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# 2015

## **Wheat variety guide for Western Australia**



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## Abbreviations

Ⓟ: denotes that the variety is protected by Plant Breeders Rights (PBR). Not all varieties protected by PBR have a restriction on grower to grower trading; these are denoted as free to trade and can be traded between growers.

**AH:** Australian Hard, **APW:** Australian Premium White, **ASW:** Australian Standard White, **ASWN:** Australian Standard White Noodle, **ASFT:** Australian Soft, **APW – imi:** Australian Premium White – imidazolinone tolerant wheat.

2015

# Wheat variety guide for Western Australia

By Georgia Trainor, Christine Zaicou-Kunesch, Harmohinder Dhammu, Brenda Shackley and Manisha Shankar

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# Introduction

Welcome to the 2015 Wheat variety guide for Western Australia (WA). It has been designed as a one stop shop to help WA's wheat growers to make the right variety decision for their cropping enterprise. The guide will again provide independent information and advice on variety, agronomy, disease and herbicide tolerance characteristics, medium to long-term yield performance as well as time of flowering information.

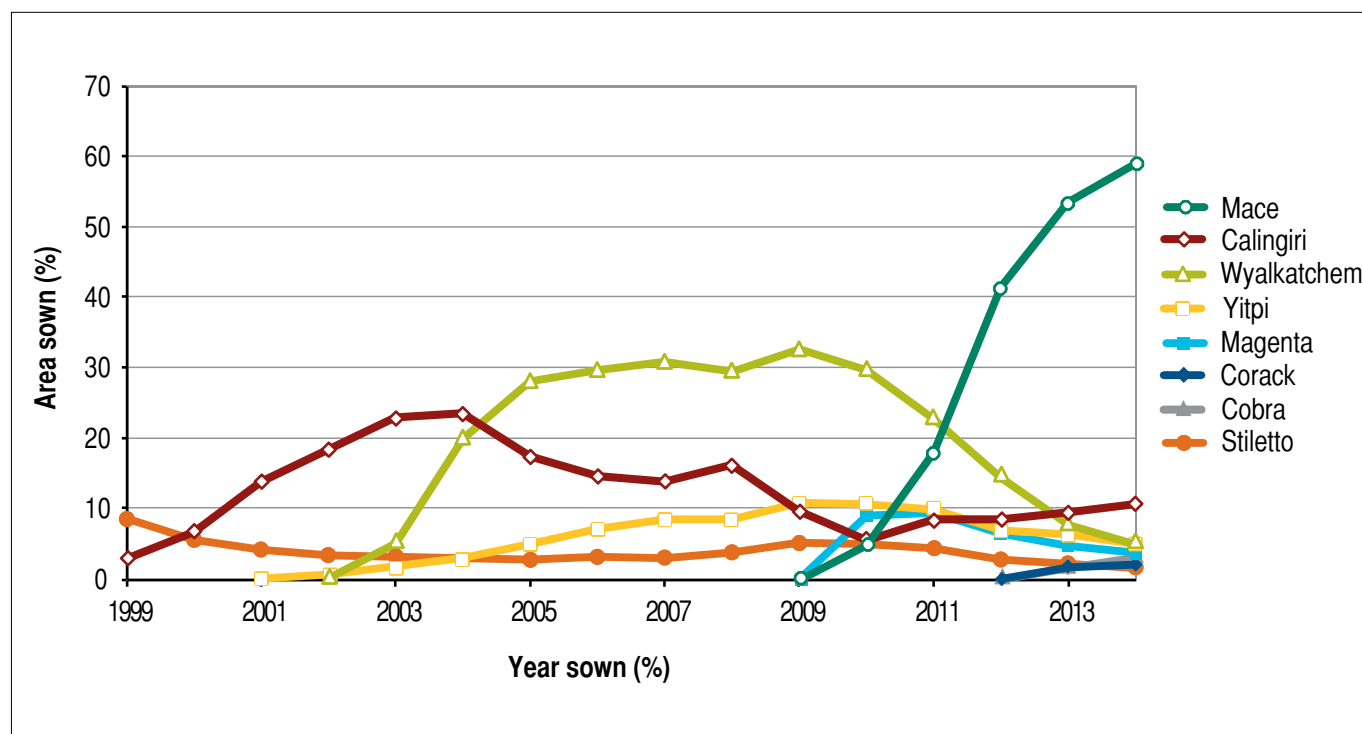


Figure 1: Estimated area sown to different wheat varieties in Western Australia. Displayed as a percentage. (Source Co-Operative Bulk Handling, CBH Group).

This year's variety guide focuses on the top 10 varieties grown in WA over the past season. It will also look at the varieties that are important to certain grain growing regions as well as information about recently released varieties. Figure 1 shows us the trends of wheat varieties used on farms in WA for the past 16 years. It is interesting to see the fast rate of adoption of Mace which accounted for approximately 59% of the area sown to wheat in the 2014/15 season. Other popular varieties included; Calingiri (10.8%), Wyalkatchem (5%), Yitpi (5%) and Magenta (3.8%) which round out the top five varieties sown in 2014. For a full list of varieties see Table 8.

DAFWA's wheat agronomy team knows that it's all about growing the most profitable variety for your conditions. The variety guide has been created to provide you with independent information to make your decisions simple.

Information has been taken from National Variety Trial (NVT) data and DAFWA's research trials.

## New varieties

Four new wheat varieties were released for WA in 2014 and 2015 at the time of print.

**Bremer<sup>®</sup>** is a mid-maturing variety with an Australian Hard classification. Bremer is suited to medium/high rainfall areas. Low rainfall areas and late plantings should be avoided. (Breeder: Australian Grain Technologies).

**Hydra<sup>®</sup>** is a short to mid-maturing variety which has performed well in a broad range of environments. Hydra has an Australian Premium White classification. (Breeder: Intergrain Pty Ltd).

**Supreme<sup>®</sup>** is an Australian Standard White Noodle with improved yield and disease resistance compared to Arrino. It has a mid

# Introduction

to short maturity and plant height similar to Wyalkatchem. (Breeder: InterGrain Pty Ltd).

**Zen<sup>®</sup>** is a mid-long maturing Australian Standard White Noodle wheat. It offers yield and disease improvements on Calingiri. (Breeder: Intergrain Pty Ltd).

## Variety snapshots

Mace has dominated plantings over recent years. However there are alternative varieties that warrant consideration or their continued use.

Before adopting a variety it is important to consider why you want to replace existing varieties, and if the new varieties meet your needs.

The variety snapshots provide details on the strengths and weaknesses, End point Royalty (EPR), maturity and licensee details of the top ten varieties sown in WA in 2014, new varieties released in the last three years and varieties which have regionally specific adaption (Table 1). More detailed information on disease resistance ratings and agronomic traits are provided in Tables 3 and 4.

## Yield using production value graphs

Yield is an important criterion when selecting varieties. It is better to base your variety decision from five years of data than just one. To meet this need, an output of GRDC's National Variety Trials (NVT) project is a unique production value-plus (PV-plus) for each variety, which is displayed graphically over time for each NVT location. This year PV's will be based on analysis from NVT wheat trials grown in WA for the five year period of 2010–14.

By assessing the production value of a variety over time and in locations relevant to your business (Figure 2), you get an indication of:

- how much more a variety is likely to yield tonnes per hectare (t/ha) compared to other varieties in that environment.
- the stability of the variety over a number of locations and years within an agzone or region.

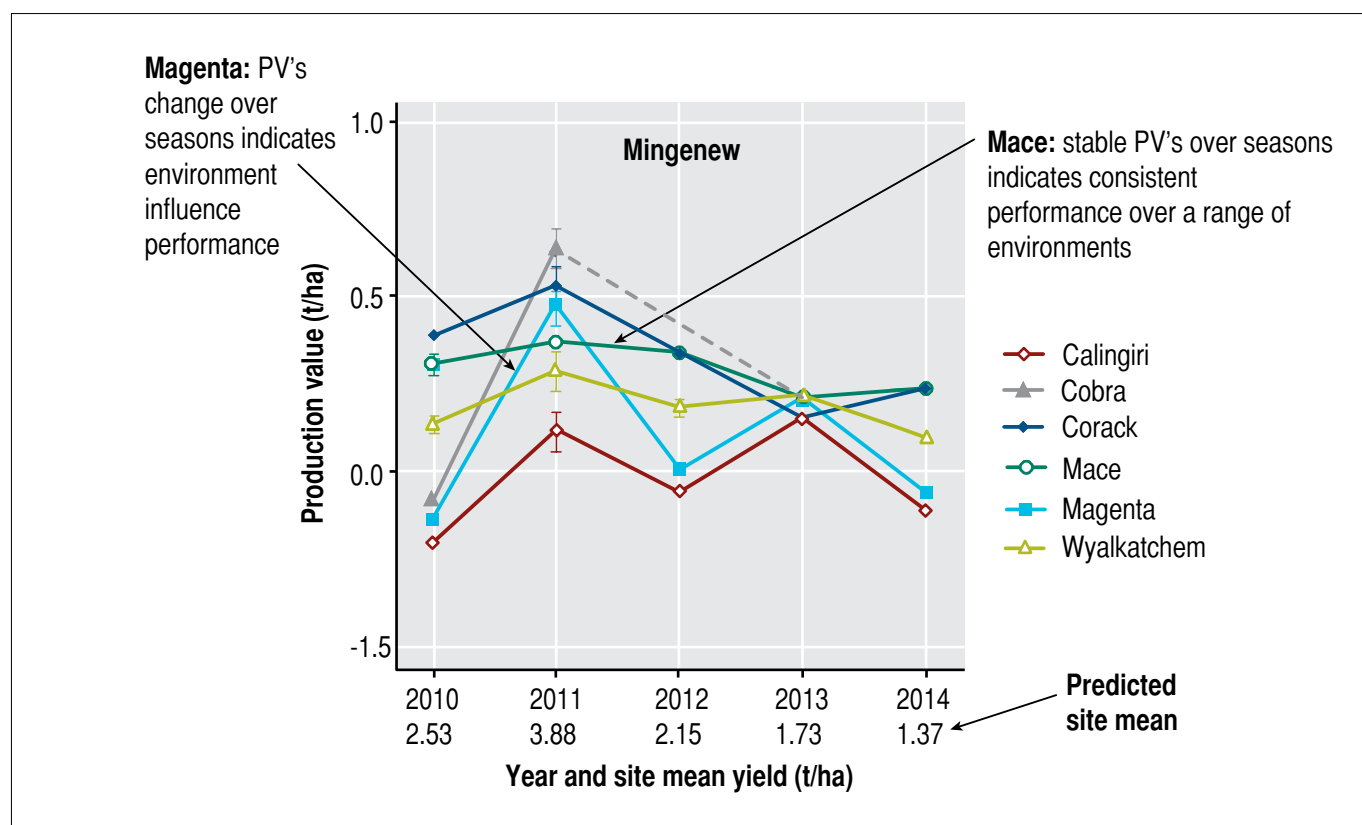
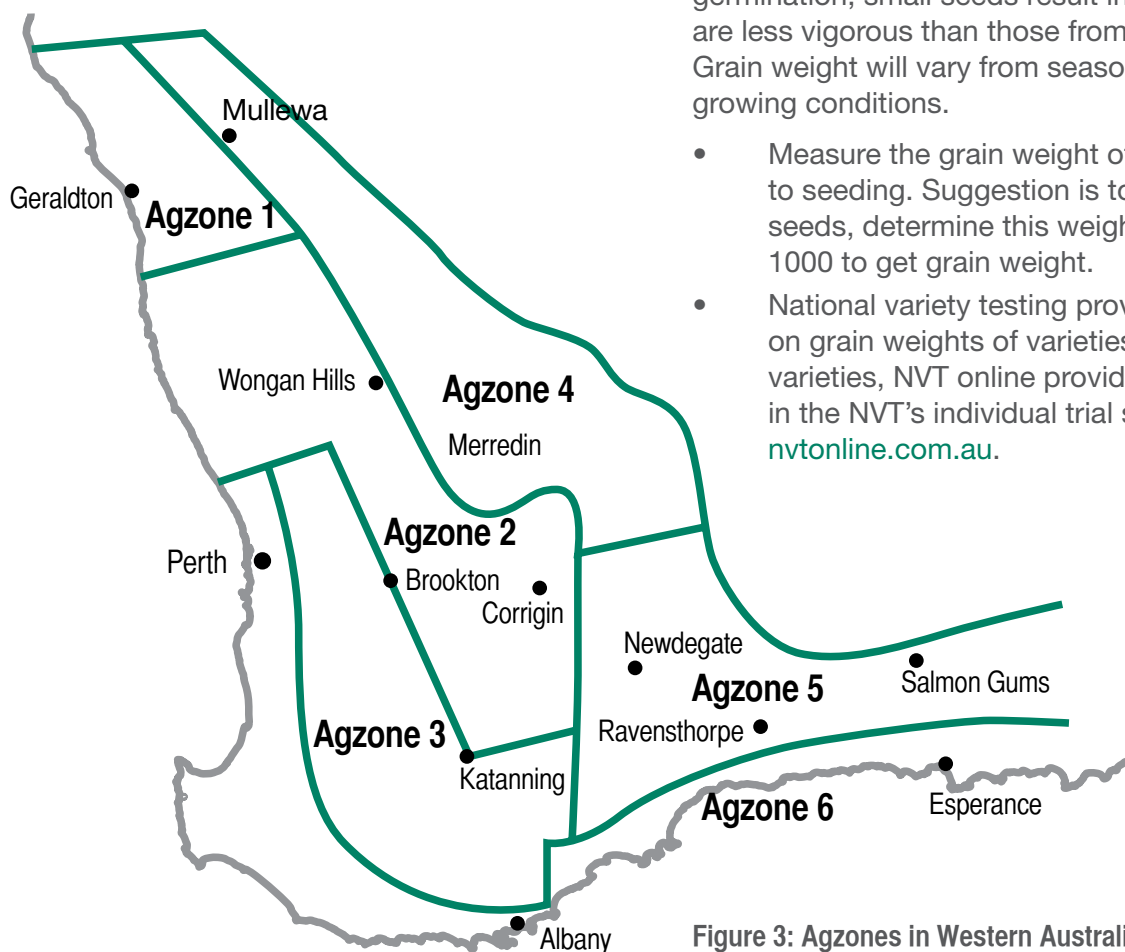


