

# Comparison of wheat varieties and summary of nitrogen decisions

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## Key findings

- Wheat yields were below average at Hart in 2025, likely due to a combination of low stored soil water, a late season break, below average spring rainfall and Decile 3 (223 mm) growing season rainfall (GSR).
- APW variety Tomahawk CL Plus and AH variety Shotgun yielded highest, achieving 2.05 and 2.01 t/ha, respectively.
- LRPB Dual, AGT-Colt, and Durum varieties Patron, AGT-Banker and Bitalli, met the respective AH or Australian Premium Durum (ADR) receival standards of  $\geq 13\%$  protein, while all other varieties did not meet the threshold.
- Despite relatively low yields, all varieties exhibited test weights greater than the 76 kg/hL minimum receival standard for AH. Average screenings across the trial were 6.0%, however variety averages ranged from 2.9-20.5%.

## Aim

To compare the performance of pre-commercial and newly released wheat (*Triticum aestivum*) varieties alongside current commercial variety options in the medium rainfall zone of South Australia.

## Methodology

A trial was conducted at Hart, SA in 2025 to investigate wheat varietal performance (Table 1). The trial was established as a randomised complete block design with three replicates of 31 wheat varieties. New lines at Hart in 2025 included AGT-Colt (RAC3254), Packer, AGT-Rio, AGT-Banker (AGTD173) and coded lines; 19Q3H0393, 19G3H0499, IGW6955, L20158-141-15 and LPB21-34503.

The trial was managed through the application of pesticides to ensure an insect, weed and disease-free canopy. Grain yield (t/ha), protein (%), test weight (kg/hL) and screenings (%) were assessed post-harvest. The 2025 growing season was characterised by below average rainfall. The trial was not subject to stress from any other external or environmental factors. Trial data was analysed utilising REML spatial model (Regular Grid) in GenStat 24th Edition. Bonferroni critical difference values (Bonferroni CD) were calculated using average standard error of difference (SED) from the GenStat output and the relevant t critical value calculated in Excel. This number can be used to determine the difference required for a significant effect between treatments.

Table 1. Trial details for 2025 wheat variety comparison at Hart, SA.

<b>Plot size</b>	1.75 x 10 m	<b>Soil N</b>	120.4 kg N/ha
<b>Location</b>	Hart, SA	<b>Fertiliser</b>	Seeding: MAP (10:22)
<b>Seeding date</b>	May 23, 2025		Zn 1% @ 80 kg/ha
<b>Harvest date</b>	November 28, 2025		July 14: 30 kg N/ha (applied as Easy N)
<b>Previous crop</b>	Bale awnless wheat		
<b>Growing season rainfall</b>	Decile 3 (223 mm)		

## Nitrogen discussion

High background N (120 kg N/ha) was observed at Hart in 2025 following Decile 2 GSR and a wheaten hay crop in 2024. In-season N decisions were influenced by considering existing soil organic N, Yield Prophet®, Bureau of Meteorology (BoM) climate outlooks and economics.

Despite being typically highly responsive to N at all decile ranges, high background N indicated that there were only small benefits of additional N, unless growing season rainfall exceeded Decile 3 (Figure 1, Graph A) (Hart Field-Site Group, 2025).

In July, the Bureau predicted 23% chance that July - September rainfall would fall into a Decile 1–4 category and 51% chance of falling into Decile 7–10. Combined, this information estimated that the likelihood of receiving above median (average) rainfall from July–September was 76% which is slightly higher than the long-term odds. To reduce the yield gap between  $Y_{P_W}$  and  $Y_{P_N}$  (Figure 1, Graph A), one in-season application of 30 kg N/ha was applied as a foliar application on July 14, taking a somewhat conservative approach considering the dry and late start to the season (Hart Field-Site Group, 2025).

