

Comparison of wheat varieties and summary of nitrogen decisions

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Key findings

- Decile 2 (176 mm) growing season rainfall (GSR) at Hart in 2024 affected yield potential and quality of all wheat varieties tested, with high variability noticed across the trial site.
- Overall, grain yield (t/ha) was similar across most varieties, with all yields achieving <1 t/ha.
- Grain quality was high for screenings (%) and protein (%). Test weight (kg/hL) was not measured due to insufficient sample size.
- A total of 60 kg N/ha (130 kg urea) was applied to wheat varieties. This decision predominately took into account starting soil N, crop yield outcomes across deciles and the seasonal outlook. At the time of key decision making, the likelihood of receiving above average rainfall from August-October was 52%.

Aim

To compare the performance of new and developing wheat varieties alongside current commercial standards.

Methodology

A trial was implemented at Hart, SA to evaluate wheat variety performance (Table 1). The trial was set up as a randomised complete block design with three replicates and 29 bread wheat varieties. New wheat lines trialed at Hart in 2024 include Tomahawk CL Plus (released in 2023) Shotgun (RAC3227), LRPB Major, Boa (LPB19-8035) and coded lines: V14026-054, LPB20-8165, IGW6924, IGW6895, IGW6993 and IGW6955.

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 (%) and screenings (%). Test weight (kg/hL) was not measured in 2024 due to insufficient sample size for testing. Severe water stress in 2024 resulted in a strong edge row effect, therefore all edge rows were removed prior to harvest to improve accuracy of grain yield results. Trial data was analysed using REML spatial model (Regular Grid) with Bonferroni test in GenStat 24th Edition. Due to drought conditions experienced, high variability was noticed across this trial site, therefore interpretation of results presented should consider this.

Table 1. Trial details for 2024 wheat variety comparison at Hart, SA.

Plot size	0.92 m x 10.0 m	Soil N fertiliser	65 kg N/ha
Seeding date	May 14, 2024		Seeding: DAP (18:20)
Location	Hart, SA		Zn 1% + Flutriafol @ 80 kg/ha
Harvest date	November 14, 2024		July 10: 30 kg N/ha (applied as Easy N @ 42.75 kg/ha)
Previous crop	Kingbale oaten hay		August 8: 30 kg N/ha (applied as urea @ 44 kg/ha)
Growing season rainfall	Decile 2 (176 mm)		

Pre-seeding available nitrogen (N) (0–105 cm) at Hart was 65 kg N/ha following an oaten hay crop in 2023. In-season N decisions considered existing soil organic N, Yield Prophet® (based on Scepter wheat), Bureau of Meteorology (BoM) climate outlooks and simple economics.

Prior to N application, the site was highly responsive (Figure 1, Graph A), and it was clear that even a Decile 1 season would require significant N input to achieve water-limited yield potential (PYw). As significant N was required to improve our final yield, 30 kg N/ha (65 kg urea) was applied as a top dress application on July 10. This was due to an opportunistic rain event (18.8 mm within 5 days), closing our yield gap (HART BEAT, 2024).

In July, we had a 32% chance that August–October rainfall will fall into a Decile 1–4 category, and 49% chance of falling into Decile 7–10. Combined, this information informed us that the likelihood of receiving above average rainfall from August–October was 52% which was similar to the long-term odds. This is in contrast to 2023, where we saw a strong swing in the odds to drier seasonal outcomes, with only a 22% chance of above average rainfall (HART BEAT, 2024). Based on this information, at the time of follow-up application of N, another 30 kg N/ha was applied, (in-crop total of 60 kg N/ha applied). After this application, there was still a slight to moderate gap between nitrogen and water-limited yield from decile 5 onwards (Figure 1, Graph B).