Figure 2: Example of display of production values from NVT's in Mingeneew (2010–14)





NVT's Yield Tool will display production values (also referred to as B.L.U.P. – best linear unbiased predictor) to compare the performance of varieties relevant to your business and location (visit [nvtonline.com.au](http://nvtonline.com.au)). More details on production values were presented at the 2015 Crop Updates (visit [giwa.org.au/2015-crop-update](http://giwa.org.au/2015-crop-update)).



We have continued to provide the average predicted yields for an agzone (2010–14) (Table 2). This information is an average based on the trials in each agzone over the 5 year period.

## Seed quality

If retaining seed from last year, to reduce the risk of poor establishment and low crop vigour in this year's crop it is important to consider:

- Routine germination testing before seeding is recommended because grain with lower germination produces seedlings with slower and more variable emergence.
- Replacing seed with less than 90% germination is recommended. Slight losses in germination can be compensated for by increasing seeding rates.
- Viable frosted grains should not be used for seed as the produce seedlings that take longer to reach the same dry weight than plants from sound grain.

Although grain size has little or no effect on germination, small seeds result in seedlings that are less vigorous than those from large seed. Grain weight will vary from season to season and growing conditions.

- Measure the grain weight of your seed prior to seeding. Suggestion is to count 1000 seeds, determine this weight, divide by 1000 to get grain weight.
- National variety testing provides information on grain weights of varieties. To compare varieties, NVT online provides information in the NVT's individual trial summaries [nvtonline.com.au](http://nvtonline.com.au).

Figure 3: Agzones in Western Australia

# Variety snapshots

Table 1: Wheat variety summary for Western Australia grouped according to a) top ten varieties sown in 2014, b) recently released and c) regionally specific.

A) Top ten varieties sown in 2014							
Variety	Grade	Breeder	Year of release	Maturity	Approved Grower Trading	Licensee	EPR (\$/t ex GST)
<b>Bonnie Rock<sup>Ⓛ</sup></b>	AH	InterGrain	2002	Short	Yes#	InterGrain	\$2.50
<b>Comments:</b> Also known as EGA Bonnie Rock. Aroona background. <b>Strengths:</b> Low risk for black point. <b>Risks:</b> very susceptible to stripe rust, so recommended in Agzones 1 & 4. Note that resistance to leaf rust has been revised to moderately susceptible with new leaf rust strain.							
<b>Calingiri</b>	ASWN	InterGrain	1997	Long	Yes	InterGrain	–
<b>Comments:</b> Kulin and Reeves background. <b>Strengths:</b> Preferred ASWN wheat for earlier sowings. <b>Risks:</b> Susceptible to current strain of stem and stripe rust (S).							
<b>Cobra<sup>Ⓛ</sup></b>	AH	LPB	2011	Short–Mid	Yes#	Associate (PacSeeds)	\$3.50
<b>Comments:</b> Westonia background. <b>Strengths:</b> Yielded well in NVT's grown on acid soils. Performs well in high yielding environment. Good resistance to both <i>S. nodorum</i> and yellow spot (MRMS). <b>Risks:</b> Stripe rust (MSS) and susceptible to low falling numbers after pre-harvest rain, risks if adopted for the south coast.							
<b>Corack<sup>Ⓛ</sup></b>	APW	AGT	2011	Short–Mid	Yes	AGT affiliates	\$3.00
<b>Comments:</b> Wyalkatchem background. Consistent high yields across NVT's since 2010. Suited to late May, early June sowing. <b>Strengths:</b> Useful resistance to Cereal Cyst Nematode, (CCN) RMR and stem rust (MR). <b>Risks:</b> Susceptible (SVS) to powdery mildew and black point (MSS). Now MR# leaf rust however may be more susceptible to new leaf rust strains. Risks mean Corack is less suitable to higher rainfall zones.							
<b>Justica CL Plus<sup>Ⓛ</sup></b>	APW–imi	AGT	2011	Mid–Long	No	AGT affiliates	\$3.55
<b>Comments:</b> Spear background with two imi-tolerance genes. <b>Strengths:</b> Weed control option and better suited to the medium to high rainfall regions especially south of the Great Eastern Highway. Good resistance to stem and stripe rusts (MR and RMR) and tolerant of boron. Maintains high falling number. <b>Risks:</b> yellow spot (S) and <i>S. tritici</i> (SVS). Moderate hectolitre weight.							
<b>Mace<sup>Ⓛ</sup></b>	AH	AGT	2008	Short–Mid	Yes^	AGT affiliates	\$3.00
<b>Comments:</b> Wyalkatchem background with higher grain yields. The benchmark variety for yield in WA. Wide adaptation across regions and soil types. <b>Strengths:</b> Better disease resistance than Wyalkatchem. Superior to Wyalkatchem for falling number after pre-harvest rain. Boron tolerance. <b>Risks:</b> High yielding so may require increased nitrogen fertilisation to prevent protein dilution.							
<b>Magenta<sup>Ⓛ</sup></b>	APW	InterGrain	2007	Mid–Long	Yes#	Free to trade	\$3.00
<b>Comments:</b> High yielding wheat suited to early to mid sowing opportunities. <b>Strengths:</b> Yields similar to Wyalkatchem, with long coleoptile, good resistances to stem rust (RMR), leaf rust (R*) and yellow spot (MR). Suited to early sowing and wheat on wheat. Excellent early vigour. <b>Risks:</b> Similar falling number risk to Wyalkatchem, so not suited to south coast.							
<b>Stiletto</b>	APW	ARI	1993	Mid–Long	Yes	Free to trade	–
<b>Comments:</b> Spear background. Out yielded by recently released varieties in all regions. Similar maturity and falling number index to Yitpi. <b>Strengths:</b> MR for stem rust. <b>Risks:</b> leaf rust (SVS) and yellow spot (S).							
<b>Wyalkatchem<sup>Ⓛ</sup></b>	APW	InterGrain	2001	Short–Mid	Yes	Free to trade	\$1.92
<b>Comment:</b> Machete background. <b>Strengths:</b> Suitable for wheat on wheat system due to resistances to yellow spot and ease of stubble management. Acid soil tolerant and low screenings. <b>Risks:</b> Short coleoptile length and less competitive with weeds due to poor early vigour. Susceptible to stripe rust (S) Risk of low falling number with pre-harvest rain.							
<b>Yitpi<sup>Ⓛ</sup></b>	AH	ARI	1999	Mid–Long	No	Seednet	\$1.00
<b>Comments:</b> Spear background. <b>Strengths:</b> Variety popular in southern areas due to lower frost susceptibility and longer maturity. Maintains falling number with pre-harvest rain. Large grain, long coleoptile, is tolerant to CCN and Boron. <b>Risks:</b> Stem rust (S) and yellow spot (SVS). Not suited for wheat on wheat.							

Note: See page 13 for details of abbreviations.

# Variety snapshots

Table 1: Wheat variety summary for Western Australia grouped according to a) top ten varieties sown in 2014, b) recently released and c) regionally specific. (cont.)

B. Varieties released within the last 3 years							
Variety	Grade	Breeder	Year of release	Maturity	Approved Grower Trading	Licensee	EPR (\$/t ex GST)
Bremer <sup>(b)</sup>	AH	AGT	2015	Mid	Yes	AGT affiliates	\$3.25
<b>Comments:</b> An AH variety for med to high rainfall areas. <b>Strengths:</b> Good rust package with stripe rust (MR*) stem rust (RMR*) and leaf rust (MR*). Low screenings. Maintains falling number after pre-harvest rain (5p), similar to Yitpi. <b>Risks:</b> Maturity like Magenta so not suited to low rainfall areas/later plantings.							
Harper <sup>(b)</sup>	APW	InterGrain	2013	Mid–Long	Yes	InterGrain	\$3.80
<b>Comments:</b> Yitpi background. Slightly earlier maturity than Yitpi. <b>Strengths:</b> A robust rust resistance package. Similar sprouting and blackpoint tolerance to YitpiA. <b>Risks:</b> powdery mildew (MSS) and yellow spot (SVS).							
Hydra <sup>(b)</sup>	APW	InterGrain	2014	Mid–Short	Yes	InterGrain	\$3.85
<b>Comments:</b> Bonnie Rock and Strzelecki background. Performs well in a broad range of environments. <b>Strengths:</b> Moderately resistant (MRp) to leaf rust, stem rust and yellow spot (MR).							
Impress CL Plus <sup>(b)</sup>	APW	InterGrain	2015	Mid–Short	No	InterGrain	\$4.10
<b>Comments:</b> Two-gene imidazolinone, Wyalkatchem type. <b>Strengths:</b> Performs well in Agzone's 1, 2 & 4. Potential IMI wheat on wheat option as has good yellow spot resistance (MRMS). Large grain size. <b>Risks:</b> SVS to powdery mildew and MSS for stripe rust.							
Supreme <sup>(b)</sup>	ASWN	InterGrain	2014	Mid–Short	Yes	InterGrain	\$3.85
<b>Comments:</b> Arrino derivative. Improved yield and disease resistance compared to Arrino. <b>Strengths:</b> resistant(R) to stem rust and moderately resistant (MR) to stripe rust. <b>Risks:</b> Similar plant height to Wyalkatchem.							
Trojan <sup>(b)</sup>	APW	LPB	2013	Mid–Long	No	Associate (PacSeeds)	\$4.00
<b>Comments:</b> For med to high rainfall areas. <b>Strengths:</b> Very good rust package with stripe rust (MR) stem rust (MRMS) and leaf rust (MR). Boron tolerant (MT). <b>Risks:</b> Mid late maturity like Yitpi so not suited to low rainfall areas unless growers are avoiding frost risk periods.							
Zen <sup>(b)</sup>	ASWN	InterGrain	2014	Mid–Long	Yes	InterGrain	\$3.85
<b>Comments:</b> Calingiri and Wyalkatchem background. Offers yield and disease improvements on Calingiri. <b>Strengths:</b> good leaf rust (RMR) and yellow leaf spot (MRMS) resistance ratings. <b>Risks:</b> stem rust rating (MSS).							

