

## Wheat varieties: Performance in GRDC's National Variety Trials, Western Australia.



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### Key messages

The GRDC's National Variety Trial program provides wheat varietal comparisons at a location and regional level. This yield information along with knowledge of a variety's traits such as maturity and disease tolerance can be used for decision on variety choice and management.

Recently released varieties have performed similar or better than Mace in the NVT's. Scepter<sup>a</sup>, an Australian Hard wheat was the top or second highest yielding wheat in all Agzones in 2015 and 2016. The APW-imi wheat Chief CL Plus<sup>a</sup> is higher yielding than other APW-imi varieties and a better option for May sowing due to its maturity which is quicker than Justica CL Plus<sup>a</sup>. Ninja<sup>a</sup>, a noodle wheat, is quicker maturing than Calingiri and yields significantly better than Calingiri.

There is no evidence based on the analysis that varieties such as Scepter<sup>a</sup> or Tungsten<sup>a</sup> differ in protein accumulation. However it is important to manage site selection and rotation for high yielding varieties as protein is lower when yields increase.

### Aims

Outline how data provided through the National Variety Trial wheat program can be utilised to improve knowledge for decisions on variety choice and management.

### Method

The long term MET (Multi Environment Trial) analysis was conducted at the Statistics for the Australian Grain Industry (SAGI) project funded by GRDC. The analysis provides predicted yield for varietal comparisons at a location and region based level using data from trials across numerous years and locations. This paper presents the predicted yields of varieties as a percentage of Mace calculated from the meta-analysis between 2012 -16 because it is considered a benchmark variety for yield and is the most widely adopted variety in Western Australia in 2016. Visit [www.nvtonline.com.au](http://www.nvtonline.com.au) for the full variety list and yield comparisons at a location or regional basis.

Single site yield and grain quality data from the NVT database for the years 2012 to 2016 was used to compare grain weight, screenings and protein of varieties relative to Mace<sup>a</sup>. The protocols for the research program are available on the NVT online website ([NVT Online](http://www.nvtonline.com.au)). Protein yield (kg/ha) was calculated as the yield per ha multiplied by protein percentage. The Zadok growth score of all varieties was monitored at 5 selected NVT's in 2016 to determine the observed flowering date of varieties. The scores were recorded twice a week or 3 times a week on all 3 reps. Scores were based on the average of the whole plot.

### Results

The majority of the Western Australian NVT trials between 2012 and 2016 were sown in May and close to the break of the season, the exception to this is in 2012 where 50% of trials were sown in June. In 2016, there was stored moisture at seeding following summer rain and early May sowing opportunities. Below average minimum temperature were experienced between May and September (source Bureau of Meteorology 2016). This included wide spread and damaging frost which impacted trials in the NVT. These trials have been omitted from analysis.

A number of new varieties have been released for WA recently and have been in the trial program for between 2 and 3 years. Bremer<sup>a</sup> (AH), Cutlass<sup>a</sup> (APW), and Scepter<sup>a</sup> (AH) were released by AGT. Ninja<sup>a</sup> is a new noodle wheat released by Intergrain in 2016. They have also released Chief CL Plus<sup>a</sup> an APW-imi wheat. Edstar have released Tungsten<sup>a</sup>, a new AH variety. Long reach Plant Breeding have released LRPB Arrow<sup>a</sup>, which is an APW wheat in Western Australia.

**Yield:** Yield is an important factor in varietal choice however disease tolerance, the varieties maturity and interactions with sowing time on yield, frost and screenings risk are also important consideration when managing any variety.

Mace<sup>a</sup> has been considered the benchmark variety for yield since its release in 2008. A number of recently released varieties have yielded similar or better than Mace in testing through the NVT system in Western Australia. Scepter<sup>a</sup> wheat was the top or second highest yielding milling grade wheat in all Agzones in the years tested (2015 and 16).

The APW wheats Corack<sup>a</sup>, Hydra<sup>a</sup> and LRPB Arrow have yielded similar or better than Mace on an Agzone basis. However powdery mildew, blackpoint and leaf rust are risks for Corack if sown in higher rainfall districts. (note: access

for WA growers to LRPB Arrow seed has been restricted as it is being promoted in South Australia where it is classified as an Australian Hard wheat, pers comm- M Piepi). Cutlass<sup>a</sup> wheat is a mid-long maturing wheat and it has performed better than Mace and Yitpi in 2016, a season with stored moisture at seeding, early sowing opportunities and cool temperatures during the growing season. Its falling number rating is slightly lower than Yitpi.