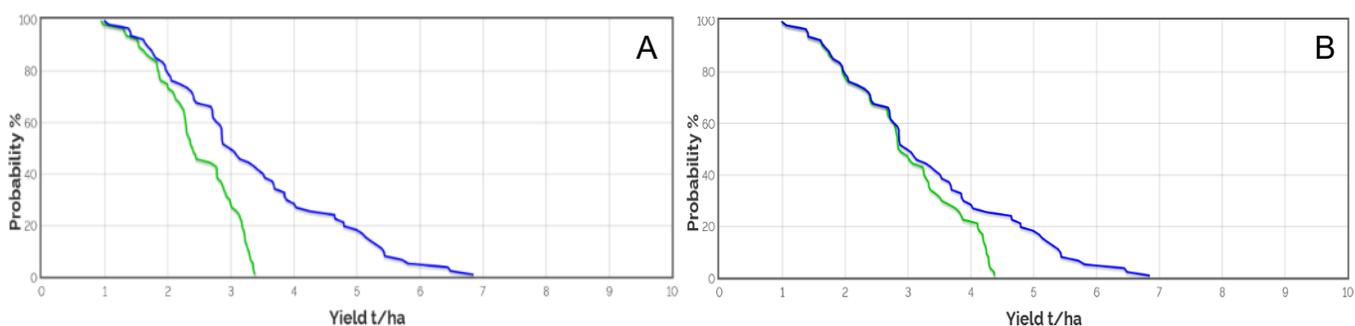


Figure 1: Yield Prophet® Output 1 (Graph A) for the Hart field site on July 10, 2025, for Scepter wheat with no in-crop N applied. This graph shows N responsiveness across all decile outcomes with  $PY_W$  ranging from 1-6.9 t/ha. Yield Prophet® Output 2 (Graph B) shows predicted yields after a total of 30kg N/ha was applied at one application timing.

## Results and discussion

### Grain yield

Minimal summer rain, Decile 2 (176 mm) GSR in 2024, and a late start to the season resulted in increased reliance on late season rainfall to improve crop yield. Above average rainfall for July favoured early crop development, however below average spring rainfall resulted in water stress during reproductive stages, impacting yield potential across all varieties.

Across the wheat variety trial, yields ranged from 1.45-2.05 t/ha with the average yield being 1.68 t/ha. Several Australian Hard (AH) and Australian Prime White (APW) varieties including Shotgun and Vixen performed significantly better than other varieties, however many were statistically equivalent (Table 2). APW variety Tomahawk CL Plus and AH variety Shotgun were the only varieties to achieve yields over 2 t/ha. Tomahawk CL Plus and Shotgun were also ranked in the top five yielding varieties within the National Variety Trial at Pinery and Spalding (GRDC, 2025).

Long-term yield data shows that Calibre, Scepter, Vixen, and Brumby continue to perform well, yielding above the trial average across multiple seasons at Hart (Table 3).

Durum varieties Bitalli, DBA Aurora and Patron yielded similarly (range 1.61-1.66 t/ha) and were ranked in the top five yielding Durum varieties within the National Variety Trial at Pinery (GRDC, 2025).

### *Grain quality*

Wheat grain protein averaged 12.3% across the trial in 2025. Durum varieties Patron, AGT-Banker and Bitalli, and AH varieties LRPB Dual and AGT-Colt, achieved the respective Australian Premium Durum (ADR) or AH receival standards of  $\geq 13\%$  protein. All other varieties exhibited a protein between 11.1 and 12.9%, achieving APW1 for protein. Despite being a feed only variety, Wallaroo recorded 13.7% protein and was among the highest performing varieties for protein.

All varieties exhibited test weights greater than 76 kg/hL, with coded line L20158-141-15 achieving 84 kg/hL, which was significantly greater than all other varieties except Durum varieties Patron and AGT-Banker which were statistically equivalent. Screenings ranged from 2.9-20.5% across all varieties at Hart in 2025, with LRPB Anvil CL Plus achieving the lowest screenings of 2.9%, although many varieties were statistically similar. Several varieties exceeded 5% screenings and did not meet H1 or APW1 receival standards, with coded line 19Q3H0393 and Genie exceeding 10% screenings, therefore not meeting AGP1 or SFW1 receival standards.

### **Summary**

Decile 3 (223 mm) GSR at Hart in 2025 affected yield potential and quality across the trial site. High test weight was observed across all varieties, with screenings highly variable dependent on variety. In general, protein was low across all varieties, with only six varieties achieving a protein higher than the 13% minimal receival standard for AH classification.