Note: See page 13 for details of abbreviations.



# Variety snapshots

Table 1: Wheat variety summary for Western Australia grouped according to a) top ten varieties sown in 2014, b) recently released and c) regionally specific. (cont.)

C. Regionally specific varieties							
Variety	Grade	Breeder	Year of release	Maturity	Approved Grower Trading	Licensee	EPR (\$/t ex GST)
<b>Arrino</b>	ASWN	InterGrain	1997	Short–Mid	Yes	InterGrain	
<b>Comment:</b> Eradu background. <b>Strengths:</b> Preferred ASWN for low rainfall areas and later sowings. <b>Risks:</b> Susceptible to low falling number, stem rust (SVS) and stripe rust (S).							
<b>Emu Rock<sup>db</sup></b>	AH	InterGrain	2011	Short	Yes#	InterGrain	\$3.50
<b>Comments:</b> Westonia and Kukri background. Shorter than Mace yet taller than Wyalkatchem. Best suited mid to late sowings in low rainfall environments. <b>Strengths:</b> Useful tolerance to crown rot (MS). Large grain size. <b>Risks:</b> Susceptible to Septoria nodorum (SVS). Susceptible to low falling numbers after pre-harvest rain. Hence, not suited to the south coast.							
<b>Scout<sup>db</sup></b>	APW	LPB	2009	Mid	Yes	Associate (PacSeeds)	\$2.80
<b>Comments:</b> Yitpi background but shorter maturing. <b>Strengths:</b> Yields competitive with Mace in southern high rainfall areas. Maintains falling number after pre-harvest rain. Good resistances to stripe rust (RMR) and stem rust (MR). <b>Risks:</b> Susceptibility to yellow leaf spot (SVS) and Blackpoint (S). Not suited for wheat on wheat.							
<b>Westonia</b>	<b>APW</b>	InterGrain	1997	Short	Yes	InterGrain	
<b>Comments:</b> <b>Strengths:</b> Yields comparable to Wyalkatchem, good aluminium tolerance. <b>Risks:</b> Stem rust (SVS) and stripe rust (VS). Marginal for hectolitre weight, susceptible to low falling numbers with pre-harvest rain.							

Breeding organisation acronyms: ARI - Adelaide University; AGT – Australian Grain Technologies; GBA – Grain Biotechnology Australia; LPB – Long Reach Plant Breeders Pty Ltd.

\*Some races in eastern states can attack these varieties. Refer to Table 3 for full disease rating.

# Approved for farmer to farmer trading in accordance with the Industry Standard Seed License & Royalty Agreement. Contact InterGrain David Meharry - 0427 855 059 or Pacific Seeds - 07 4690 2666 for enquiries.

^Grower to grower sales via seed sharing permitted as long as seller purchased original Seed from AGT Affiliate or Retailer Contact AGT 08 9622 for enquiries.

For a more extensive list for EPR visit <http://varietycentral.com.au>.

Note: See page 13 for details of abbreviations.



# Variety snapshots

Table 2: Predicted yields of varieties in NVT trials from 2010 to 2014, expressed as a percentage of Mace. Grouped according to a) top ten varieties sown in 2014, b) recently released and c) regionally specific.

Top 10 Varieties by area grown in WA													
		Agzone 1		Agzone 2		Agzone 3		Agzone 4		Agzone 5		Agzone 6	
	Mace (t/ha) Yield	2.39	33	2.79	72	4.12	24	1.72	39	2.59	28	3.31	14
Grade	Variety	Yield (%)	n	Yield (%)	n	Yield (%)	n	Yield (%)	n	Yield (%)	n	Yield (%)	n
AH	Bonnie Rock <sup>(b)</sup>	95	33	95	72	95	24	95	39	91	28	93	14
ASWN	Calingiri	89	33	92	72	97	24	87	39	90	28	97	11
AH	Cobra <sup>(b)</sup>	96	26	99	58	103	24	93	31	93	25	102	11
APW	Corack <sup>(b)</sup>	103	33	102	72	100	24	103	38	99	28	100	14
APW-imi	Justica CL Plus <sup>(b)</sup>	87	33	90	72	95	24	89	39	91	28	93	14
AH	Mace <sup>(b)</sup>	100	33	100	72	100	24	100	39	100	28	100	14
APW	Magenta <sup>(b)</sup>	93	33	96	72	102	24	91	39	93	28	101	14
APW	Wyalkatchem <sup>(b)</sup>	97	33	97	72	98	24	95	39	97	28	99	14
AH	Yitpi <sup>(b)</sup>	86	26	90	57	96	20	90	31	91	23	93	12
Varieties released within the last 3 years													
		Agzone 1		Agzone 2		Agzone 3		Agzone 4		Agzone 5		Agzone 6	
	Mace (t/ha) Yield	2.39	33	2.79	72	4.12	24	1.72	39	2.59	28	3.31	14
Grade	Variety	Yield (%)	n	Yield (%)	n	Yield (%)	n	Yield (%)	n	Yield (%)	n	Yield (%)	n
APW	Harper <sup>(b)</sup>	–	–	93	30	99	10	–	–	94	11	96	6
APW	Hydra <sup>(b)</sup>	101	12	102	31	104	10	97	14	97	11	104	6
ASWN	Supreme <sup>(b)</sup>	94	12	96	31	100	10	95	14	97	11	99	3
APW	Trojan <sup>(b)</sup>	91	13	96	30	103	15	90	15	92	17	100	9
ASWN	Zen <sup>(b)</sup>	95	12	97	31	101	10	91	14	95	11	103	3
Regionally specific varieties													
		Agzone 1		Agzone 2		Agzone 3		Agzone 4		Agzone 5		Agzone 6	
	Mace (t/ha) Yield	2.39	33	2.79	72	4.12 t	24	1.72	39	2.59	28	3.31	14
Grade	Variety	Yield (%)	n	Yield (%)	n	Yield (%)	n	Yield (%)	n	Yield (%)	n	Yield (%)	n
ASWN	Arrino	93	21	94	41	92	14	95	24	87	6	–	–
AH	Emu Rock <sup>(b)</sup>	94	33	95	72	95	24	99	38	95	28	92	14
APW	Scout <sup>(b)</sup>	86	26	92	65	100	24	92	30	96	28	96	14
APW	Westonia	95	33	97	72	98	24	96	39	93	28	96	14

Note: n = total number of trials

# Disease update for 2015

Geoff Thomas, DAFWA's Plant Pathologist

Disease incidence and severity in wheat crops is dependent on the presence of inoculum carried over from last season, favourability of seasonal conditions, pathotype virulence and varietal susceptibility. In planning which variety to grow or how to manage the variety that has been chosen, it is important to review the current disease resistance ratings found in this guide (Table 3). Being aware of disease risks to a crop allows for appropriate planning and proactive management to reduce risk of yield losses.

For foliar diseases such as the rusts, yellow spot and septoria nodorum, resistance rankings and in-field management recommendations are established and well understood.

For some root and crown disorders, such as root lesion nematodes and crown rot, variety tolerance and guidelines for variety selection are currently being developed or refined. For a small group of root diseases such as rhizoctonia barepatch and take-all, variety choice is not a significant management factor.

Paddock surveys show that crown rot incidence is increasing across the wheatbelt. The disease was evident in many moisture stressed wheat crops in the eastern wheatbelt in the 2014 season. In paddocks with known risk of crown rot, growers should use all available management options (rotation, variety, row placement, nitrogen nutrition, sowing date). Crown rot resistance ratings for wheat varieties are included in the guide for the first time this year using data generated in eastern states' screening trials, WA specific data will be included in future Guides. While no varieties are resistant, some varieties are less susceptible to crown rot and may provide some benefit in at-risk paddocks. For example; in DAFWA trials with high crown rot disease pressure, Emu Rock (MS) can become yield competitive with Mace (S).

In 2013 a new pathotype of leaf rust was confirmed in WA. Trials in 2014 confirmed that several varieties, including Mace, are more susceptible to this pathotype and demonstrated that significant yield losses can result from infection. However no rust was reported from wheat crops during 2014 and ongoing dry summer weather indicate a low risk of leaf rust for



the coming season. In the absence of confirmed establishment of this new pathotype, current ratings are presented for the previously dominant pathotype. Wheat rust samples should be sent directly to the ACRCP Annual Cereal Rust Survey, Plant Breeding Institute, Private Bag 4011, Narellan NSW 2567. For more information contact the Plant Breeding Institute +61 (0)2 9351 8800.

Table 3 provides the current disease resistance ratings for wheat varieties grown in WA. Additional information on diseases and disease management can be obtained on [agric.wa.gov.au/cropdisease](http://agric.wa.gov.au/cropdisease).



# Disease update for 2015

Table 3: Disease resistance ratings for wheat varieties grown in WA in 2015

Variety	Grade	Septoria nnodorum blotch	Septoria tritici blotch	Yellow spot	Stem rust	Stripe rust	Leaf rust	Powdery mildew
Arrino	ASWN	MSS	MRMS	S	SVS	S	MS	MR
Binnu <sup>(d)</sup>	ASWN	MSS	MSS	MSS	MSS/RMR	RMR*	MS	MRMS
Bonnie Rock <sup>(d)</sup>	AH	MSS	S	MRMS	MS	VS	MS	S
Bremer <sup>(d)</sup>	AH	MSP	Sp	MSS	RMR	MR*	MR	MSSp
Calingiri	ASWN	MS	MSS	MSS	S	S	MS	MSS
Carnamah	AH	MSS	S	MS	MRMS	S	MS	MSS
Clearfield Stl <sup>(d)</sup>	APW-Imi	MRMS	S	MS	RMR	S	SVS	S
Cobra <sup>(d)</sup>	AH	MRMS	MSS	MRMS	RMR	MSS	MR	MSS
Corack <sup>(d)</sup>	APW	MSS	MSS	(MR)	MR	MS	MR#	SVS
Corell <sup>(d)</sup>	APW	S	SVS	SVS	MRMS	MRMS	MSS	MRMS
Eagle Rock <sup>(d)</sup>	AH	MS	S	MSS	MR	MS	RMR	MRMS
Emu Rock <sup>(d)</sup>	AH	SVS	S	MRMS	MRMS	MRMS	MR#	MSS
Endure <sup>(d)</sup>	APW	MRMS	S	MSS	RMR	RMR*	MRMS	MS
Envoy <sup>(d)</sup>	APW	MSS	MSS	S	MR	RMR*	R	S
Eradu <sup>(d)</sup>	ASWN	S	S	MSS	MR	SVS	S	MRMS
Espada <sup>(d)</sup>	APW	MS	S	MS	MR	R*	R	MSS
Estoc <sup>(d)</sup>	APW	MS	S	MSS	MR	MR*	MRMS	MS
Fortune <sup>(d)</sup>	ASWN	MSS	MRMS	MS	MS	MS	MR	MRMS
Frame	APW	MS	MSS	S	MRMS	MS	MS	MRMS
Grenade CL Plus <sup>(d)</sup>	APW-Imi	MSS	MSS	S	MR	RMR	MS	MS
Halberd	APW	SVS	SVS	MSS	S	MRMS	MSS	S
Harper <sup>(d)</sup>	APW	MS	SVS	S	MRMS	RMR	MRMS	MSS
Hydra <sup>(d)</sup>	APW	MSSp	–	(MR)	MRp	MS	MRp	–
Impress CL Plus <sup>(d)</sup>	APW-Imi	MS	S	MRMS	MR	MSS	R	SVS
Justica CL Plus <sup>(d)</sup>	APW-Imi	MS	SVS	S	MR	RMR*	MSS	MS
King Rock <sup>(d)</sup>	AH	MSS	S	MRMS	MRMS	RMR*	MRMS	MSS
Kunjin <sup>(d)</sup>	ASFT	MSS	S	MSS	MRMS	MS	MRMS	S
Mace <sup>(d)</sup>	AH	MS	S	MRMS	MR	RMR*	MR#	MSS
Magenta <sup>(d)</sup>	APW	MRMS	MRMS	(MR)	RMR	MS	R*	MRMS
Sapphire <sup>(d)</sup>	AH	MSS	MRMS	MSS	RMR	MSS	RMR*	MS
Scout <sup>(d)</sup>	APW	SVS	MSS	SVS	MR	RMR*	R	MS
Stiletto <sup>(d)</sup>	APW	MS	MSS	S	MR	MSS	SVS	MSS
Supreme <sup>(d)</sup>	ASWN	MSSp	MRMSp	MS	R	MR*	RMR	MRMSp
Tammarin Rock <sup>(d)</sup>	AH	MSS	S	SVS	MRMS	MSS	MS	MSS
Trojan <sup>(d)</sup>	APW	MS	S	MSS	MRMS	MR	MR	SVS
Wedin <sup>(d)</sup>	ASFT	MSS	MR	MSS	RMR	MS	R*	S
Westonia	APW	MSS	SVS	MS	SVS	VS	MS	S
Wyalkatchem <sup>(d)</sup>	APW	MS	S	(MR)	MS	S	RMR#	S
Yitpi <sup>(d)</sup>	AH	MS	MRMS	SVS	S	MRMS	MSS	MRMS
Zen <sup>(d)</sup>	ASWN	MSP	Sp	MRMS	MSS	MR	RMR	SVSp

