sowing time can have a major impact on ultimate productivity of the crop. In the Mallee we observe each year the effects of delayed sowing by as little as one week to 10 days. Therefore there appears to be a small window of optimum sowing opportunity after which yield and yield potential from later sown crops can drop off significantly.

The effect of variety to time of sowing is well known. At the 2009 GRDC update Glenn McDonald et al in his paper 'Time of Sowing' reviewed the current knowledge in the literature and showed the general pattern for cereal yield with time of sowing (Fig. 1).



Source: Gomez-MacPherson & Richards(1995) Aust J Agric Res 46: 1381

**Figure 1.** Collation of yield results from South Eastern Australia (McDonald et al, 2009).

McDonald also showed (Fig. 2) the yield response of three varieties (Axe, Gladius and Frame) to time of sowing and these display very different patterns for the different maturity lines. Axe achieves optimum yield in late May whereas Gladius

and Yitpi are better sown earlier. The take home message is to align the variety sowing time to the flowering window in mid to late September.

McDonald et al summarized their findings with the following points:

- Average yield losses from delayed sowing are 200kg/ha/week.
- The flowering window determines the optimum sowing time for a variety.
- Differences in crop development and grain yield among varieties increases with earlier sowing.
- Later flowering varieties can provide flexibility when sowing can occur in early May.
- Further yield benefits from very early sowing (April) may be slight but may provide other management options.
- Predicted changes in temperature and rainfall may increase the importance of early sowing. (McDonald et al, 2009)

From these trials I think McDonald's summary points are worthwhile and relevant for the Mallee. Because the break of the season is so variable and uncertain in the Mallee the general idea would be to sow the long season varieties such as Yitpi first and the short season lines such as Axe last.

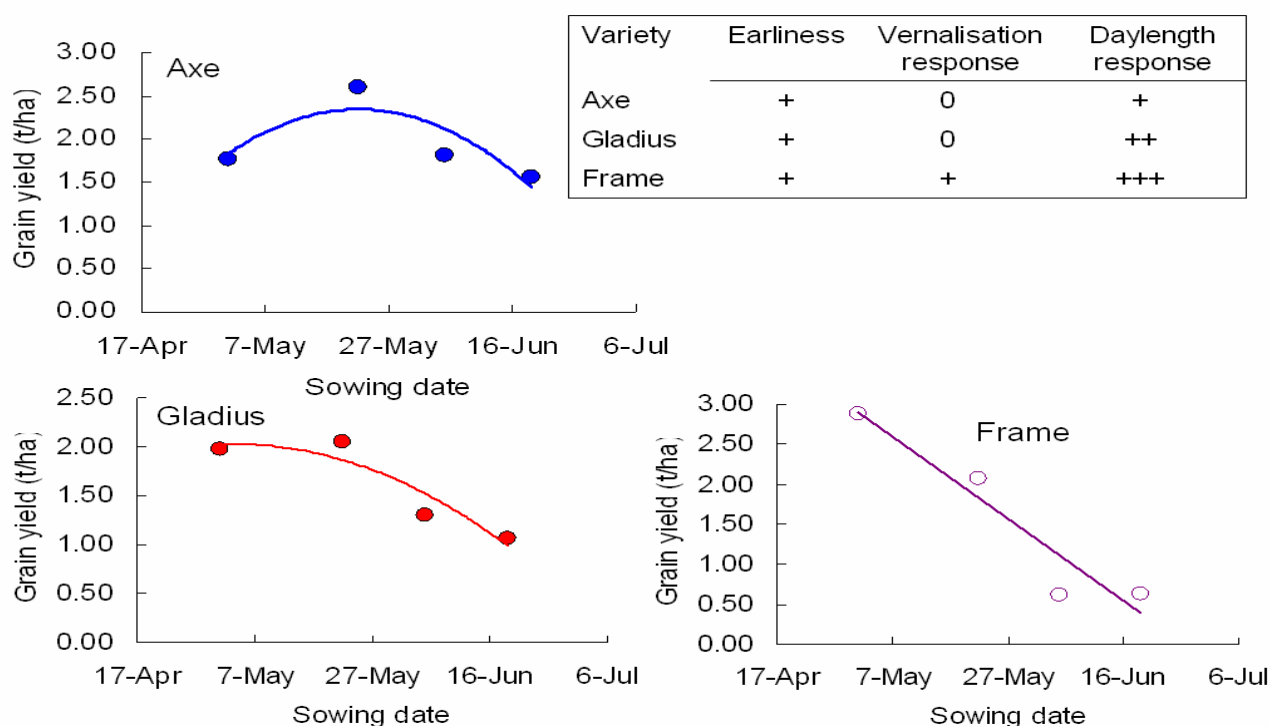


Figure 2. Yield response of various wheat varieties to time of sowing (McDonald et al, 2009)

In these 2009 Mallee trials, the yield analyses (Table 1) shows significant differences between TOS treatments at the Karoonda site. Yield at Waikerie was not significant for any treatment or interaction. Because of the high coefficient of variation (CV % > 15) at Waikerie the high variation suggest the trial results are of limited value whereas Karoonda shows a much lower CV % of 8.2.