*Photo. Wheat varieties trial at Hart, 2025.*

Table 2. Wheat grain yield (t/ha) and quality results in Hart in 2025. Shaded values indicate significant best performing treatments. Any difference between two means greater than the Bonferroni critical difference value is significant at  $\alpha = 0.05$  after Bonferroni correction.

Quality	Variety	Grain yield t/ha	% of site average	Protein %	% of site average	Test weight kg/hL	% of site average	Screenings %	% of site average	
AH	AGT-Colt <sup>(b)</sup> (RAC3254)	1.61 <sup>a-f</sup>	96	13.4 <sup>jk</sup>	109	81.3 <sup>fm</sup>	101	6.3 <sup>b-j</sup>	100	
	Boa <sup>(b)</sup>	1.67 <sup>b-i</sup>	99	12.1 <sup>c-f</sup>	99	78.6 <sup>a-d</sup>	97	6.9 <sup>e-j</sup>	110	
	Calibre <sup>(b)</sup>	1.71 <sup>c-i</sup>	102	12.3 <sup>efg</sup>	100	79.8 <sup>-i</sup>	99	4.0 <sup>a-e</sup>	64	
	Dale <sup>(b)</sup>	1.72 <sup>d-i</sup>	102	11.5 <sup>abc</sup>	94	81.5 <sup>-m</sup>	101	4.8 <sup>a-f</sup>	77	
	Genie <sup>(b)</sup>	1.48 <sup>abc</sup>	88	12.6 <sup>gh</sup>	103	80.1 <sup>b-j</sup>	99	20.5 <sup>i</sup>	329	
	LRPB Anvil <sup>(b)</sup> CL Plus	1.55 <sup>a-d</sup>	92	12.1 <sup>c-g</sup>	99	81.1 <sup>h-i</sup>	101	2.9 <sup>a</sup>	47	
	LRPB Dual <sup>(b)</sup>	1.61 <sup>a-f</sup>	96	13.2 <sup>hij</sup>	107	81.3 <sup>a-m</sup>	101	3.5 <sup>a-d</sup>	56	
	LRPB Major <sup>(b)</sup>	1.59 <sup>a-e</sup>	95	12.3 <sup>efg</sup>	100	81.1 <sup>h-i</sup>	101	8.3 <sup>ijk</sup>	133	
	LRPB Matador <sup>(b)</sup>	1.79 <sup>e-j</sup>	107	12.0 <sup>-f</sup>	98	80.6 <sup>a-k</sup>	100	9.0 <sup>jk</sup>	145	
	Packer <sup>(b)</sup>	1.57 <sup>a-e</sup>	94	11.9 <sup>b-f</sup>	97	81.7 <sup>-m</sup>	101	4.1 <sup>a-e</sup>	66	
	RockStar <sup>(b)</sup>	1.72 <sup>d-i</sup>	102	11.8 <sup>a-e</sup>	96	80.1 <sup>d-j</sup>	99	5.8 <sup>a-j</sup>	94	
	Scepter <sup>(b)</sup>	1.71 <sup>d-i</sup>	102	11.8 <sup>a-e</sup>	96	82.1 <sup>klm</sup>	102	4.9 <sup>a-g</sup>	78	
	Shotgun <sup>(b)</sup>	2.01 <sup>jk</sup>	120	11.2 <sup>ab</sup>	92	81.3 <sup>fm</sup>	101	3.5 <sup>a-d</sup>	55	
	Vixen <sup>(b)</sup>	1.87 <sup>gh-k</sup>	111	11.6 <sup>a-d</sup>	94	79.6 <sup>-g</sup>	99	4.9 <sup>a-h</sup>	79	
<b>H1 receival standard</b>				<b>&gt;13</b>		<b>&gt;76</b>		<b>&lt;5</b>		
APW	AGT-Rio <sup>(b)</sup> (V15019-88)	1.55 <sup>a-d</sup>	92	12.3 <sup>dg</sup>	100	79.6 <sup>-f</sup>	99	7.8 <sup>fj</sup>	125	