Low Medium High



# Disease update for 2015

Table 3: Disease resistance ratings for wheat varieties grown in WA in 2015 (cont.)

Variety	Grade	Flag smut	Common bunt	RLN (P. teres)	RLN (p. neglectus)	CCN	Crown Rot
Arrino	ASWN	MSS	MS	S	S	–	–
Binnu <sup>(d)</sup>	ASWN	MSS	S	Sp	S	–	–
Bonnie Rock <sup>(d)</sup>	AH	S	MS	S	S	S	–
Bremer <sup>(d)</sup>	AH	MRp	MR	–	–	–	S
Calingiri	ASWN	RMR	MRMS	S	SVS	–	S
Carnamah	AH	MSS	MS	SVS	SVS	S	–
Clearfield Stl <sup>(d)</sup>	APW–Imi	MS	MS	–	S	–	–
Cobra <sup>(d)</sup>	AH	MS	SVS	MRMSp	MSS	MRMS	S
Corack <sup>(d)</sup>	APW	MRMS	MSS	MSS	MSS	RMR	S
Corell <sup>(d)</sup>	APW	R	MSS	S	MSS	MR	S
Eagle Rock <sup>(d)</sup>	AH	S	MRMS	S	MSS	S	–
Emu Rock <sup>(d)</sup>	AH	R	S	MRMS	MSS	MS	MS
Endure <sup>(d)</sup>	APW	R	MSS	Sp	MSS	–	–
Envoy <sup>(d)</sup>	APW	R	MS	–	VS	MRMS	S
Eradu <sup>(d)</sup>	ASWN	MSS	S	–	MS	–	–
Espada <sup>(d)</sup>	APW	MR	S	–	S	MS	S
Estoc <sup>(d)</sup>	APW	MR	MR	–	SVS	MR	MS
Fortune <sup>(d)</sup>	ASWN	R	MR	Sp	MS	–	Sp
Frame	APW	RMR	MS	–	MSS	MR	–
Grenade CL Plus <sup>(d)</sup>	APW–Imi	MR	SVS	–	S <sup>^</sup>	R	S
Halberd	APW	MRMS	S	–	S <sup>^</sup>	S	–
Harper <sup>(d)</sup>	APW	RMR	MSS	–	S <sup>^</sup>	MRMS	S
Hydra <sup>(d)</sup>	APW	–	–	–	–	–	–
Impress CL Plus <sup>(d)</sup>	APW–Imi	MSS	MR	–	–	–	MSSp
Justica CL Plus <sup>(d)</sup>	APW–Imi	RMR	SVS	SVS	SVS	MS	S
King Rock <sup>(d)</sup>	AH	SVS	MSS	–	MSS	–	S
Kunjin <sup>(d)</sup>	ASFT	S	MSS	–	SVS	–	MSS
Mace <sup>(d)</sup>	AH	MSS	R	MRMS	MS	MRMS	S
Magenta <sup>(d)</sup>	APW	MSS	S	MSS	MSS	MSS	MSS
Sapphire <sup>(d)</sup>	AH	MRMS	MS	S	MSS	S	–
Scout <sup>(d)</sup>	APW	R	MSS	Sp	MSS	R	S
Stiletto <sup>(d)</sup>	APW	MS	MS	MRMS	MS	S	–
Supreme <sup>(d)</sup>	ASWN	MSSp	SVS	–	–	–	MSS
Tammarin Rock <sup>(d)</sup>	AH	RMR	MR	SVSp	MS	–	–
Trojan <sup>(d)</sup>	APW	SVS	S	MRMSp	MSS	MS	MS
Wedin <sup>(d)</sup>	ASFT	MRMS	MSS	MRMSp	MSS	–	–
Westonia	APW	SVS	S	S	SVS	S	Sp
Wyalkatchem <sup>(d)</sup>	APW	S	RMR	MSS	MRMS	S	S
Yitpi <sup>(d)</sup>	AH	MR	S	MS	MSS	MR	S
Zen <sup>(d)</sup>	ASWN	MRMSp	MRMS	–	–	–	S

Low Medium High

**Disease ratings:** VS = Very susceptible, SVS = Susceptible to very susceptible, S = Susceptible, MSS = Moderately susceptible to susceptible, MS = Moderately susceptible, MRMS = Moderately resistant to moderately susceptible, MR = Moderately resistant, RMR = Resistant to moderately resistant, R = Resistant. No score '–' = no rating is currently available.

p = Provisional assessment. / = Scores separated by ' / ' indicate the response to the 'currently predominant' and 'alternate' strains of stem rust existing in WA. \* = Some races in eastern Australia can attack these varieties. # = May be more susceptible to the leaf rust pathotype. ( ) = Higher disease at some sites. **Combined RLN ratings** from DAFWA, SARDI(^), DPI Vic and DEEDI data. **CCN ratings** from SARDI data. Wallwork and Zwer (2013) Cereal Variety Disease Guide 2013, Factsheet Feb 2013.

R = resistant – nematode numbers will decrease when this variety is grown. MR = moderately resistant – nematode numbers will slightly decrease when this variety is grown. MS = moderately susceptible – nematode numbers will slightly increase when this variety is grown. S = susceptible – nematode numbers will increase greatly when this variety is grown. **Crown rot ratings** from SARDI data 2009–2014 (Butt, Edmondson, and Wallwork), Qld data 2009–2014 (Bottomley, Herde, Neate, Percy, and Walters) and DPI NSW data 2013–2014 (Simpfendorfer)

# Frost rating information

Brenton Leske and Ben Biddulph, DAFWA's Research Officers

Growers already effectively manage varieties based on known susceptibility to frost through delayed sowing of Wyalkatchem types or the planting of longer season varieties like Yitpi. The frost susceptibility ratings (will be available on [nvtonline.com.au](http://nvtonline.com.au)) will enable growers to manage the frost risk of new varieties, based on how known varieties of similar rating are currently managed. The rating covers current commercial varieties and will encompass new varieties in the future.

The best option to reduce frost damage is choosing a variety with the most appropriate maturity. Select varieties based on yield, maturity, agronomic and disease characteristics, then use the preliminary reproductive frost susceptibility ratings to fine tune you management.

Use your knowledge of varieties with similar risk ratings and consider management strategies in relation to:

- relative time of sowing
- flowering time prediction
- frost risk
- heat risk.

Tools such as Flower Power and Yield Prophet can help with these issues.

[agric.wa.gov.au/frost/flower-poweryieldprophet.com.au](http://agric.wa.gov.au/frost/flower-poweryieldprophet.com.au)

Large dedicated frost screening nurseries in Loxton South Australia (SA), Merredin and Wickepin WA and Narrabri NSW have been established to measure susceptibility to reproductive frost under minor frosts with greater accuracy and repeatability. The facilities are funded under GRDC's Australian National Frost Program (ANFP) which forms part of the GRDC's National Frost Initiative. The frost ratings have been developed from frost susceptibility data generated by these facilities from the 2012, 2013 and 2014 seasons.

Varieties in the trials will be given a preliminary rating as very susceptible or moderately



susceptible to reproductive frost damage. The ratings are not due to difference in phenology/flowering time, and refer to the relative susceptibility of varieties both flowering at the same time and do not take into account the frost risk associated with when a particular variety will flower given a certain sowing date. No wheat varieties are frost tolerant. Under severe frost (for example  $-8^{\circ}\text{C}$ ) or multiple minor frosts (several nights of  $-2^{\circ}$  to  $-4^{\circ}\text{C}$ ) all varieties tested to date are equally susceptible, resulting in up to 100 percent sterility in flowering heads.

An example of this is Wyalkatchem, which is very susceptible to frost, and Yitpi, which is less susceptible to frost are managed differently in terms of sowing date and position in landscape and the associated frost risk to maximise production while minimising frost risk. Ensuring that flowering occurs within the optimum flowering window to minimise frost, heat and terminal drought continues to be critical and the reproductive frost ratings need to be used within this context.

# Quality and agronomic information

Table 4. Quality and agronomic traits for wheat varieties grown in WA in 2014


Variety	Grade	Height	Coleoptile	Blackpoint	Falling Number Index
Arrino	ASWN	M	M	MS	2
Binnu <sup>(b)</sup>	ASWN	M	L	MSS	5
Bonnie Rock <sup>(b)</sup>	AH	M	M	MRMS	4
Calingiri	ASWN	M	M	MS	5
Carnamah	AH	M	L	MS	2
Clearfield Stl <sup>(b)</sup>	APW-lmi	M/T	M	MRMS	6
Cobra <sup>(b)</sup>	AH	M	M	MS <sup>^</sup>	2
Corack <sup>(b)</sup>	APW	M	M	S	4
Corell <sup>(b)</sup>	APW	M	L	MS	2
Eagle Rock <sup>(b)</sup>	AH	M	–	MS	6
Emu Rock <sup>(b)</sup>	AH	S	M	MS <sup>^</sup>	2
Endure <sup>(b)</sup>	APW	M/T	–	MS	4
Envoy <sup>(b)</sup>	APW	M	M	–	5
Eradu <sup>(b)</sup>	ASWN	M/T	–	SVS	2
Espada <sup>(b)</sup>	APW	M	M	S <sup>^</sup>	2
Estoc <sup>(b)</sup>	APW	M	L	MS	6
Fortune <sup>(b)</sup>	ASWN	M	M	MRMS	2
Frame	APW	M	L	MS	5
Grenade CL Plus <sup>(b)</sup>	APW-lmi	M	M	MS <sup>^</sup>	5
Halberd	APW	T	–	–	5
Harper <sup>(b)</sup>	APW	M	VL	RMR	5
Justica CL Plus <sup>(b)</sup>	APW-lmi	M	M	MS <sup>^</sup>	5
King Rock <sup>(b)</sup>	AH	M	M	MRMS	4
Kunjin <sup>(b)</sup>	ASFT	M/T	M	MSp	2
Mace <sup>(b)</sup>	AH	M	M	MS	5
Magenta <sup>(b)</sup>	APW	M	L	MS	3
Sapphire <sup>(b)</sup>	AH	M	–	MS	5
Scout <sup>(b)</sup>	APW	M	L	S <sup>^</sup>	6
Stiletto <sup>(b)</sup>	APW	M	–	MS	5
Tammarin Rock <sup>(b)</sup>	AH	M	M	MS	3
Trojan <sup>(b)</sup>	APW	M	L	MRMS	5
Wedin <sup>(b)</sup>	ASFT	M	M	MSSp	2
Westonia	APW	M	L	MS	2
Wyalkatchem <sup>(b)</sup>	APW	S	M	MS	3
Yitpi <sup>(b)</sup>	AH	M	VL	MS	5

**Height ratings:** S= short (<70cm), M=medium (70–85cm) and T=tall (>85cm). **Coleoptile ratings** based on predicted mean length of main season sown wheats at 29 sites in Australia during 2008 and 2012. Screening of varieties is undertaken as part of the National Variety Trial project. S=short(<60mm), M=medium(60–69mm), L=long(70–79mm), VL=very long (>79mm). **Black point ratings** using DAFWA data 1997–2009 and 2011 data from D.Mares (University of Adelaide). Black point ratings using DAFWA data 1997–2009, 2011 data from D Mares (University of Adelaide) and 2013 H Wallward (<sup>^</sup>SARDI). **Falling Number Index:** germination index data has been used along with falling number from field experiments to give an indication of the likelihood of maintaining falling number after a harvest rain. 9=most likely to maintain FN, 1=least likely.