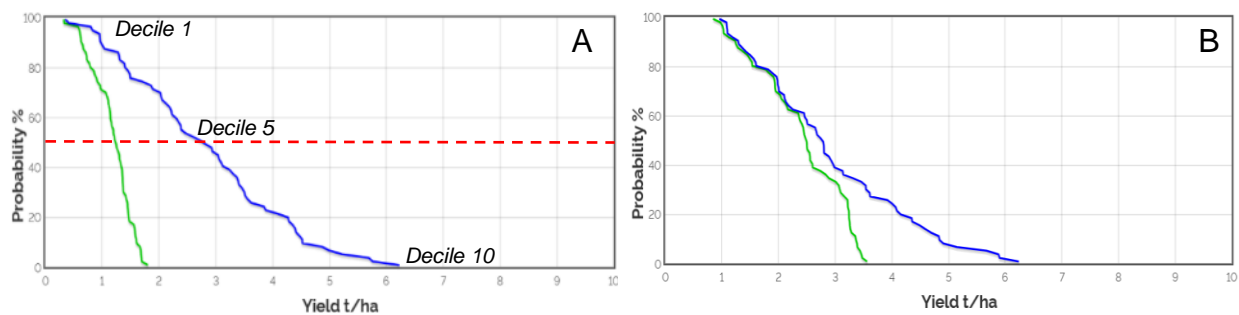


Figure 1. Yield Prophet® Output 1 (Graph A) for the Hart field site on July 10, 2024 for Scepter wheat with no in-crop N applied. This graph shows N responsiveness across all decile outcomes with PYw ranging from 0.5–6.3 t/ha. Yield Prophet® Output 2 (Graph B) shows predicted yields after a total of 60 kg N/ha was applied across two in-crop timings.

Results and Discussion

Grain yield

Decile 2 GSR (176 mm) in 2024 significantly reduced yield potential at Hart. Low stored soil moisture and a late season break received on May 29 increased reliance on late season rainfall to improve yield potential. Below average rainfall for the growing season (April–October) resulted in low yields across all varieties.

In addition to low yield, high variability was noticed across the wheat variety trial site, exacerbated by dry conditions, and impacting results. Therefore, most varieties at Hart performed similarly with no wheat variety achieving above 1 t/ha. Wheat varieties yielded lower than barley this season at the Hart field site, which was unexpected. This result was due to trial location with reduced water availability at the wheat site.

Grain quality

Similarly to grain yield, quality was affected by drought conditions experienced at Hart in 2024. Poor grain fill resulting from water stress caused high protein and also high screenings, with all varieties exceeding the 5% maximum screenings threshold for H1 receival standards.

Summary

Decile 2 (176 mm) GSR at Hart in 2024 resulted in poor and variable yields across the wheat variety trial. High protein and high screenings across all varieties can be attributed to severe water stress during grain fill, leading to higher protein concentration in the small amount of grain present.

Table 2. Wheat grain yield (t/ha) and quality results at Hart in 2024. Test weight (kg/hL) not included as 2024 sample insufficient size for testing.

Quality	Variety	Grain yield (t/ha)	% of site average	Protein (%)	% of site average	Screenings (%)	% of site average	
AH	LRPB Anvil CL Plus ^(b)	0.64 ^{bc}	115	17.07 ^{ab}	99	24.15 ^{a-d}	134	
	Ballista ^(b)	0.59 ^{bc}	107	16.97 ^{ab}	98	17.78 ^{a-d}	99	
	Calibre ^(b)	0.67 ^{bc}	122	17.91 ^{ab}	104	31.06 ^{bd}	173	
	Catapult ^(b)	0.55 ^{a-c}	99	16.73 ^{ab}	97	10.36 ^{a-d}	58	
	LRPB Dual ^(b)	0.45 ^{a-c}	81	18.75 ^{ab}	109	16.94 ^{a-d}	94	
	Hammer CL Plus ^(b)	0.64 ^{bc}	116	17.12 ^{ab}	99	23.28 ^{a-d}	129	
	IGW6993	0.58 ^{a-c}	104	16.69 ^{ab}	97	13.18 ^{a-d}	73	
	Kingston ^(b)	0.47 ^{a-c}	85	16.21 ^a	94	29.57 ^{cd}	164	
	LRPB Matador ^(b)	0.68 ^{bc}	122	16.94 ^{ab}	98	19.8 ^{a-d}	110	
	LRPB Major ^(b)	0.28 ^{ab}	51	17.17 ^{ab}	99	5.83 ^a	32	
	Boa ^(b) (LPB19-8035)	0.65 ^{bc}	118	15.77 ^a	91	16.94 ^{a-d}	94	
	Reilly ^(b)	0.71 ^{bc}	127	16.62 ^{ab}	96	18.76 ^{a-d}	104	
	Genie ^(b)	0.35 ^{a-c}	63	17.51 ^{ab}	101	15.89 ^{a-d}	88	
	RockStar ^(b)	0.41 ^{a-c}	73	17.63 ^{ab}	102	11.17 ^{a-d}	62	
	Scepter ^(b)	0.56 ^{a-c}	101	17.29 ^{ab}	100	15.47 ^{a-d}	86	
	Shotgun ^(b) (RAC3227)	0.57 ^{a-c}	103	18.26 ^{ab}	106	17.52 ^{a-d}	97	
	Sunblade CL Plus ^(b)	0.35 ^{a-c}	64	16.16 ^a	94	18.3 ^{a-d}	102	
	Vixen ^(b)	0.67 ^{bc}	120	17.89 ^{ab}	104	25.85 ^{a-d}	144	
	H1 receival standard				≥ 13		≤ 5	
	APW	Brumby ^(b)	0.57 ^{a-c}	103	17.05 ^{ab}	99	12.24 ^{a-d}	68
Dozer CL Plus ^(b)		0.68 ^c	123	17.78 ^{ab}	103	16.32 ^{a-d}	91	
Mowhawk ^(b)		0.19 ^a	35	17.2 ^{ab}	100	9 ^{ab}	50	
Soaker ^(b)		0.67 ^{bc}	121	16.8 ^{ab}	97	15.86 ^{a-d}	88	
Sheriff CL Plus ^(b)		0.45 ^{a-c}	82	18.2 ^{ab}	105	10.13 ^{a-c}	56	
Tomahawk CL Plus ^(b)		0.71 ^c	129	16.94 ^{ab}	98	15.8 ^{a-d}	88	
APW1 receival standard				≥ 10.5		≤ 5		
Pending quality	LPB20-8165	0.56 ^{a-c}	101	17.74 ^{ab}	103	18.46 ^{a-d}	103	
	IGW6895	0.75 ^c	135	16.99 ^{ab}	98	18.55 ^{a-d}	103	
No further development	IGW6924	0.52 ^{a-c}	95	19.31 ^b	112	29.06 ^{bcd}	162	
	IGW6955	0.54 ^{a-c}	98	18.4 ^{ab}	106	22.02 ^{a-d}	122	
	V14026-054	0.48 ^{a-c}	87	16 ^a	93	22.06 ^{a-d}	123	
Site average		0.55		17.3		18.0		