	Brumby <sup>(b)</sup>	1.76 <sup>d-i</sup>	104	11.6 <sup>a-e</sup>	95	80.1 <sup>d-j</sup>	99	6.1 <sup>a-j</sup>	98	
	Dozer <sup>(b)</sup> CL Plus	1.53 <sup>a-d</sup>	91	12.3 <sup>c-g</sup>	100	78.1 <sup>abc</sup>	97	7.7 <sup>fj</sup>	123	
	Mowhawk <sup>(b)</sup>	1.83 <sup>f-k</sup>	109	12.9 <sup>ghi</sup>	105	82.1 <sup>klm</sup>	102	4.1 <sup>a-e</sup>	65	
	Murray <sup>(b)</sup>	1.66 <sup>a-h</sup>	99	11.8 <sup>a-e</sup>	96	79.7 <sup>b-h</sup>	99	8.1 <sup>gk</sup>	130	
	RG T Ponsford <sup>(b)</sup>	1.45 <sup>a</sup>	86	12.3 <sup>c-g</sup>	100	77.1 <sup>a</sup>	96	6.1 <sup>a-j</sup>	97	
	Soaker <sup>(b)</sup>	1.57 <sup>a-d</sup>	93	11.8 <sup>a-e</sup>	96	81.3 <sup>fm</sup>	101	9.0 <sup>jk</sup>	143	
	Tomahawk CL Plus <sup>(b)</sup>	2.05 <sup>k</sup>	122	11.1 <sup>a</sup>	91	81.9 <sup>klm</sup>	102	3.6 <sup>a-e</sup>	58	
	<b>APW1 receival standard</b>				<b>&gt;10.5</b>		<b>&gt;76</b>		<b>&lt;5</b>	
	Feed	Wallaroo <sup>(b)</sup>	1.46 <sup>ab</sup>	87	13.7 <sup>jk</sup>	112	82.5 <sup>lm</sup>	102	6.5 <sup>-j</sup>	103
<b>SFW1 receival standard</b>				<b>NA</b>		<b>&gt;70</b>		<b>&lt;10</b>		
ADR	AGT-Banker <sup>(b)</sup> (AGTD173)	1.66 <sup>a-i</sup>	99	14.1 <sup>k</sup>	115	82.9 <sup>nm</sup>	103	4.6 <sup>a-f</sup>	74	
	Bitalli <sup>(b)</sup>	1.61 <sup>a-e</sup>	96	14.1 <sup>k</sup>	115	81.7 <sup>klm</sup>	101	5.5 <sup>a-i</sup>	88	
	Patron <sup>(b)</sup>	1.62 <sup>a-f</sup>	97	13.6 <sup>jk</sup>	111	82.5 <sup>nm</sup>	102	3.1 <sup>ab</sup>	50	
	19Q3H0393	1.74 <sup>d-i</sup>	103	11.7 <sup>a-e</sup>	96	78.1 <sup>ab</sup>	97	11.0 <sup>k</sup>	176	
Pending quality	19Q3H0499	1.87 <sup>g-k</sup>	111	11.2 <sup>ab</sup>	91	81.2 <sup>-m</sup>	101	5.7 <sup>a-i</sup>	91	
	IGW6955	1.81 <sup>e-j</sup>	108	11.8 <sup>a-e</sup>	96	79.8 <sup>-i</sup>	99	5.8 <sup>a-j</sup>	94	
	L20158-141-15	1.65 <sup>ac-g</sup>	98	12.1 <sup>c-f</sup>	99	84.0 <sup>n</sup>	104	3.2 <sup>abc</sup>	51	
	LPB21-34503	1.62 <sup>a-f</sup>	97	12.0 <sup>-f</sup>	98	79.0 <sup>-e</sup>	98	6.3 <sup>-j</sup>	101	
<b>Site Average</b>		<b>1.68</b>		<b>12.3</b>		<b>80.7</b>		<b>6.2</b>		
<b>P-value</b>		<b>&lt;0.001</b>		<b>&lt;0.001</b>		<b>&lt;0.001</b>		<b>&lt;0.001</b>		
<b>Bonferroni CD</b>		<b>0.23</b>		<b>0.73</b>		<b>1.69</b>		<b>3.25</b>		

Table 3. Long term wheat variety performance at Hart for 2021–2025 seasons (expressed as a % of trial average).