# A FREE online tool for predicting when wheat varieties flower



Enables  
more informed  
decisions on  
variety choice  
and sowing



## Flower Power

Maximising  
yield potential

Better  
management of  
frost and heat  
stress risks





# Flowering dates

Table 5. Date of flowering (50%) for 17 wheat varieties from different sowing dates at four locations in WA in 2014

Variety	Geraldton				Northam			
	24-Apr	13-May	30-May	20-Jun	24-Apr	13-May	30-May	20-Jun
Bremer <sup>(b)</sup>	–	6-Aug	29-Aug	10-Sep	10-Aug	4-Sep	10-Sep	20-Sep
Calingiri	23-Jul	11-Aug	28-Aug	8-Sep	12-Aug	6-Sep	12-Sep	21-Sep
Cobra <sup>(b)</sup>	10-Jul	6-Aug	18-Aug	29-Aug	29-Jul	1-Sep	7-Sep	17-Sep
Corack <sup>(b)</sup>	5-Jul	31-Jul	17-Aug	26-Aug	4-Aug	31-Aug	6-Sep	17-Sep
Emu Rock <sup>(b)</sup>	25-Jun	–	17-Aug	28-Aug	14-Jul	22-Aug	6-Sep	17-Sep
Harper <sup>(b)</sup>	2-Aug	18-Aug	1-Sep	11-Sep	17-Aug	5-Sep	13-Sep	22-Sep
Hydra <sup>(b)</sup>	–	–	–	–	–	2-Sep	7-Sep	–
Justica CL Plus <sup>(b)</sup>	22-Jul	8-Aug	–	8-Sep	4-Aug	2-Sep	13-Sep	22-Sep
Mace <sup>(b)</sup>	9-Jul	4-Aug	18-Aug	1-Sep	2-Aug	28-Aug	6-Sep	18-Sep
Magenta <sup>(b)</sup>	25-Jul	15-Aug	25-Aug	4-Sep	16-Aug	7-Sep	17-Sep	27-Sep
Scout <sup>(b)</sup>	16-Jul	7-Aug	22-Aug	3-Sep	7-Aug	3-Sep	10-Sep	20-Sep
Supreme <sup>(b)</sup>	–	23-Jul	18-Aug	26-Aug	26-Jul	30-Aug	10-Sep	20-Sep
Trojan <sup>(b)</sup>	1-Aug	14-Aug	26-Aug	11-Sep	18-Aug	8-Sep	13-Sep	23-Sep
Westonia	1-Jul	23-Jul	15-Aug	26-Aug	26-Jul	30-Aug	6-Sep	13-Sep
Wyalkatchem <sup>(b)</sup>	7-Jul	5-Aug	20-Aug	1-Sep	3-Aug	–	7-Sep	17-Sep
Yitpi <sup>(b)</sup>	15-Aug	20-Aug	–	14-Sep	20-Aug	10-Sep	21-Sep	27-Sep
Zen <sup>(b)</sup>	22-Jul	9-Aug	26-Aug	4-Sep	11-Aug	4-Sep	14-Sep	21-Sep

Variety	Katanning				Esperance			
	24-Apr	13-May	30-May	20-Jun	12-May	24-May	3-Jun	16-Jun
Bremer <sup>(b)</sup>	–	12-Sep	20-Sep	6-Oct	2-Sep	14-Sep	19-Sep	24-Sep
Calingiri	15-Aug	–	–	28-Sep	2-Sep	10-Sep	19-Sep	24-Sep
Cobra <sup>(b)</sup>	12-Aug	31-Aug	16-Sep	28-Sep	–	–	–	–
Corack <sup>(b)</sup>	9-Aug	31-Aug	13-Sep	1-Oct	–	9-Sep	11-Sep	15-Sep
Emu Rock <sup>(b)</sup>	–	24-Aug	13-Sep	26-Sep	17-Aug	10-Sep	13-Sep	16-Sep
Harper <sup>(b)</sup>	–	10-Sep	21-Sep	3-Oct	31-Aug	13-Sep	15-Sep	24-Sep
Hydra <sup>(b)</sup>	–	–	14-Sep	28-Sep	26-Aug	12-Sep	16-Sep	24-Sep
Justica CL Plus <sup>(b)</sup>	8-Aug	3-Sep	21-Sep	5-Oct	1-Sep	7-Sep	16-Sep	22-Sep
Mace <sup>(b)</sup>	9-Aug	1-Sep	13-Sep	26-Sep	28-Aug	8-Sep	15-Sep	24-Sep
Magenta <sup>(b)</sup>	–	–	25-Sep	9-Oct	2-Sep	16-Sep	17-Sep	23-Sep
Scout <sup>(b)</sup>	15-Aug	–	16-Sep	29-Sep	1-Sep	8-Sep	14-Sep	19-Sep
Supreme <sup>(b)</sup>	29-Jul	26-Aug	14-Sep	27-Sep	29-Aug	6-Sep	15-Sep	22-Sep
Trojan <sup>(b)</sup>	17-Aug	10-Sep	17-Sep	29-Sep	1-Sep	10-Sep	15-Sep	23-Sep
Westonia	–	–	10-Sep	27-Sep	28-Aug	8-Sep	14-Sep	22-Sep
Wyalkatchem <sup>(b)</sup>	8-Aug	5-Sep	–	28-Sep	28-Aug	7-Sep	15-Sep	–
Yitpi <sup>(b)</sup>	30-Aug	17-Sep	25-Sep	6-Oct	6-Sep	16-Sep	22-Sep	25-Sep
Zen <sup>(b)</sup>	18-Aug	7-Sep	20-Sep	3-Oct	4-Sep	13-Sep	18-Sep	23-Sep

Flowering dates in green fall within estimated flowering date for the highest yield at the locations (Geraldton: 11–31 Aug, Northam: 5–25 Sep, Katanning: 17 Sep–7 Oct, Esperance: 7–27 Sep), amber represents + or - 7 days outside the estimated window, while red represents sowing times where the variety flowers more than 7 days outside the estimated flowering window.

# Herbicide tolerance

The herbicide tolerance trials conducted over the last 15 years in WA indicate that some wheat varieties are more susceptible to damage from certain herbicides than others (Tables 6 and 7). The variation in tolerance may be due to differences in morphological or physiological characters and/or internal ear development stages among the varieties. The level of tolerance amongst varieties varies with the rate of herbicide, the environmental conditions when the herbicide is applied, and the stage of the crop growth. Seasonal variability makes it essential to test herbicide and variety interaction over several seasons and locations. The risk of crop damage from a herbicide should be balanced against the potential yield loss from both the weed competition and the number of weed seeds returning to the soil seed bank. Small yield reductions due to herbicide damage in sensitive varieties may not be easily detected at the paddock level, but over larger areas can be of great economic importance.

The herbicide tolerance of 10 commonly grown wheat varieties in WA (Table 6) and nine recently released varieties (Table 7) are summarised using the following symbols. The herbicide and variety interactions are based on the yield response across herbicide crop tolerance trials conducted in WA from 1999–2014.

– Not tested or insufficient data
✓ no significant yield reductions at the label recommended rates in (Z) trials.
N (w/z) narrow margin, significant yield reductions at higher than the label recommended rate, but not at the label recommended rate. Significant event occurring in w trials out of z trials conducted. Eg (2/5) = tested in 5 trials, 2 trials returning with a significant yield reduction.
x% (1/z) yield reduction (warning) significant yield reduction at recommended rate in 1 trial only out of z trials conducted.
x–y% (w/z) yield reductions (warning) significant yield reductions at recommended rate in w trials out of z trials conducted.

A narrow crop safety margin implies that when spraying herbicide at the label rate under less than optimal conditions, herbicide damage and yield loss may occur. For example, when:

- overlapping herbicide
- spraying under wet conditions (for soil active and residual herbicides)
- there are stressed plants due to abiotic/biotic factors.

## Herbicide tolerance of recent varieties

Since 2009, NVT advanced lines/varieties have been tested for herbicide tolerance in small plot (1.6m x 1.5m) screening trials at Katanning. The herbicides Boxer<sup>®</sup> Gold, Diuron + Dual<sup>®</sup>, Sakura<sup>®</sup>, Triflur<sup>®</sup> X, Glean<sup>®</sup>, Hoegrass<sup>®</sup> + Achieve<sup>®</sup>, Jaguar<sup>®</sup>, Affinity<sup>®</sup> + MCPA (Amine), Ally<sup>®</sup>, Diuron + MCPA (Amine), Tigrex<sup>®</sup> and 2 4–D LV ester 680 (xtra) are tested at higher than label rates. The majority of these herbicides were selected based upon their consistent damage (significant yield reduction) to wheat varieties in the previous trials. Boxer<sup>®</sup> Gold and Sakura<sup>®</sup> were included in the trials due to an expected rapid uptake of these herbicides for better ryegrass management. Any variety x herbicide/herbicides combination(s) that registered significant yield reduction in the screening trials, are being tested in larger plot (10m x 1m) advanced trials. The testing is done at label and higher than label rates for at least two years to validate the results and to minimise the seasonal influences on herbicide tolerance. The results from the advanced trials on the new varieties are presented in the Table 7. Velocity<sup>®</sup> results on Scout are from another trial conducted at Katanning during 2013.

## A. Important comments regarding safe use of herbicides

Sakura<sup>®</sup> 850 WG @ 118 g/ha is registered as a pre-emergent herbicide on bread wheat (not durum wheat) for the control of annual ryegrass, barley grass, silver grass, toad rush and annual phalaris. Sakura<sup>®</sup> could cause crop damage in situations which lead to an increased concentration of this herbicide in the planting row, or movement of the herbicide to the depth of the crop seed, which is similar to other soil active residual pre-emergent herbicides. Examples include the movement of herbicide treated soil into the seeding furrows due to wind or heavy rainfall soon after sowing,

resulting in higher concentration of herbicide in the crop row. Another example is heavy rainfall between application and crop emergence on soils which have high potential for leaching, which may result in movement of the herbicide into the seed zone. For detail please see the Sakura® label.