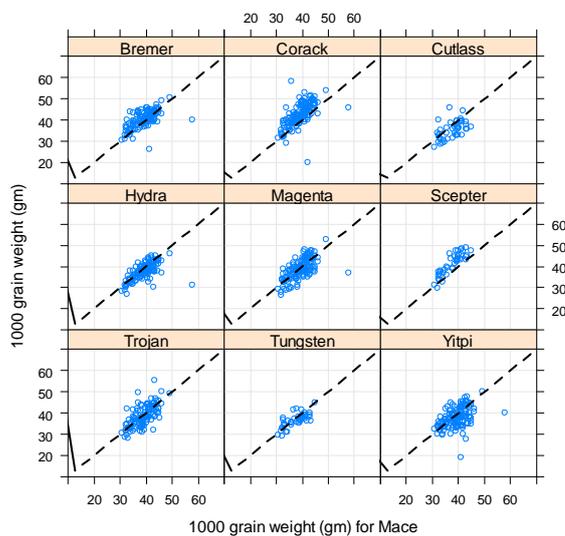
Imi-wheats may be a consideration for weed control options. Chief CL Plus<sup>a</sup>, released in 2016 yielded consistently higher than the other imi-tolerant wheats in 2014 and 2016. Its maturity is similar to Impress CL Plus<sup>a</sup> and quicker than Justica CL Plus<sup>a</sup>.

**Table 1: Predicted grain yield (t/ha) of selected wheat varieties in Agzone 2 from 2012-16.**

Classification	Mace Predicted Yield (t/ha)	2012	2013	2014	2015	2016	Trial #
AH	Scepter <sup>a</sup>	2.46	3.38	2.75	2.45	3.66	23
	Cobra <sup>a</sup>		98	99	100	106	54
	Bremer <sup>a</sup>		97	96	101	93	54
	Tungsten <sup>a</sup>				96	99	23
	Emu Rock <sup>a</sup>	95	92	96	92	95	69
	Yitpi <sup>a</sup>	85	88	94	92	101	69
APW	Hydra <sup>a</sup>		103	101	104	106	54
	LRPB Arrow <sup>a</sup>				104	103	23
	Cutlass <sup>a</sup>				99	109	23
	Corack <sup>a</sup>	99	99	101	100	97	69
APW-IMI	Chief CL Plus <sup>a</sup>			100		98	24
	Justica CL Plus <sup>a</sup>	88	88	92	91	96	69
	Impress CL Plus <sup>a</sup>	90	91	88	91	75	69
ANW	Ninja <sup>a</sup>				107	111	23
	Zen <sup>a</sup>		100	100	103	102	54
	Calingiri	85	91	91	94	99	69

Note: These response are illustrated for Agzone 2 (Table 1) but access the NVT online website for details in other locations and regions.

**Grain weight:** The grain weight of wheat varieties was compared to Mace wheat for the NVT's in which they were trialled between 2012 and 16 (Figure 1). Bremer<sup>a</sup>, Corack<sup>a</sup> and Scepter<sup>a</sup> wheats had a larger grain weights than Mace<sup>a</sup>. Cutlass<sup>a</sup>, and Yitpi<sup>a</sup>, are mid-long maturing wheats which may be a factor for the smaller grain weights since the NVT's are sown in May (Figure 1).



**Figure 1: Grain weight (g/1000seeds) of selected wheat varieties relative to the grain weight of Mace wheat (g/1000seeds) in NVT's from 2012 - 16.**

**Protein:** Yield will influence grain protein and newly released wheat varieties have similar protein accumulation. The grain protein of Scepter<sup>a</sup> was lower than Mace<sup>a</sup> however average yields were higher. Tungsten<sup>a</sup>, Mace<sup>a</sup> and Bremer<sup>a</sup> had similar yield and protein relationships (Figure 2). This analysis can be misleading because yield can influence protein. Protein yield provides an indication of how much protein a variety produces. The responses of Mace<sup>a</sup>, Scepter<sup>a</sup> and Tungsten<sup>a</sup> were very similar (Figure 3). This indicates that each of these varieties have similar accumulation of grain protein on a hectare basis. (Note- assessments are based on non-replicated sampling for grain protein for NVT's between 2012 and 2016).