Table 3. Long term wheat variety performance at Hart for 2020–2024 seasons (expressed as a % of trial average).

Quality	Variety	% Trial average					Grain yield (t/ha)
		2020	2021	2022	2023	2024	2024
AH	LRPB Anvil CL Plus (D)		105	81	87	115	0.64
	Ballista (D)	95	100	108	106	107	0.59
	Calibre (D)		112	99	108	122	0.67
	Catapult (D)	107	96	105	101	99	0.55
	Devil (D)	109		98			
	LRPB Dual (D)				99	81	0.45
	Grenade CL Plus (D)	93	93	97	96		
	Hammer CL Plus (D)	106	108	89	94	116	0.64
	Kingston (D)		101	95	106	85	0.47
	LRPB Scout (D)	106	86	101	98		
	LRPB Matador (D)				104	122	0.68
	LRPB Major (D)					51	0.28
	Boa (D) (LPB19-8035)					118	0.65
	IGW6993					104	0.58
	Reilly (D)			102	102	128	0.71
	Genie (D)				95	64	0.35
	RockStar (D)	108	80	107	95	73	0.41
	Scepter (D)	101	113	100	108	101	0.56
	Shotgun (D) (RAC3227)					103	0.57
	Sunblade CL Plus (D)		105	111	114	64	0.35
Valiant CL Plus (D)		93	100	95			
Vixen (D)	109	130	96	105	120	0.67	
APW	Brumby (D)		115	104	104	103	0.57
	Chief CL Plus (D)	113	102	85	95		
	Cutlass (D)	81	76				
	Dozer CL Plus (D)				98	123	0.68
	Denison (D)		86	110	105		
	Mowhawk (D)				100	35	0.19
	Soaker (D)				99	121	0.67
	LRPB Trojan (D)	94	93	105	106		
	Sheriff CL Plus (D)	100	107	96	89	82	0.45
Tomahawk CL Plus (D)					129	0.71	
ASW	Razor CL Plus (D)	98	111	94	98		
Pending	LPB20-8165					101	0.56
	IGW6895					136	0.75
Trial average yield (t/ha)		2.50	2.03	4.40	3.75	0.55	
Sowing date		May 6	May 3	May 5	May 12	May 14	
April-October rain (mm)		336	232	355	236	176	
Annual rain (mm)		503	401	519	355	240	

Acknowledgements

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References

HART BEAT (2024). Available online: <https://www.hartfieldsite.org.au/pages/resources/hart-beat-newsletters.php>

