

# Early sown winter and awnless wheats

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## Key Findings

- Slower season varieties performed best in 2022 due to a wet spring, with Denison and LPB19-14343 the highest yielding varieties of 5.34 t/ha and 5.68 t/ha, respectively. Illabo, Catapult, RockStar, LRPB Orion and LRPB Dual were also high performing with an average yield of 5.06 t/ha.
- Time of sowing did not affect grain yield or hay production due to minimal rainfall between sowing dates. In 2020, there was sufficient rainfall between sowing times, resulting in a decrease in yield (0.35 t/ha) at the earlier sowing due to dry conditions at critical development times.
- Hay performance between awnless varieties was similar in 2022, with an average production of 7.67 t/ha. Dry spring conditions in 2021 saw LRPB Bale perform best with 5.98 t DM/ha produced. There was a wet finish in 2020, similar to 2022, that resulted in no difference in hay yield between awnless wheats.
- Grain quality varied between varieties with low protein (8.9 %), high test weights (82.4 kg/hL) and low screenings (0.5%). Protein was low due to under fertilisation, resulting in all varieties, excluding Orion, meeting ASW1 receival specifications.

## Introduction

Winter wheats allow growers to sow a cereal program earlier in the growing season, utilising early April rainfall. Winter wheats can be sown earlier as they have a vernalisation (cold) requirement, which lengthens the crops growing season (Porker et al 2019). Due to this, winter wheats will still flower in the optimal window, whereas early sown spring wheats are at risk of frost damage as they will flower early.

Dual purpose crops such as awnless wheat varieties are a useful tool within cropping systems prone to frost damage as they can be utilised for grain or hay production. Awnless wheats produce a safer hay option due to the lack of awns; awns have the potential to injure animals consuming awned hay (Lyon 2021).

Trials investigating the performance of longer season spring wheats and winter wheats in the Mid-North were conducted from 2020 – 2022. The aim was to compare these varieties to Scepter wheat in its optimal flowering window (September 15-25) and evaluate newly released awnless varieties for hay and grain production.

## Methodology

<b>Plot size</b>	1.75 m x 10.0 m	<b>Fertiliser</b>	Seeding: DAP (18:20) Zn 1% + Impact @ 80 kg/ha
<b>Seeding date</b>	TOS 1: April 22 TOS 2: May 13		June 22: Easy N (42.5:0) @ 70 L/ha August 17: Easy N (42.5:0) @ 60 L/ha
<b>Crop History</b>	Mulgara Oaten Hay		
<b>Harvest date</b>	December 1, 2022	<b>Location</b>	Hart, SA



The trial was a split plot design with three replicates, two times of sowing (TOS) and 12 wheat varieties. Seeding dates were chosen to represent the early sowing opportunity for winter and slow spring wheats on April 22, and the ideal sowing time of Scepter (May 13) to flower in the optimal flowering window (Hunt et al 2020). This trial was managed with the application of pesticides to ensure a weed, insect and disease-free canopy. All plots were assessed for grain yield (t/ha), protein (%), test weight (kg/hL) and screenings (%). Data was analysed using a split-plot ANOVA model in Genstat 22<sup>nd</sup> edition.

Awnless wheat varieties were also assessed for hay production by sampling 4 x 1 m section of row at watery ripe (GS71). Samples were oven dried at 60°C for 48 hours and weighed to assess hay production. Varieties that were included in this trial are listed in Table 1.

A pre-commercial testing line (V13121-030) by AGT was included in the trial due to its awnless and quick maturing characteristics. DS Bennett was not included into the 2022 trial due to very late maturing proving un-suitable to the medium rainfall regions of the Mid-North, like Hart. It was replaced with a quick winter variety (LPB19-14343), with maturity similar to Longsword, developed and undergoing testing by LongReach Plant Breeding.

Table 1. Summary of wheat varieties, including development and quality sown at Hart in 2022 (Schilling et al 2021).