Trial results (Table 6) indicate Sakura® at higher than the label rate caused statistically significant yield loss across the majority of varieties at Mullewa during 2011 and 2012 on sandy loam to loamy soils. A significant yield loss was registered even at label rate in four out of six varieties tested during 2012 at Mullewa. This could be due to a higher concentration of the herbicide in the seeding furrow or leaching into the seed/root zone as a result of a 26mm and 29mm rainfall event within a week of sowing during 2011 and 2012, and a single rainfall event of 34mm within a month during 2011. Another pre-emergent herbicide, Boxer® Gold, also responded similarly in the trials. When looking at occasional yield effects, it is important to remember that using grass herbicides in cereal crops often causes some crop effect, but the herbicides are being used to control weeds and the net return is a yield increase from weed control after any crop effect.

When using trifluralin, Yield®, Stomp® and Avadex®, ensure sown seed is placed below the herbicide treated soil band; otherwise severe root retardation may result. Surface crusting may exacerbate emergence problems. Old seed with reduced vigour, varieties with short coleoptiles, and seed dressings that reduce coleoptile length should be avoided. If sowing with knife points, and using higher label rates, ensure that treated soil does not get thrown, blown or washed into the furrows.

Diuron 1.0L + Dual® (Metolachlor 720g/L) 0.5L/ha have been reported to cause more crop damage on lighter than heavier soil types. If using knife point and press wheels to sow the crop, apply this mixture pre plant only (0–7 days) as knife points leave open furrows/slots. Crop damage can result if herbicide is washed into the furrows. If using a 'Full Cut' seeding system, that leaves a relatively smooth surface, this mixture can be applied post plant pre-emergent within 3–4 days of planting.

Metribuzin at 75 g a.i./ha as an early post-emergent is registered on all wheat varieties for control of toad rush (*Juncus bufonius*). However, metribuzin at 150 g a.i./ha as a pre-emergent herbicide is registered only on metribuzin tolerant wheat varieties Blade and EGA Eagle Rock for suppression/control of annual ryegrass, barley grass, brome grass, wild radish, capeweed, doublegee, etc. To achieve good control of annual ryegrass and barley grass, trifluralin 480 g a.i./ha can also be mixed with the recommended rate of metribuzin. The trial work has indicated that metribuzin 75 g.a.i./ha applied post-emergent was tolerated well with good crop safety margin by all wheat varieties (Table 6 and 7). A two way mix of metribuzin 150g a.i./ha (e.g. Lexone® 200 g/ha) with Diuron® 1.0L or Stomp® 330E 1.0L or three way mix with Diuron 1.0L and Dual® Gold 250mL/ha was safe on EGA Eagle Rock and Blade. Any weed escapes, especially brome grass after pre-emergent metribuzin use could possibly be controlled or suppressed, by application of Monza® @ 25g/ha at 2–3 leaf or Atlantis® @ 330mL/ha at 3–4 leaf stage of the crop. Do not use metribuzin at a higher rate (alone or in mixture with other herbicides) on the commonly grown wheat varieties (e.g. Carnamah, Mace), as large yield reductions have been recorded in the trials.

Where marginal zinc and copper deficiency conditions exist, Glean® and Logran® may aggravate such deficiencies.

## **B. Safe timings for phenoxy herbicides' application**

MCPA, 2,4-D and dicamba are the main phenoxy herbicides used in wheat. The timing of their application is much more critical than for other herbicides. These herbicides often produce morphological abnormalities in both the vegetative parts and ears of wheat plants.

Wheat tolerance to these herbicides depends on the stage of ear development. Wheat is most sensitive to these herbicides at the double ridge/floral initiation stage of ear development. At this stage, cells change from producing leaves and begin to form the ear. The embryonic ear continues to form until the 'terminal spikelet' stage is reached.

# Herbicide tolerance

Spraying advice is based on leaf and tiller development, but not all varieties have the same correlation between leaf/tiller and ear development. Thus different varieties become safe to phenoxy spray at slightly different growth stages. Long season varieties take longer to reach the safe stage.

To use higher rates of MCPA amine (2.0L/ha) and 2,4-D amine 625 (1.3L/ha) in Amery, Axe, Bonnie Rock, Cobra, Corack, Emu Rock, Espada, King Rock, Kunjin, Mace, Tincurrin, Westonia, Wyalkatchem, and Zippy apply these herbicides at Z15–Z16 (5–6 leaves on the main stem); in Brookton, Bumper, Camm, Carnamah, EGA Eagle Rock, Fortune, Magenta, Scout, Stiletto, Yandanooka and Yitpi at Z16Z17, and in Endure, Calingiri and Spear at Z17–Z18. At these stages floral initiation will be completed in the above varieties.

Do not apply these phenoxy herbicides between flag leaf emergence and the soft dough stage on any variety. Generally MCPA amine is safer than 2,4-D amine especially on later developing varieties.

Dicamba (and mixtures with 2,4-D or MCPA) should not be applied after Zadoks 30 (pseudo-stem elongation, but first node not yet above soil surface).

The previous trial results indicate that caution should be used if applying phenoxies in dry seasons when there is moisture stress. Brookton and Calingiri were found to be more sensitive to phenoxy herbicides than the other varieties under moisture stress conditions.

As several wild radish populations from the Northern Agricultural Region have been confirmed resistant to phenoxy herbicides, rotate the phenoxies with other herbicides or apply as a mix with other herbicides at full rates to keep these herbicides working.

## C. Waterlogging and crop safety

A number of products, including Group A and B herbicides are tolerated by wheat because they are metabolised within the seedling. If a seedling's growth is retarded by waterlogging, cold or any other factor, its metabolism is reduced, and toxic levels of herbicide can accumulate within the plant. There were many cases of such damage in 1999.

There were also many examples of trifluralin reducing emergence when the paddocks were waterlogged. It is suspected that this was due to increased uptake by the coleoptile from the wet soil. If there is any chance of extreme waterlogging just after seeding, crop damage is more likely, and growers should consider using safer products, or spraying post-emergence.

Note: Herbicide tolerance data was provided by Harmohinder Dhammu, DAFWA Northam. More information can be found online at [nvtonline.com.au](http://nvtonline.com.au) or contact Dr Dhammu (08) 9690 2217 or [harmohinder.dhammu@agric.wa.gov.au](mailto:harmohinder.dhammu@agric.wa.gov.au).

The State of Western Australia, the Minister for Agriculture, the Chief Executive Officer of the Department of Agriculture and Food and their respective officers, employees and agents:

- a) Do not endorse or recommend any individual specified product or any manufacturer of a specified product. Brand, trade and proprietary names have been used solely for the purpose of assisting users of this publication to identify products. Alternative manufacturers' products may perform as well or better than those specifically referred to.
- b) Do not endorse the use of herbicides above the registered rate, off-label use of herbicides or off-label tank mixes. Crop tolerance and yield responses to herbicides are strongly influenced by seasonal conditions. Always adhere to label recommendation.



# Herbicide tolerance

Table 6 Herbicide tolerance of wheat varieties (1999–2014) commonly grown in Western Australia.

Varieties		Arrino	Calingiri	Carnamah	Bonnie Rock <sup>Ⓢ</sup>	Mace <sup>Ⓢ</sup>	Magenta <sup>Ⓢ</sup>	Stiletto	Westonia	Wyalkatchem <sup>Ⓢ</sup>	Yitpi <sup>Ⓢ</sup>
Year of testing and trial sites		1999-2001	1999-2002, 2010-2014	1999-2003, 2006, 2010-2012	2002-2004, 2006, 2010-2014	2009, 2012, 2013, 2014	2008, 2009, 2012, 2013-2014	2000, 2010-2012	1999-2003, 2013	2001-2006, 2008-2014	2000, 2010-2014
Herbicides/ha	Timing	ADEF	ACDEF	ABCDEF	CDE	CE	CE	BCE	ABDEF	BCDE	BCE
Avadex® BW 2L ( <i>Tri-alleate</i> )	IBS	√ (6)	√ (6)	√ (12)	√ (5)	–	–	√ (1)	31 (1/10)	√ (8)	√ (1)
Boxer® Gold 2.5L ( <i>s-Metolachlor</i> + <i>Prosulfocarb</i> )	IBS	–	4 (1/4)	4 (1/5)	N (2/3)	10 (1/5)	N (1/6)	7 (1/3)	√ (1)	N (2/5)	N (1/3)
Dual® Gold 0.25L ( <i>s-Metolachlor</i> )	IBS	–	–	–	–	√ (2)	√ (3)	–	–	√ (3)	–
Diuron 1L + Dual® Gold 0.25L ( <i>Diuron</i> + <i>s-Metolachlor</i> )	IBS/IPP	√ (5)	√ (5)	17 (1/10)	√ (2)	√ (2)	√ (3)	16 (1/1)	√ (8)	18 (1/8)	√ (1)
Glean® 12.5g ( <i>Chlorsulfuron</i> )	IBS	37 (1/6)	12 – 25 (2/6)	√ (12)	√ (3)	–	–	√ (1)	√ (10)	√ (6)	√ (1)
Glean® 20g ( <i>Chlorsulfuron</i> )	IBS	√ (2)	√ (2)	√ (2)	√ (2)	–	–	–	√ (2)	√ (5)	–
Logran® 35g ( <i>Triasulfuron</i> )	IBS	√ (7)	√ (7)	√ (13)	√ (3)	–	–	√ (1)	√ (11)	√ (6)	√ (1)
Logran® B Power 50g ( <i>Triasulfuron</i> + <i>Butafenacil</i> )	IBS	–	–	√ (3)	√ (5)	√ (2)	√ (3)	–	√ (2)	√ (11)	–
Monza® 25g + Triflur® X 480 3L ( <i>Sulfosulfuron</i> + <i>Trifluralin</i> )	IBS	–	√ (1)	–	√ (1)	√ (1)	–	–	–	√ (1)	–
Monza® 25g + Boxer® Gold 2.5L ( <i>Sulfosulfuron</i> + <i>s-Metolachlor</i> + <i>Prosulfocarb</i> )	IBS	–	√ (1)	–	√ (1)	√ (1)	–	–	–	√ (1)	–
Sakura® 850 WG 118g ( <i>Pyroxasulfone</i> )	IBS	–	8 – 15 (3/5)	N (1/4)	11 (1/4)	16 (1/3)	16 (1/3)	N (1/4)	√ (1)	N (1/5)	N (1/4)
Sakura® 850 WG 118g + Triflur® X 480 3L ( <i>Pyroxasulfone</i> + <i>Trifluralin</i> )	IBS	–	√ (1)	–	√ (1)	√ (1)	–	–	–	√ (1)	–
Stomp®330 1.8L ( <i>Pendimethalin</i> )	IBS	13 (1/7)	√ (7)	36 (1/13)	√ (5)	–	√ (1)	√ (1)	21 – 24 (2/11)	√ (12)	√ (1)
Treflan® 1L ( <i>Trifluralin</i> )	IBS	√ (7)	√ (7)	√ (12)	√ (2)	–	–	√ (1)	√ (10)	√ (5)	√ (1)
Triflur® X 2L ( <i>Trifluralin</i> )	IBS	–	–	36(1/1)	√ (3)	–	–	–	√ (1)	√ (6)	–
Triflur® X 3L ( <i>Trifluralin</i> )	IBS	–	–	–	–	12 (1/2)	√ (3)	–	–	√ (3)	–
Yield® 250 EC 2L ( <i>Oryzalin</i> + <i>Trifluralin</i> )	IBS	√ (7)	√ (7)	12 (1/10)	–	–	–	√ (1)	√ (9)	√ (3)	√ (1)
Diuron 1L + Glean® 15g ( <i>Diuron</i> + <i>Chlorsulfuron</i> )	IPP	√ (5)	√ (5)	√ (6)	–	–	–	15 (1/1)	14 (1/6)	–	√ (1)
Achieve® 250g ( <i>Tralkoxydim</i> )	Z12–Z14	√ (6)	√ (6)	√ (12)	√ (3)	–	–	√ (1)	√ (10)	√ (6)	√ (1)
Achieve® 380g ( <i>Tralkoxydim</i> )	Z12–Z14	√ (1)	√ (1)	√ (1)	√ (2)	13 (1/2)	√ (3)	–	√ (1)	√ (8)	–
Axial® 300mL ( <i>Pinoxadin</i> )	Z12–Z13	–	–	–	–	–	√ (1)	–	–	√ (4)	–

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# Herbicide tolerance

Table 6 Herbicide tolerance of wheat varieties (1999–2014) commonly grown in Western Australia. (cont.)

