

# Early sown winter wheats – Booleroo

Dylan Bruce<sup>1</sup>, Sarah Noack<sup>1</sup>, Kenton Porker<sup>2</sup>, James Hunt<sup>3</sup>  
Hart Field-Site Group<sup>1</sup>, SARDI<sup>2</sup>, La Trobe University<sup>3</sup>

## Key Findings

- The highest yielding spring wheat was Scepter sown on the 4th of May and 16<sup>th</sup> of March at 1.98 t/ha and 1.82 t/ha, respectively.
- The winter wheat varieties yielded between 0.82 – 1.33 t/ha, with no variety consistently outperforming another.
- 2017 conditions at Booleroo were unfavourable for winter wheats, further data across seasons and locations will be continued in 2018 and 2019.

## How was it done?

<b>Plot size</b>	1.75 m x 10.0 m	<b>Fertiliser</b>	DAP (18:20) + 2% Zn @ 75 kg/ha
<b>Seeding date</b>	ToS 1 – 16 <sup>th</sup> March ToS 2 – 3 <sup>rd</sup> April ToS 3 – 19 <sup>th</sup> April ToS 4 – 4 <sup>th</sup> May		UAN (42:0) @ 60 L/ha on 13 <sup>th</sup> July

The trial was a split block design with four replicates of nine varieties (Table 1) at four times of sowing (ToS). Fungicides and herbicides were applied as necessary to keep the crop canopy free of disease (i.e. stripe rust and net blotch) and weeds. All plots were assessed for grain yield, protein, test weight and screenings with a 2.0 mm screen.

Table 1. Different categories of wheat varieties based on their development habits (and speed) selected for the trial at Booleroo.

Spring	Facultative	Winter
Cutlass (slow)	LPB14-0392 (intermediate	ADV08.0008 (slow)
Trojan (fast-medium)	winter – fast spring)	ADV11.9419 (slow)
Scepter (fast)		Kittyhawk (medium)
		Longsword (fast)
		V09150-01 (medium)

## Results and discussion

After receiving above average rainfall over the summer months of 2016/2017 (86 mm above long-term average) opening rains for the 2017 growing season were minimal during the March ToS, with only 2.6 mm falling for the month. A significant rainfall event did not arrive until the 20<sup>th</sup> of April where 32 mm fell at the Booleroo site. To ensure plant emergence would occur, the first two ToS (16<sup>th</sup> March and 3<sup>rd</sup> April) were irrigated with the equivalent of 10 mm of rainfall post-sowing. The last two ToS did not require irrigation for emergence.

### Emergence & Establishment

Plant establishment differed between ToS with the lowest average plant density recorded at ToS 1 (16<sup>th</sup> March) with 33 plant/m<sup>2</sup>, while the highest average plant density was recorded at ToS 3 (19<sup>th</sup> April) with 149 plant/m<sup>2</sup> (Table 2). The reduced emergence and establishment during the earlier ToS was due to the combination of a lack of initial soil moisture and higher soil temperatures in the first 10 cm of top soil, therefore leading to faster evaporation and soil crusting. For the latter two ToS however, conditions were more suitable for germination with adequate seed bed moisture and cooler soil temperatures, allowing plant densities to reach the targeted 150 plants/m<sup>2</sup>. The slower maturing winter types ADV08.0008 and ADV11.9419, and the facultative type LBP14-0392 on average emerged poorly when compared to the other varieties.

Table 2. Average plant densities across all four ToS at Booleroo (target 150 plants/m<sup>2</sup>).

Time of Sowing	Average plants/m <sup>2</sup>	Average air temperature (°C) two weeks post sowing
1	33	23.0
2	81	17.2
3	154	15.4
4	149	12.6
<b>LSD (P≤0.05)</b>	<b>23.5</b>	

### Grain Yield

Overall grain yields at Booleroo ranged from 0.82 t/ha to 1.98 t/ha (Table 3). The yield and flowering date results for the spring varieties in ToS 1 at Booleroo were inconsistent, flowering later and yielding higher compared to ToS 2 (Figure 1 and 2). This was a result of the variable and staggered germination in ToS 1, causing the development of plants in individual plots to be inconsistent and initiate flowering at different times.