Variety	Development	Quality	Awnless
Scepter	Mid spring	AH	N
RockStar	Mid – slow spring	AH	N
Nighthawk	Very slow spring	APW	N
LRPB Orion	Mid – slow spring	ASF	Y
LRPB Bale	Slow spring	APW	Y
LRPB Dual	Mid – slow spring	AH	Y
Valiant CL Plus	Mid – slow spring	AH	N
Catapult	Mid – slow spring	AH	N
Denison	Slow spring	APW	N
V13121-020	Quick spring*	-	Y
Illabo	Quick – mid winter	AH	N
LPB19-14343	Quick winter*	-	N

\*Provisional development rating

## Results and discussion

### Grain yield

Longer season wheat varieties were some of the best performing wheats in 2022 at Hart.

Denison and LPB19-14343 were the highest yielding varieties with grain yields of 5.34 t/ha and 5.68 t/ha, respectively (Figure 1). Illabo, Catapult, RockStar, LRPB Orion and LRPB Dual were also high performing with an average yield of 5.06 t/ha.

The 2022 growing season was characterised by a cold winter (daily average temperature of 10.9 °C), followed by a wet spring (246 mm). Winter wheat and longer season spring wheats were able to capitalise on the longer growing season and utilise the late spring moisture more effectively. The quick spring variety V13131-020 was the lowest yielding with a grain yield of 4.58 t/ha. This is due to its faster maturity not suiting dry conditions experienced in the winter months. LRPB Bale, Scepter, and Nighthawk also performed similarly to V13121-020 with yields ranging from 4.58 – 4.95 t/ha.

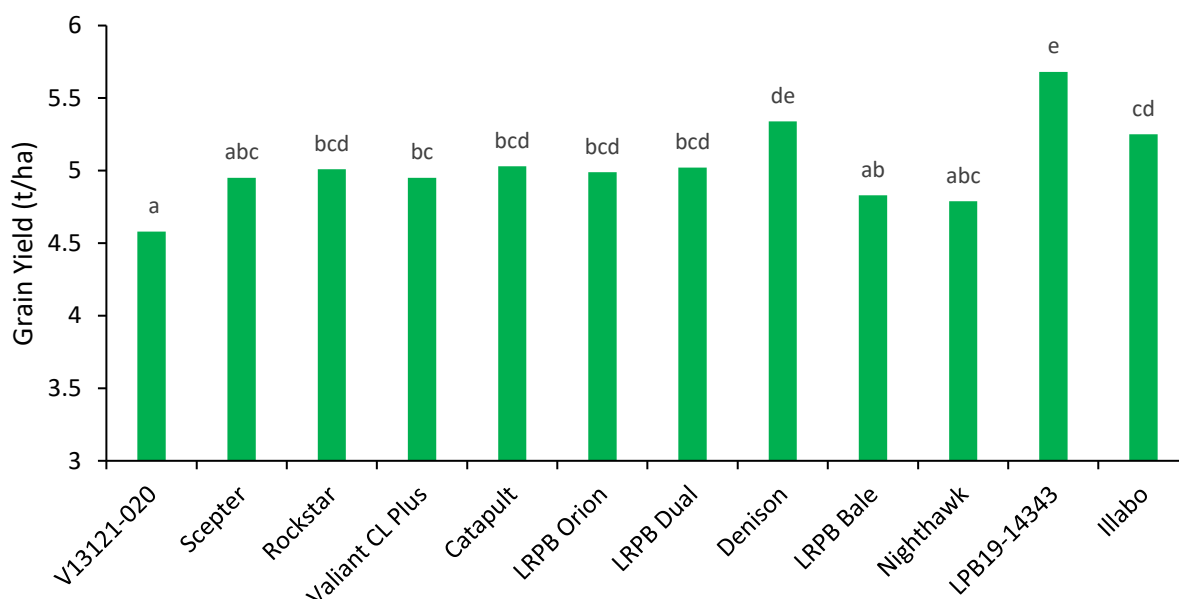


Figure 1. Wheat grain yield at Hart in 2022. Varieties are ordered from fastest to slowest maturity. Varieties with the same lettering are not significantly different.

#### Time of sowing

Time of sowing did not affect grain yield in 2022 (Table 2). Wheat grain yields were also similar across both times of sowing in 2021 (Anderson & Allen 2021). This was a result of marginal rainfall between the early and standard time of sowing, preventing early germination.