At Karoonda, Yitpi yielded 11% higher than the average yield of all three varieties across all three sowing dates. TOS2 was the best sowing date at total yield from the three varieties, 9% higher than the total yield from the other two sowing dates.

Water use efficiency figures for the treatments were all relatively low, ranging from 5.6 to 6.8 kg/mm (Table 2). Yields were adversely affected by drought through spring (mid July to mid Sept) and high temperatures and evaporation during this period. On the 11<sup>th</sup> and 12<sup>th</sup> of September temperatures reached 33°C with strong winds (>23 knots) and relative humidity plummeting to 1%. It was highlighted in 2008 by Hayden Kuchel (AGT, Adelaide) that high temperatures at anthesis (flowering) have a strong negative effect on grain yield – more so than spring or winter rainfalls. It is thought here that prevailing conditions during the time leading up to anthesis has significantly affected yields and grain quality. At the beginning of September cv. Axe particularly at Waikerie had changed plant colour from green to white in response to season stress.

Although the yields are low, Figure 3 below shows the pattern of yield for each variety at each time of sowing. Axe shows a similar linear pattern to the response of this variety shown by McDonald. Gladius and Yitpi yields show similar but flatter patterns with optimum yield at TOS 2 in 2009 at the Karoonda site. Nevertheless the general yield trend is decreasing with later time of sowing. It is strongly suspected that late significant rains in September aided yield in treatments TOS 2 and 3.

Season stress also shows up in the grain quality data shown in Table 3. The most obvious stress response is seen in the Waikerie figures with high grain protein, high screenings and low test weights. From Karoonda the general trends in each variety are reduction in protein, test weight and 1000 grain weight with later time of sowing. The exception to this is Yitpi protein which remains the same for each time of sowing. Conversely screenings levels consistently increased with later time of sowing at Karoonda.

On average, Waikerie grain quality figures were higher for every test than those from Karoonda – most importantly screenings and protein. Many treatments at Karoonda failed to make the test weight minimum standard of 76 kg/hL, yet had very low levels of screenings. Grain size at both sites, as shown by 1000 grain weight (tkw) was reasonably high.

It would be interesting to repeat this experiment with a greater range of varieties and more times of sowing.

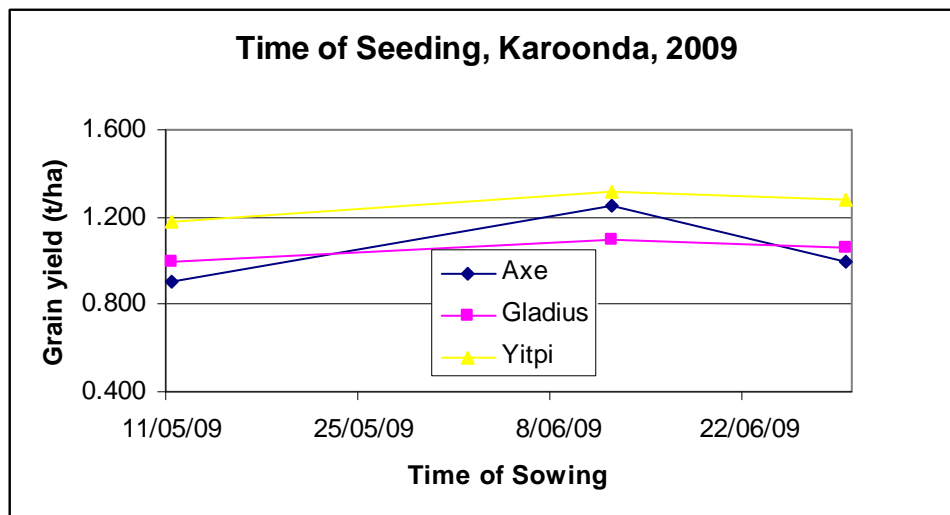


Figure 3. Variety response to time of sowing at Karoonda, 2009.

### Who's Involved:

The trial is supported by;

- Caring for our Country SAMS2 project; DWLBC; Alan Buckley, Waikerie and Peter Loller, Karoonda; Bill Davoren, CSIRO, for use of sowing equipment and assistance with harvest; Bev Gogel, University of Adelaide analysed the Karoonda yield results; Brett Klau, Viterra, Loxton, kindly allowed Rural Solutions SA to use Viterra equipment for grain quality determination.