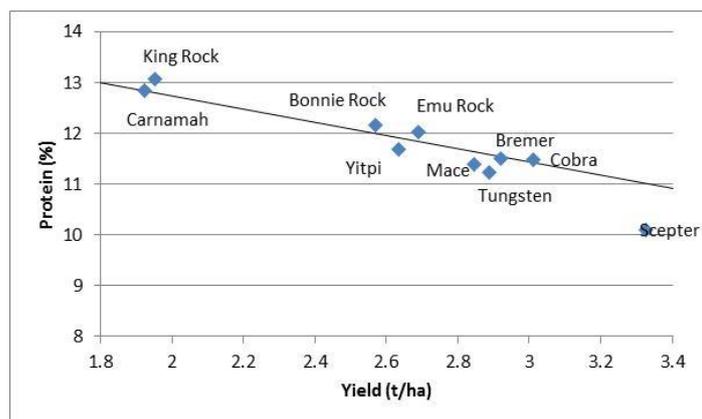


Figure 2: The average grain protein of ten Australian Hard wheat varieties relative to grain yield in the Western Australian NVT's between 2012 and 2016 ( $R^2 = 0.5597$  for all varieties tested between 2012-16).

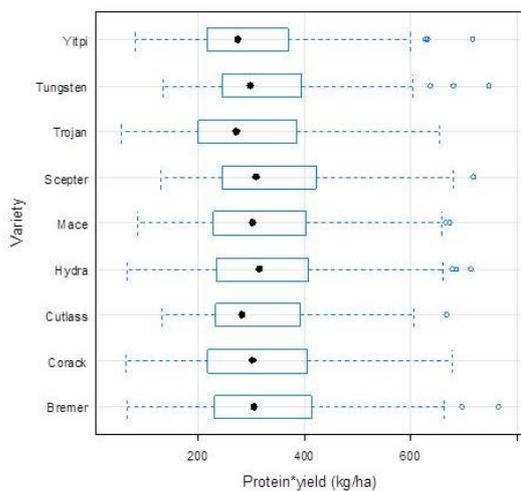


Figure 3 Protein yield (kg/ha) of selected varieties in the NVT's 2012-16

**Flowering date:** The cold winter temperatures in 2016 delayed flowering dates of varieties. The observed flowering dates were compared to predictions provided by DAFWA's online tool 'Flower Power' ([Flower Power](#)). For example, at Gibson NVT (sown on May 1<sup>st</sup>), the observed flowering date of Mace<sup>a</sup> wheat was 12 days later than predicted. Similarly at the Kojonup NVT (sown on 18<sup>th</sup> May), the observed flowering date for Mace<sup>a</sup> was 20 days later than predicted.

Scepter<sup>a</sup> wheat is considered an early-mid maturing, similar to Mace<sup>a</sup> and Wyalkatchem<sup>a</sup>; however, its flowering response to environment is similar to Wyalkatchem<sup>a</sup> (Table 2). It was 3-5 days longer than Mace<sup>a</sup> in the north and south east trials but similar to Mace<sup>a</sup> in the central and southern trials. In comparison, Scepter<sup>a</sup> wheat's maturity was similar to Wyalkatchem wheat in the NVT trials assessed. The maturity of Zen<sup>a</sup> was similar to Calingiri at all locations assessed. Ninja was between 1 and 3 days earlier than Calingiri at Wyalkatchem, York and Kojonup, however, it was

3 days later in maturity than Calingiri at Mullewa which was not observed at the other sites (Table 2). Chief CL Plus<sup>a</sup> has a similar maturity to Impress CL Plus<sup>a</sup> and both are earlier than Justica CL Plus<sup>a</sup>.