In 2020, there was over 50 mm of rainfall received between sowing times (April 20 – May 6) resulting in yield differences of 0.35 t/ha (Table 2). Sowing early in 2020 resulted in decreased grain yield due to very dry conditions across June and July (47 mm) causing significant crop stress for TOS 1 during the transitional phase at stem elongation, impacting grain yield potential. During this time TOS 2 was still tillering, reducing crop stress and rainfall from August 7 onwards relieved crop stress with 70 mm over 17 days.

Table 2. Summary of average wheat grain yield for TOS comparisons trialed at Hart from 2020 – 2022. Shaded values indicate the highest performing treatments. Varieties with the same letters are not significantly different.

Variety	2020		2021		2022	
	April 20	May 6	April 19	May 3	April 22	May 13
	Grain yield (t/ha)		Grain yield (t/ha)		Grain yield (t/ha)	
Scepter	1.65 <sup>f</sup>	3.03 <sup>a</sup>	2.18	2.28	5.08	4.82
RockStar	-	-	-	-	5.12	4.89
Nighthawk	2.28 <sup>cde</sup>	1.97 <sup>def</sup>	1.74	1.77	4.81	4.77
Valiant CL Plus	-	-	-	-	5.09	4.82
Catapult	2.13 <sup>def</sup>	2.92 <sup>ab</sup>	2.34	2.22	5.18	4.88
Denison	1.91 <sup>ef</sup>	2.43 <sup>bcd</sup>	2.18	2.30	5.22	5.45
Illabo	1.65 <sup>f</sup>	2.00 <sup>def</sup>	2.05	1.82	5.29	5.21
LPB19-14343	-	-	-	-	5.70	5.65
LRPB Orion	2.06 <sup>de</sup>	2.00 <sup>def</sup>	1.41	1.46	5.22	4.76
LRPB Bale	1.98 <sup>def</sup>	2.04 <sup>def</sup>	1.75	1.8	4.94	4.71
LRPB Dual	2.02 <sup>def</sup>	2.64 <sup>abc</sup>	1.94	1.99	5.20	4.84
DS Bennett	2.19 <sup>cde</sup>	2.25 <sup>cde</sup>	1.94	1.69	-	-
V13121-020	-	-	-	-	4.68	4.49
<b>Average yield</b>	<b>1.99<sup>a</sup></b>	<b>2.34<sup>b</sup></b>	<b>1.95</b>	<b>1.93</b>	<b>5.13</b>	<b>4.94</b>
<b>LSD (P≤0.05)</b>	<b>0.17 (0.49 in each TOS)</b>		<b>NS</b>		<b>NS</b>	

#### Grain quality

All varieties, excluding Orion, were classified as ASW1 due to low protein levels in 2022. The awnless testing line V13121-020 recorded the highest protein of 10.1% (Table 3). Protein levels for all remaining varieties were lower, ranging from 8.2 – 9.5%.

Test weight was high for most varieties, with Scepter, Valiant CL Plus and LPB19-14343 performing well with test weights of 84.6, 84.4, and 84.2 kg/hL respectively. The only variety to receive a low test weight was Orion (75.9), just below minimum receival standards for SFE1 of 76 kg/hL. Screenings were low across all varieties with an average of 0.46%.

Table 3. Summary of grain quality and maximum receival standards for all wheat varieties trialed at Hart in 2022. Shaded values show the highest performing varieties. Values with the same letter are not significantly different.