Varieties		Arrino	Calingiri	Carnamah	Bonnie Rock <sup>φ</sup>	Mace <sup>φ</sup>	Magenta <sup>φ</sup>	Stiletto	Westonia	Wyalkatchem <sup>φ</sup>	Yitpi <sup>φ</sup>
Year of testing and trial sites		1999-2001	1999-2002, 2010-2014	1999-2003, 2006, 2010-2012	2002-2004, 2006, 2010-2014	2009, 2012, 2013, 2014	2008, 2009, 2012, 2013-2014	2000, 2010-2012	1999-2003, 2013	2001-2006, 2008-2014	2000, 2010-2014
Herbicides/ha	Timing	ADEF	ACDEF	ABCDEF	CDE	CE	CE	BCE	ABDEF	BCDE	BCE
Cheetah® Gold 1L ( <i>Diclofop</i> + <i>Sethoxydim</i> + <i>Fenoxaprop</i> )	Z12–Z13	–	–	–	–	√ (2)	7 (1/3)	–	–	√ (5)	–
Decision® 1.0L ( <i>Diclofop</i> + <i>Sethoxydim</i> )	Z12–Z13	–	–	√ (3)	√ (5)	–	–	–	√ (2)	√ (6)	–
Eclipse® 10g ( <i>Metosulam</i> )	Z12–Z13	√ (4)	12 (1/4)	√ (7)	–	–	–	√ (1)	√ (6)	√ (3)	√ (1)
Glean® 20g ( <i>Chlorsulfuron</i> )	Z12–Z13	–	–	–	–	√ (2)	√ (3)	–	–	6 (1/3)	–
Hoegrass® 200mL + Achieve® 200g ( <i>Diclofop-methyl</i> + <i>Tralkoxydim</i> )	Z12–Z13	√ (1)	√ (1)	10 (1/6)	√ (5)	√ (2)	√ (3)	–	√ (4)	19 – 30 (2/14)	–
Hoegrass® 375 1.5L ( <i>Diclofop-methyl</i> )	Z12–Z13	√ (2)	√ (2)	√ (2)	–	–	–	–	√ (2)	–	–
Hoegrass® 375 2L ( <i>Diclofop-methyl</i> )	Z12–Z13	–	–	√ (2)	√ (4)	–	√ (1)	–	√ (1)	20 (1/8)	–
Jaguar® 1.0L ( <i>Bromoxynil</i> + <i>Diffenican</i> )	Z12–Z13	√ (6)	15 – 19 (2/6)	√ (12)	√ (5)	√ (2)	√ (3)	√ (1)	√ (10)	√ (14)	√ (1)
Metribuzin 750 100g ( <i>Metribuzin</i> )	Z12–Z13	–	√ (2)	–	√ (1)	√ (2)	–	–	–	√ (1)	–
Monza® 25g ( <i>Sulfosulfuron</i> )	Z12–Z13	–	–	√ (3)	√ (5)	√ (2)	√ (3)	–	√ (2)	6 (1/11)	–
Topik® 240 EC 0.140L ( <i>Clodinafop</i> )	Z12–Z13	√ (1)	√ (1)	√ (1)	–	–	–	–	√ (1)	–	–
Topik® 240 EC 0.210L ( <i>Clodinafop</i> )	Z12–Z13	–	–	–	√ (2)	–	–	–	–	√ (2)	–
Tristar® 1.4L ( <i>Diclofop</i> + <i>Fenoxaprop</i> )	Z12–Z13	√ (1)	√ (1)	√ (1)	–	–	–	–	√ (1)	–	–
Velocity® 0.670L ( <i>Bromoxynil</i> + <i>Pyrosulfotole</i> )	Z12–Z15	–	25 (1/4)	√ (2)	11 (1/3)	√ (4)	8(1/4)	√ (2)	9(1/1)	5 – 9 (2/6)	√ (3)
Velocity® 0.670L + Ecopar® 0.2L + BS 1000 0.2% ( <i>Bromoxynil</i> + <i>Pyrosulfotole</i> + <i>Pyraflufen-ethyl</i> )	Z12–Z13	–	√ (1)	√ (1)	√ (1)	√ (1)	13 (1/1)	–	–	√ (1)	–
Wildcat® 0.5L ( <i>Fenoxaprop-P-ethyl</i> )	Z12–Z13	√ (2)	√ (2)	√ (2)	–	–	–	–	√ (2)	–	–
Affinity® 50g + MCPA 0.5L ( <i>Carfentrazone-ethyl</i> + <i>MCPA amine</i> )	Z13–Z14	√ (4)	9 – 15 (2/4)	√ (10)	√ (5)	√ (2)	√ (3)	√ (1)	√ (8)	22 (1/14)	√ (1)
Affinity® Force 100mL + MCPA 0.5L ( <i>Carfentrazone-ethyl</i> + <i>MCPA amine</i> )	Z13–Z14	–	5(1/4)	√ (4)	5 (1/4)	√ (1)	–	√ (4)	–	9 (1/4)	√ (4)

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# Herbicide tolerance

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Varieties		Arrino	Calingiri	Carnamah	Bonnie Rock <sup>φ</sup>	Mace <sup>φ</sup>	Magenta <sup>φ</sup>	Stiletto	Westonia	Wyalkatchem <sup>φ</sup>	Yitpi <sup>φ</sup>
Year of testing and trial sites		1999-2001	1999-2002, 2010-2014	1999-2003, 2006, 2010-2012	2002-2004, 2006, 2010-2014	2009, 2012, 2013, 2014	2008, 2009, 2012, 2013-2014	2000, 2010-2012	1999-2003, 2013	2001-2006, 2008-2014	2000, 2010-2014
Herbicides/ha	Timing	ADEF	ACDEF	ABCDEF	CDE	CE	CE	BCE	ABDEF	BCDE	BCE
Ally 5g + MCPA LVE 0.5L + Lontrel® 750 SG 40g (Metsulfuron + MCPA + Clopyralid)	Z13–Z16	–	–	√ (1)	√ (1)	–	–	–	–	√ (1)	–
Ally® 5g (Metsulfuron)	Z13–Z14	√ (5)	11(1/5)	15 (1/11)	√ (5)	–	–	√ (1)	14 – 26 (3/9)	√ (11)	√ (1)
Ally® 7g (Metsulfuron)	Z13–Z14	√ (1)	–	√ (1)	–	11 (1/2)	√ (3)	–	√ (1)	8 (1/3)	–
Atlantis® 330mL (Mesosulfuron–methyl)	Z13–Z14	–	–	√ (2)	√ (4)	√ (2)	√ (3)	–	–	√ (10)	–
Broadside® 1L (Bromoxynil + MCPA+Dicamba)	Z13–Z14	√ (6)	√ (6)	8–10 (2/12)	√ (3)	–	√ (1)	√ (1)	√ (10)	√ (10)	√ (1)
Broadside® 1.4L (Bromoxynil + MCPA+Dicamba)	Z13–Z14	–	–	–	√ (2)	–	–	–	–	√ (2)	–
Buctril® MA 1L (Bromoxynil + MCPA)	Z13–Z14	√ (4)	9 (1/4)	√ (7)	–	–	–	√ (1)	12 (1/6)	√ (3)	√ (1)
Buctril® MA 1.4L(Bromoxynil + MCPA)	Z13–Z14	–	–	√ (3)	√ (5)	√ (2)	√ (3)	–	√ (2)	6 (1/11)	–
Crusader® 0.5L (Pyroxysulam + Cloquintocet Methyl)	Z13–Z16	–	–	√ (1)	√ (1)	–	–	–	–	√ (1)	–
Crusader® 0.5L+ Lontrel® 750 SG 120g (Pyroxysulam + Cloquintocet Methyl + Clopyralid)	Z13–Z16	–	–	N (1/1)	√ (1)	–	–	–	–	N (1/1)	–
Crusader® 0.5L + MCPA LVE 0.350g (Pyroxysulam + Cloquintocet Methyl + MCPA LVE )	Z13–Z16	–	–	√ (1)	√ (1)	–	–	–	–	√ (1)	–
Diuron 0.350L + MCPA 0.4L (Diuron +MCPA)	Z13–Z14	–	–	–	–	N (1/3)	√ (3)	–	–	√ (3)	–
Diuron 0.350L + MCPA 0.5L (Diuron +MCPA)	Z13–Z14	√ (7)	16 (2/7)	√ (10)	–	–	–	√ (1)	√ (9)	√ (3)	√ (1)
Diuron 0.5L + 2,4–D 0.25L (Diuron +2,4–D)	Z13–Z14	–	–	√ (3)	√ (5)	–	–	–	√ (2)	√ (5)	–
Eclipse® 5g + MCPA LVE 0.5L (Metosulam + MCPA)	Z13–Z14	–	–	–	√ (2)	√ (2)	√ (3)	–	–	√ (8)	–
Flight® EC 0.720L (Picolinafen + Bromoxynil + MCPA ester)	Z13–Z14	–	√ (6)	18 (1/5)	√ (5)	N (1/3)	√ (3)	√ (5)	√ (1)	14	19

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# Herbicide tolerance

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Varieties		Arrino	Calingiri	Carnamah	Bonnie Rock <sup>Ⓛ</sup>	Mace <sup>Ⓛ</sup>	Magenta <sup>Ⓛ</sup>	Stiletto	Westonia	Wyalkatchem <sup>Ⓛ</sup>	Yitpi <sup>Ⓛ</sup>
Year of testing and trial sites		1999-2001	1999-2002, 2010-2014	1999-2003, 2006, 2010-2012	2002-2004, 2006, 2010-2014	2009, 2012, 2013, 2014	2008, 2009, 2012, 2013-2014	2000, 2010-2012	1999-2003, 2013	2001-2006, 2008-2014	2000, 2010-2014
Herbicides/ha	Timing	ADEF	ACDEF	ABCDEF	CDE	CE	CE	BCE	ABDEF	BCDE	BCE
Glean® 3g + Ally® 3g + MCPA 0.3L ( <i>Chlorsulfuron</i> + <i>Metsulfuron</i> + MCPA)	Z13–Z14	✓ (1)	✓ (1)	✓ (3)	–	–	–	–	✓ (2)	✓ (3)	–
Hussar® 200g ( <i>Iodosulfuron-methyl</i> )	Z13–Z14	✓ (1)	✓ (1)	✓ (6)	✓ (5)	✓ (2)	✓ (3)	–	✓ (4)	✓ (14)	–
Hussar® 200g + Lontrel® 750 SG 120g ( <i>Iodosulfuron-methyl</i> + <i>Clopyralid</i> )	Z13–Z16	–	–	✓ (1)	✓ (1)	–	–	–	–	✓ (1)	–
Lontrel® 300 0.3L ( <i>Clopyralid</i> )	Z13–Z14	–	–	–	✓ (2)	–	–	–	–	✓ (2)	–
Mataven® – L 3.0L ( <i>Flamprop-M-methyl</i> )	Z13–Z14	✓ (1)	✓ (1)	✓ (6)	✓ (5)	–	–	–	✓ (4)	✓ (11)	–
Paragon® 0.375L ( <i>Picolinafen</i> + MCPA)	Z13–Z14	–	–	–	✓ (2)	–	–	–	–	✓ (3)	–
Precept® 300 1L ( <i>Pyrasulfotole</i> + MCPA Ester)	Z13–Z14	–	–	–	–	–	✓ (1)	–	–	✓ (1)	–
Tigrex® 0.75L ( <i>Diffufenican</i> + MCPA)	Z13–Z16	–	–	N (1/1)	✓ (1)	–	–	–	–	N (1/1)	–
Tigrex® 1.0L ( <i>Diffufenican</i> + MCPA)	Z13–Z14	✓ (7)	16 (1/7)	30 (1/13)	✓ (5)	✓ (2)	✓ (3)	✓ (1)	18 – 41 (2/11)	✓ (14)	✓ (1)
Torpedo® 0.1L ( <i>Florasulam</i> + <i>Clopyralid</i> )	Z13–Z16	–	–	✓ (1)	✓ (1)	–	–	–	–	✓ (2)	–
Torpedo® 0.1L + Bromoxynil M 0.5L ( <i>Florasulam</i> + <i>Clopyralid</i> + Bromoxynil + MCPA)	Z13–Z16	–	–	✓ (1)	✓ (1)	–	–	–	–	✓ (1)	–
Torpedo® 0.1L + MCPA LVE 0.5L ( <i>Florasulam</i> + <i>Clopyralid</i> + MCPA LVE)	Z13–Z16	–	–	✓ (1)	✓ (1)	–	–	–	–	✓ (1)	–
Torpedo® 0.1L + MCPA LVE 0.5L + Ally® 5g ( <i>Florasulam</i> + <i>Clopyralid</i> + MCPA + <i>Metsulfuron</i> )	Z13–Z16	–	–	✓ (1)	✓ (1)	–	–	–	–	✓ (1)	–
Triathlon® 1L ( <i>Diffufenican</i> + Bromoxynil + MCPA)	Z13–Z15	–	✓ (2)	–	✓ (1)	✓ (4)	✓ (3)	–	✓ (1)	✓ (2)	✓ (1)
X-Pand® 125g ( <i>Isoxaben</i> + <i>Florasulam</i> )	Z13–Z16	–	–	✓ (1)	✓ (1)	–	–	–	–	✓ (1)	–