**Table 3: Flowering date (Zadok 65) and number to days to flowering after Mace (DAM) on selected varieties in five NVT trials in 2016.**

	Variety	Mullewa*		Wyalkatchem		York		Kojonup#		Gibson	
		Sowing date	5-May	DAM	5-May	DAM	11-May	DAM	18-May	DAM	1-May
AH	Bremer <sup>a</sup>	19-Aug	5	8-Sep	3	15-Sep	3	15-Oct	3	12-Sep	6
	Mace <sup>a</sup>	<b>14-Aug</b>	0	<b>5-Sep</b>	<b>0</b>	<b>12-Sep</b>	<b>0</b>	<b>12-Oct</b>	<b>0</b>	<b>6-Sep</b>	<b>0</b>
	Scepter <sup>a</sup>	18-Aug	4	8-Sep	3	13-Sep	1	12-Oct	0	11-Sep	5
	Yitpi <sup>a</sup>	27-Aug	13	17-Sep	12	25-Sep	13	18-Oct	6	19-Sep	13
APW	Corack <sup>a</sup>	15-Aug	1	1-Sep	-4	9-Sep	-3	10-Oct	-2	29-Aug	-7
	Cutlass <sup>a</sup>	29-Aug	15	23-Sep	17	24-Sep	12	21-Oct	9	21-Sep	15
	Hydra <sup>a</sup>	17-Aug	3	5-Sep	0	12-Sep	0	12-Oct	0	1-Sep	-5
	Magenta <sup>a</sup>	20-Aug	6	14-Sep	9	25-Sep	13	20-Oct	8	15-Sep	9
	Wyalkatchem <sup>a</sup>	17-Aug	3	6-Sep	1	12-Sep	0	13-Oct	1	10-Sep	5
ANW	Calingiri	23-Aug	9	11-Sep	6	20-Sep	8	15-Oct	3	12-Sep	6
	Ninja <sup>a</sup>	26-Aug	12	8-Sep	3	19-Sep	7	13-Oct	1	12-Sep	6
	Zen <sup>a</sup>	25-Aug	11	10-Sep	5	20-Sep	8	14-Oct	2	12-Sep	7
APW imi	Chief CL Plus <sup>a</sup>	13-Aug	-1	5-Sep	0	14-Sep	2	12-Oct	0	5-Sep	-1
	Impress CL Plus <sup>a</sup>	12-Aug	-2	5-Sep	0	12-Sep	0	11-Oct	-1	3-Sep	-3
	Justica CL Plus <sup>a</sup>	18-Aug	4	10-Sep	5	17-Sep	5	18-Oct	6	12-Sep	6

Note: \* 2 reps only. Figures in italics: Date later than expected. #: Frost damage at site

## Conclusion

Mace<sup>a</sup> wheat is considered the benchmark variety for yield in Western Australia. There are a number of recently released wheat varieties which have performed similar or better than Mace in the NVT's. The majority of NVT's are sown in May and mid and early - midy maturing varieties have performed well in the NVT's. Frost across the state had a significant impact on production in 2016 and NVT's adversely affected by frost were not included in the analysis. Scepter<sup>a</sup> wheat has emerged as a potential benchmark Australian Hard variety with consistently higher yields than Mace in 2015 and 2016. It has a similar flowering date response to Wyalkatchem. Hydra wheat is one of the highest yielding APW wheats between 2012 and 2016. Chief CL Plus<sup>a</sup>, released in 2016, may be a better imi-tolerant wheat option for May sowing. It yields are consistently higher than the other imi-tolerant wheats. Its maturity is similar to Impress CL Plus<sup>a</sup> and quicker than Justica CL Plus<sup>a</sup>.

There is no evidence based on the analysis that wheat varieties such as Scepter<sup>a</sup> or Tungsten<sup>a</sup> differ in protein accumulation. The protein yields of these varieties were similar to Mace when compared in the 2015-16 NVT's. Managing grain protein through site selection and fertiliser must be considered for high yielding varieties.

Measure a variety's grain weight and adjust seeding rates accordingly because varieties differ in grain weight. Bremer, Corack<sup>a</sup> and Scepter<sup>a</sup> had a larger grain size than Mace compared to Cutlass<sup>a</sup>, Hydra<sup>a</sup> and Yitpi<sup>a</sup>. NVT's sown later in May could have influence the grain size of Cutlass<sup>a</sup> and Yitpi<sup>a</sup> which are mid-long maturing varieties. The grain size of Tungsten<sup>a</sup> and Trojan<sup>a</sup> were similar to Mace.

## Key words

Wheat, National Variety Testing (NVT), yield and flowering date.

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