Quality	Variety	Protein (%)	Test weight (kg/hL)	Screenings (%)
AH	Scepter	9 <sup>ef</sup>	84.6 <sup>g</sup>	0.43 <sup>cd</sup>
	Illabo	8.9 <sup>de</sup>	81.2 <sup>b</sup>	0.35 <sup>bc</sup>
	Catapult	8.3 <sup>ab</sup>	82.8 <sup>d</sup>	0.56 <sup>ef</sup>
	RockStar	8.2 <sup>a</sup>	82.1 <sup>c</sup>	0.58 <sup>fg</sup>
	Valiant CL Plus	8.7 <sup>cde</sup>	84.4 <sup>g</sup>	0.24 <sup>a</sup>
	LRPB Dual	9.4 <sup>g</sup>	83.4 <sup>de</sup>	0.48 <sup>de</sup>
<i>H1 receival standard</i>		>13.0	>76	<5.0
APW	Nighthawk	9.2 <sup>fg</sup>	83.7 <sup>ef</sup>	0.31 <sup>ab</sup>
	LRPB Bale	9.4 <sup>g</sup>	80.7 <sup>b</sup>	0.77 <sup>h</sup>
	Denison	8.4 <sup>abc</sup>	83.6 <sup>e</sup>	0.67 <sup>gh</sup>
<i>APW1 receival standard</i>		>10.5	>76	<5.0
ASF	LRPB Orion	8.2 <sup>a</sup>	75.9 <sup>a</sup>	0.42 <sup>cd</sup>
<i>SFE1 receival standard</i>		<9.5	>76	<5.0
Unclassified	V13121-020	10.1 <sup>h</sup>	81.7 <sup>c</sup>	0.34 <sup>abc</sup>
	LPB19-14343	8.6 <sup>bcd</sup>	84.2 <sup>fg</sup>	0.38 <sup>bcd</sup>
<b>LSD (P≤0.05)</b>		<b>0.34</b>	<b>0.57</b>	<b>0.10</b>

## Hay yield

Dry matter production at watery ripe (GS71) was similar for all varieties, ranging from 7.23 t/ha to 8.01 t/ha (Figure 2). Hay yields measured in 2020 were also similar for varieties trialed.

A wet spring was present in both 2020 and 2022 seasons, suggesting that hay production (t/ha) would be similar between varieties in wet spring finishes under similar agronomic conditions. A dry spring finish in 2021 resulted in differences between awnless wheats with LRPB Bale the highest performer at 5.98 t/ha (Figure 2).

Time of sowing has had no effect on hay yield for awnless wheats across three growing seasons at Hart (data not shown).

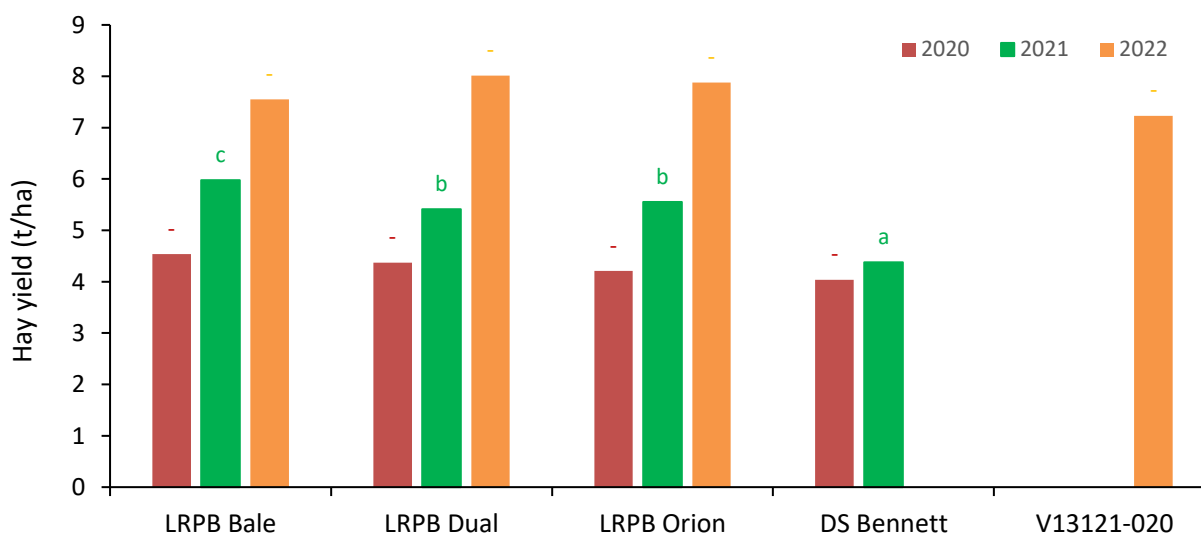


Figure 2. Summary of the average hay yield for each awnless wheat variety trialed at Hart from 2020-2022. Hay yield data for 2020 and 2022 is not significant.

## Acknowledgements

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## References

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