### Activities, Events and Industry Participation:

- Included in respective site field days in 2009.

### For more information, please contact

Richard Saunders  
 Farming System Consultant  
 (08) 8595 9152  
 richard.saunders@sa.gov.au



CARING  
FOR  
OUR  
COUNTRY



**Table 1.** Grain yield analysis and Water Use Efficiency (WUE) results for Time of Sowing by Variety trials, Waikerie and Karoonda in 2009.

	Waikerie			Karoonda		
	Yield (kg/ha)	Significance	% mean	Yield (kg/ha)	Significance	% mean
<b>Axe</b>	0.432	b	84	1.047	b	93
<b>Gladius</b>	0.568	a	110	1.082	b	96
<b>Yitpi</b>	0.543	ab	106	1.254	a	111
<b>mean</b>	0.514			1.128		
lsd	0.129	ns (P<0.05)	25	0.144	sig. (P<0.05)	13
			<b>% mean</b>			<b>% mean</b>
<b>TOS 1</b>	0.312	a	61	1.033	b	92
<b>TOS 2</b>	0.630	a	122	1.231	a	109
<b>TOS 3</b>	0.602	a	117	1.119	ab	99
<b>mean</b>	0.514			1.128		
lsd	0.414	ns (P<0.05)	80	0.184	sig. (P<0.05)	16
cv (%)	17.8			8.2		
<b>Fertiliser (DAP +Zn)</b>	58			58		
	TOS 1	4-May		TOS 1	11-May	
	TOS 2	21-May		TOS 2	12-Jun	
	TOS 3	8-Jun		TOS 3	29-Jun	

**Table 2.** Grain yield and Water Use Efficiency (WUE) figures for all treatments at Waikerie and Karoonda in 2009

Variety	Yield t/ha		<sup>a</sup> WUE (kg/ha)	
	Waikerie	Karoonda	<sup>b</sup> Waikerie	<sup>c</sup> Karoonda
<b>Axe 1</b>	0.198	0.903	1.5	4.9
<b>Axe 2</b>	0.508	1.250	3.8	6.8
<b>Axe 3</b>	0.589	1.000	4.4	5.4
<b>Gladius 1</b>	0.277	0.996	2.1	5.4
<b>Gladius 2</b>	0.738	1.097	5.5	5.9
<b>Gladius 3</b>	0.690	1.064	5.2	5.8
<b>Yitpi 1</b>	0.460	1.182	3.4	6.4
<b>Yitpi 2</b>	0.644	1.317	4.8	7.1
<b>Yitpi 3</b>	0.526	1.278	3.9	6.9
<b>Mean</b>	0.514	1.121	3.8	6.1
<b>Max</b>	0.738	1.317	5.5	7.1
<b>Min</b>	0.198	0.903	1.5	4.9

<sup>a</sup>WUE calculated as Yield (kg/ha)/[Growing Season Rainfall (GSR) - 60 mm evaporation]

<sup>b</sup>Waikerie GSR = 194 mm (April to October)

<sup>c</sup>Karoonda GSR = 245 mm (April to October)

**Table 3.** Grain quality results for Time of Sowing by Variety trials, Waikerie and Karoonda in 2009.

Variety	Protein		Screenings		Test Weight		1000 Grain Weight	
	Waikerie	Karoonda	Waikerie	Karoonda	Waikerie	Karoonda	Waikerie	Karoonda
<b>Axe 1</b>	16.1	12.1	29.2	0.7	67.9	78.3	29.7	43.7
<b>Axe 2</b>	15.6	11.7	4.8	1.0	81.4	78.0	44.6	43.0
<b>Axe 3</b>	15.0	11.9	5.8	2.1	81.0	75.4	40.7	38.5
<b>Gladius 1</b>	15.1	11.6	11.4	0.9	74.8	78.9	39.7	45.0
<b>Gladius 2</b>	14.9	11.2	8.5	1.1	78.9	76.9	42.4	42.8
<b>Gladius 3</b>	13.5	11.1	9.3	3.2	77.8	75.4	40.7	37.1
<b>Yitpi 1</b>	16.2	10.5	22.6	0.4	69.8	81.1	34.5	47.6
<b>Yitpi 2</b>	14.2	10.5	9.6	1.4	76.8	78.8	39.8	41.3
<b>Yitpi 3</b>	14.6	10.5	12.0	2.4	72.8	76.1	39.2	37.4
<b>Mean</b>	15.0	11.2	12.6	1.5	75.7	77.7	39.0	41.8