The highest yielding treatment at Booleroo was Scepter sown on 4<sup>th</sup> May at 1.98 t/ha (Table 3). Both Cutlass and Trojan were also high yielding at the early May sowing. The winter varieties yielded between 0.82 t/ha and 1.33 t/ha, with no one variety consistently outperforming another. In general, the yield of the winter varieties was consistent across all ToS. The exception was Longsword at ToS 3 where the yield dropped due to a high level of sterility (57%), as also observed at Hart (see 'Early sown winter wheats – Hart', page 17 of this manual).

Overall the selected spring varieties and facultative variety outperformed the winter varieties, even when sown well before their optimal sowing window. These results have been caused by the combination of drought, frost, heat and disease (crown rot) stress observed at Booleroo in a season which favoured varieties that develop quickly.

Environmental conditions at Booleroo made it difficult for any varieties to flower during periods of low frost or heat/drought risk as the optimal flowering window is narrow. This is primarily due to a lack of in-season rainfall and temperatures dipping below 0°C on ten occasions and exceeding 30°C on two occasions between August and September. Due to the nature of the season yields and grain quality were generally low. This can be attributed to high levels of sterility.

## Grain Quality

Grain protein content was generally high across the trial and differed between variety and ToS (Table 3). The majority of variety and ToS treatments contained protein levels well above 13% (minimum required for maximum grade). The highest protein contents were observed in Kittyhawk (ToS 4) at 18.0%, closely followed by V09150-01 (ToS 4), Longsword (ToS 4) and Kittyhawk (ToS 3). This is likely due to the extreme drought and heat experienced during grain-fill with later sowing, where accumulated nitrogen has been distributed amongst fewer grains or within smaller grains, increasing the protein concentrations in each grain.

Test weights differed between variety and ToS across the trial (Table 3). In general test weight increased with ToS from 74.5 kg/hL at ToS 1 up to 76.9 kg/hL at ToS 4. Overall the spring varieties outperformed the winter varieties in test weight. Trojan had the highest average test weight with 78.1 kg/hL, followed by Scepter and Cutlass with 76.5 kg/hL and 76.4 kg/hL, respectively.

Overall there were few treatments to exceed the 5% screening level at Booleroo (Table 3). The lowest performing ToS was ToS 1 with screenings levels at 3.9%, however this improved with later ToS. Overall the spring varieties had lower screenings on average when compared to the winter varieties with Trojan, Cutlass and Scepter recording average screenings of 1.9%, 2.2% and 2.3%, respectively.

Table 3. Grain yield and quality for all wheat varieties at different times of sowing at Booleroo in 2017 (LSD  $P \leq 0.05$  is for the interaction between variety and time of sowing). Treatments shaded grey are not significantly different from the highest yielding treatment.