Quality	Variety	% Trial average					Grain yield (t/ha)
		2021	2022	2023	2024	2025	2025
AH	AGT-Colt <sup>(b)</sup> (RAC3254)					96	1.61
	Ballista <sup>(b)</sup>	100	108	106	107		
	Boa <sup>(b)</sup>				118	99	1.67
	Calibre <sup>(b)</sup>	112	99	108	122	102	1.71
	Catapult <sup>(b)</sup>	96	105	101	99		
	Dale <sup>(b)</sup> (IGW6993)				104	102	1.72
	Devil <sup>(b)</sup>		98				
	Genie <sup>(b)</sup>			95	63	88	1.48
	Grenade CL Plus <sup>(b)</sup>	93	97	96			
	Hammer CL Plus <sup>(b)</sup>	108	89	94	116		
	Kingston <sup>(b)</sup>	101	95	106	85		
	LRPB Anvil <sup>(b)</sup> CL Plus	105	81	87	115	92	1.55
	LRPB Dual <sup>(b)</sup>			99	81	96	1.61
	LRPB Major <sup>(b)</sup>				51	95	1.59
	LRPB Matador <sup>(b)</sup>			104	122	107	1.79
	LRPB Scout <sup>(b)</sup>	86	101	98			
	Packer <sup>(b)</sup>					94	1.57
	Reilly <sup>(b)</sup>		102	102	127		
	RockStar <sup>(b)</sup>	80	107	95	73	102	1.72
	Scepter <sup>(b)</sup>	113	100	108	101	102	1.71
Shotgun <sup>(b)</sup>				103	120	2.01	
Sunblade CL Plus <sup>(b)</sup>	105	111	114	64			
Valiant <sup>(b)</sup> CL Plus	93	100	95				
Vixen <sup>(b)</sup>	130	96	105	120	111	1.87	
APW	AGT-Rio <sup>(b)</sup> (V15019-88)					92	1.55
	Brumby <sup>(b)</sup>	115	104	104	103	104	1.76
	Chief <sup>(b)</sup> CL Plus	102	85	95			
	Cutlass <sup>(b)</sup>	76					
	Dozer <sup>(b)</sup> CL Plus			98	123	91	1.53
	Denison <sup>(b)</sup>	86	110	105			
	LRPB Trojan <sup>(b)</sup>	93	105	106			
	Mowhawk <sup>(b)</sup>			100	35	109	1.83
	Murray <sup>(b)</sup> (IGW6895)				135	99	1.66
	RGT Ponsford <sup>(b)</sup>					86	1.45
	Sheriff CL Plus <sup>(b)</sup>	107	96	89	82		
	Soaker <sup>(b)</sup>			99	121	93	1.57
Tomahawk CL Plus <sup>(b)</sup>				129	122	2.05	
ASW	Razor CL Plus <sup>(b)</sup>	111	94	98			
Feed	Wallaroo <sup>(b)</sup>					87	1.46
Pending quality	19Q3H0393					103	1.74
	19Q3H0499					111	1.87
	IGW6955					108	1.81
	L20158-141-15					98	1.65
	LPB20-8165				101		
	LPB21-34503					97	1.62
ADR	AGT-Banker <sup>(b)</sup> (AGTD173)					99	1.66
	Bitalli <sup>(b)</sup>		106	97		96	1.61
	DBA Aurora <sup>(b)</sup>		109	98			
	Patron <sup>(b)</sup>		124	98		97	1.62
<b>Trial average yield t/ha</b>		<b>2.03</b>	<b>4.40</b>	<b>3.75</b>	<b>0.55</b>	<b>1.68</b>	
Sowing date		May 3	May 5	May 12	May 14	May 23	
Apr-Oct rain (mm)		232	355	236	176	223	
Annual rain (mm)		401	519	355	240	263	

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## References

Grains Research & Development Corporation (GRDC). 2025. National Variety Trials. Available at <https://nvt.grdc.com.au/>

Hart Field-Site Group. 2025. 'HART BEAT. Issue 67; July 9, 2025.' Available at <https://www.hartfieldsite.org.au/pages/resources/hart-beat-newsletters.php>



*Photo. Wheat trials at Hart in 2025.*