	Yield (t/ha)				Protein %			
	16th March	3rd April	19th April	4th May	16th March	3rd April	19th April	4th May
ADV08.0008	0.83	1.03	1.14	1.09	15.7	14.6	14.7	16.0
ADV11.9419	1.15	1.21	1.21	1.33	15.1	13.9	13.9	15.7
Cutlass	1.32	1.03	0.99	1.61	13.5	13.1	13.9	14.1
Kittyhawk	1.13	1.10	0.97	0.99	14.6	13.8	16.5	18.0
LPB14-0392	1.22	1.31	1.17	1.28	14.5	14.9	15.3	16.2
Longsword	1.11	0.91	0.82	1.22	16.2	16.2	16.1	16.6
Scepter	1.82	1.70	1.56	1.98	11.9	12.0	12.9	12.8
Trojan	1.53	1.59	1.42	1.57	12.6	13.2	13.4	14.1
V09150-01	1.10	1.12	1.11	1.30	15.3	15.1	15.2	16.7
<b>LSD (<math>P \leq 0.05</math>)</b>	<b>0.29</b>				<b>1.25</b>			
	Test weight (kg/hL)				Screenings %			
	16th March	3rd April	19th April	4th May	16th March	3rd April	19th April	4th May
ADV08.0008	72.0	73.4	76.4	76.5	5.2	6.0	4.7	4.2
ADV11.9419	73.4	74.5	75.6	76.0	7.6	7.3	4.3	4.9
Cutlass	76.0	76.2	75.6	77.7	2.3	1.2	2.5	2.8
Kittyhawk	75.3	75.8	76.4	77.5	4.6	4.8	5.1	2.1
LPB14-0392	74.0	74.2	75.2	77.5	7.0	5.2	5.6	3.2
Longsword	72.8	73.2	69.8	74.1	2.0	2.0	4.3	2.6
Scepter	76.8	76.3	74.4	78.5	2.3	1.5	2.5	3.0
Trojan	78.1	76.2	78.0	80.1	1.6	2.1	2.0	1.7
V09150-01	71.9	74.5	74.5	74.4	2.0	3.3	2.2	3.3
<b>LSD (<math>P \leq 0.05</math>)</b>	<b>2.83</b>				<b>2.44</b>			

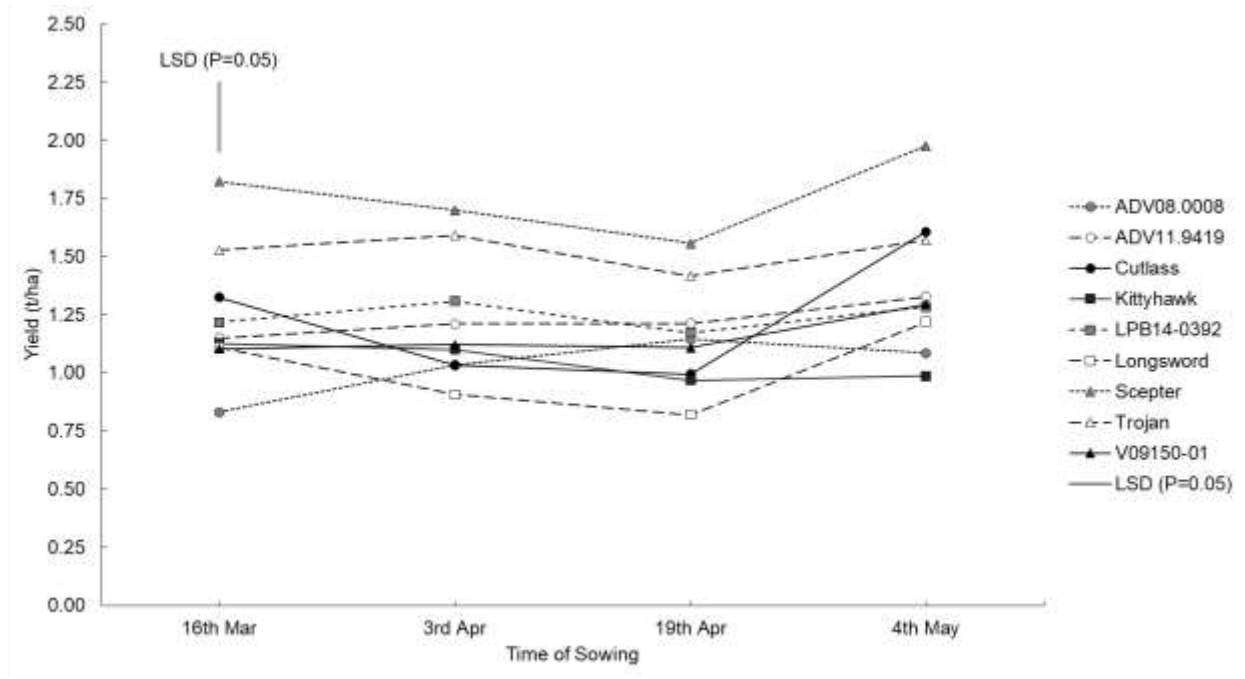


Figure 1. Average yield for all varieties and times of sowing at Booleroo in 2017.

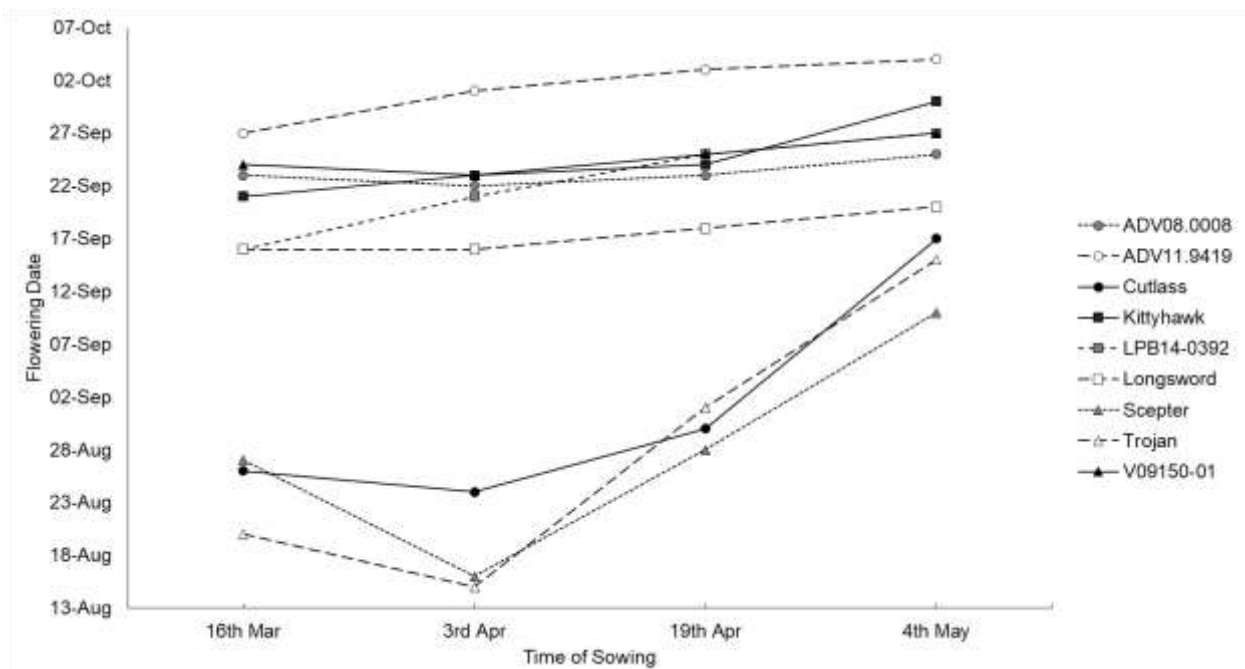


Figure 2. Average flowering dates for all varieties and times of sowing at Booleroo in 2017.

## Summary / implications

Overall the 2017 season at Booleroo was a challenging one with only 165 mm falling during the growing season compared to the long-term average of 274 mm. Achieving good emergence and establishment was difficult due to dry top soil and lack of opening rainfall, until a significant rainfall event arrived in late April.

The use of different ToS and short and long season varieties resulted in a wide range of flowering dates, yields and overall crop performance. Due to low rainfall, hot and frosty conditions, quicker developing spring varieties such as Scepter, Trojan and Cutlass were favoured at Booleroo compared to the longer season winter wheats. The winter wheats however, had greater stability in flowering time and yield even though they were consistently lower than the spring varieties. It would be interesting to see how these varieties would perform in this environment under more favourable conditions, but further investigation and consecutive years of data collection and analysis is required.

## Acknowledgements

The authors thank GRDC for project funding 'Development of crop management packages for early sown, slow developing wheats in the Southern region' (ULA9175069). We also thank the SARDI Clare team for their assistance with trial management.