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# Herbicide tolerance

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Varieties		Arrino	Calingiri	Carnamah	Bonnie Rock <sup>φ</sup>	Mace <sup>φ</sup>	Magenta <sup>φ</sup>	Stiletto	Westonia	Wyalkatchem <sup>φ</sup>	Yitpi <sup>φ</sup>
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Herbicides/ha	Timing	ADEF	ACDEF	ABCDEF	CDE	CE	CE	BCE	ABDEF	BCDE	BCE
Paragon® 0.5L ( <i>Picolinafen</i> + <i>MCPA</i> )	Z15+	–	–	–	–	√ (2)	√ (3)	–	–	√ (3)	–
X-Pand® 125g + Bromoxynil M 0.35L ( <i>Isoxaben</i> + <i>Florasulam</i> + <i>Bromoxynil</i> + <i>MCPA</i> )	Z13–Z16	–	–	√ (1)	√ (1)	–	–	–	–	√ (1)	–
X-Pand® 125g + MCPA LVE 0.3 L ( <i>Isoxaben</i> + <i>Florasulam</i> + <i>MCPA LVE</i> )	Z13–Z16	–	–	√ (1)	√ (1)	–	–	–	–	√ (1)	–
MCPA (amine) 500 1.25L (MCPA)	Z15+	√ (1)	36 (1/1)	√ (5)	18 (1/3)	–	–	√ (1)	√ (4)	√ (3)	√ (1)
MCPA (amine) 500 2L (MCPA)	Z15+	–	–	–	√ (2)	√ (2)	√ (3)	–	–	√ (8)	–
2,4-D Amine 500 1L (2,4–D)	Z15+	√ (2)	√ (3)	√ (7)	√ (3)	–	–	√ (1)	11 – 35 (2/6)	√ (3)	√ (1)
2,4-D Amine 625 1.3L (2,4–D)	Z15+	–	–	–	√ (2)	√ (2)	√ (3)	–	–	√ (8)	–
2,4-D LV Ester 600 0.5L (2,4–D)	Z15+	√ (1)	√ (1)	39 (1/2)	–	–	–	√ (1)	41 (1/2)	–	√ (1)
2,4-D LV Ester 680 0.8L (2,4–D)	Z15+	–	√ (2)	–	–	√ (2)	√ (3)	–	–	√ (3)	–
2,4-D Ester 800 0.7L (2,4–D)	Z15+	–	–	12 (1/2)	√ (4)	–	–	–	√ (1)	16 (1/7)	–
Kamba® 500 0.28L (Dicamba)	Z15+	–	–	√ (3)	√ (3)	–	–	–	32 (1/2)	29 (1/3)	–
Kamba® 500 0.4L (Dicamba)	Z15+	–	–	–	–	√ (2)	√ (2)	–	–	√ (2)	–
Jaguar® 1.0L (Bromoxynil + Diflufenican)	Z16–Z17	–	√ (2)	–	√ (1)	20 (1/2)	7 (1/1)	–	–	10 (1/1)	√ (1)
Velocity® 1.0L (Bromoxynil + Pyrosulfotole)	Z16–Z17	–	√ (2)	–	√ (1)	√ (2)	√ (1)	–	–	√ (1)	√ (1)

The names in the parenthesis are the chemical names. IBS=Incorporated by seeding/applied before seeding, IPP=Immediately post plant. A= Buntine, B= Esperance (Flemming gravelly sand, pH–4.5 ), C= Katanning (Duplex sandy, loamy sand, sandy loam, loam, pH–4.3–5.2), D= Merredin (Clay loam/loam, pH–5.1–5.3), E= Mullewa (Sandy loam/red loam, pH–4.6–6.4) & F= Newdegate (Duplex sand over clay, pH–4.1). **Note:** Higher than the label herbicide rates to work out crop safety margins (N) were used in some trials and/or some for products only.

# Herbicide tolerance

Table 7. Herbicide tolerance of recently released wheat varieties conducted at Katanning during 2010–2014 and at Mullewa during 2014.

Varieties		Cobra <sup>Ⓛ</sup>	Corack <sup>Ⓛ</sup>	Emu Rock <sup>Ⓛ</sup>	Envoy <sup>Ⓛ</sup>	Estock <sup>Ⓛ</sup>	Harper <sup>Ⓛ</sup>	Jusctica C L Plus <sup>Ⓛ</sup>
Year of Testing	Year of testing	2013–14	2013–14	2012–14	2012–14	2012–14	2014	2013–14
Herbicides/ha	Timing							
Monza <sup>®</sup> 25g + Triflur <sup>®</sup> X 480 3L * (Sulfosulfuron + Trifluralin)	PS	√ (1)	√ (1)	–	–	–	–	–
Monza <sup>®</sup> 25g + Boxer <sup>®</sup> Gold 2.5L * (Sulfosulfuron + s-Metolachlor + Prosulfocarb)	PS	√ (1)	√ (1)	–	–	–	–	–
Sakura <sup>®</sup> 850 WG 118g (Pyroxasulfone)	PS	–	–	–	–	√ (2)	–	–
Sakura <sup>®</sup> 850 WG 118g + Triflur <sup>®</sup> X 480 3L * (Pyroxasulfone + Trifluralin)	PS	√ (1)	√ (1)	–	–	–	–	–
Hoegrass <sup>®</sup> 200mL + Achieve <sup>®</sup> 200g (Diclofop-methyl + Tralkoxydim)	Z12–Z13	–	–	–	√ (2)	–	–	–
Jaguar <sup>®</sup> 1.0L (Bromoxynil + Diflufenican)	Z12–Z13	√ (2)	–	–	–	–	–	–
Metribuzin 750 WG 100g (Metribuzin) *	Z12–Z13	√ (1)	√ (1)	–	–	–	–	–
Velocity <sup>®</sup> 0.670 L (Bromoxynil + Pyrosulfotole)	Z12–Z15	–	–	–	–	–	–	–
Affinity <sup>®</sup> 60 g + MCPA 0.5L (Carfentrazone-ethyl + MCPA amine)	Z13–Z14	√ (2)	–	–	√ (2)	–	–	–
Ally <sup>®</sup> 7g (Metsulfuron)	Z13–Z14	–	–	–	–	N (1/2)	–	–
Diuron 0.350L + MCPA 0.4L (Diuron + MCPA)	Z13–Z14	N (2/2)	N (2/2)	N (2/2)	N (2/2)	√ (2)	–	N (2/2)
Legacy <sup>®</sup> MA 1.0L (Diflufenican + MCPA)	–	–	–	–	√ (1)	√ (1)	–	–
Tigrex <sup>®</sup> 1.0L (Diflufenican + MCPA)	Z13–Z14	–	–	–	12 (1/2)	30 (1/2)	8 (1/1)	–
Triathlon <sup>®</sup> 1L * (Diflufenican + Bromoxynil + MCPA)	–	√ (1)	10 (1/1)	–	7 (1/1)	√ (1)	–	–
2,4-D LV Ester 680 0.8L (2,4-D)	Z15+	√ (2)	√ (2)	√ (2)	N (1/2)	N (1/2)	–	N (1/2)
Jaguar <sup>®</sup> 1.0L * (Bromoxynil + Diflufenican)	Z16–Z17	–	–	–	–	–	–	–
Velocity <sup>®</sup> 1.0L * (Bromoxynil + Pyrosulfotole)	Z16–Z17	–	–	–	–	–	–	–

PS= Pre-seeding. The trials were conducted at Great Southern Agricultural Research Institute (GSARI) Katanning on Sandy loam to Loamy sand soils with pH range of 4.3–5.1. The names in the parenthesis are the chemical names. Hoegrass<sup>®</sup> 375 200 mL = Hoegrass<sup>®</sup> 500 150 mL, Affinity<sup>®</sup> 400 DF 60 g = Affinity<sup>®</sup> Force 100 mL and Diuron 500 350 mL = Diuron 900 194.5 g. The total rainfall from May to November at Katanning was 211, 419, 299, 355 and 395 mm during 2010, 2011, 2012, 2013 and 2014, respectively. \* indicates that all or some of the varieties were tested at Mullewa on sandy loam soil (pH CaCl<sub>2</sub> : 5.8 and OC (%): 0.75) during 2014.

# Herbicide tolerance

Table 7. Herbicide tolerance of recently released wheat varieties conducted at Katanning during 2010–2014 and at Mullewa during 2014. (cont.)

Varieties		King Rock <sup>Ⓛ</sup>	Kunjin <sup>Ⓛ</sup>	Mace <sup>Ⓛ</sup>	Magenta <sup>Ⓛ</sup>	Scout <sup>Ⓛ</sup>	Wyalkatchem <sup>Ⓛ</sup>	Trojan <sup>Ⓛ</sup>
Year of Testing	Year of testing	2010–11, 2014	2012–13	2013–14	2013–14	2013–14	2013–14	2014
Herbicides/ha	Timing							
Monza <sup>®</sup> 25g + Triflur <sup>®</sup> X 480 3L * (Sulfosulfuron + Trifluralin)	PS	–	–	√ (1)	–	–	√ (1)	–
Monza <sup>®</sup> 25g + Boxer <sup>®</sup> Gold 2.5L * (Sulfosulfuron + s-Metolachlor + Prosulfocarb)	PS	–	–	√ (1)	–	–	√ (1)	–
Sakura <sup>®</sup> 850 WG 118g (Pyroxasulfone)	PS	√ (1)	30 (1/1)	–	–	√ (2)	–	–
Sakura <sup>®</sup> 850 WG 118g + Triflur <sup>®</sup> X 480 3L * (Pyroxasulfone + Trifluralin)	PS	–	–	√ (1)	–	–	√ (1)	–
Hoegrass <sup>®</sup> 200mL + Achieve <sup>®</sup> 200g (Diclofop-methyl + Tralkoxydim)	Z12–Z13	–	–	–	–	√ (1)	–	–
Jaguar <sup>®</sup> 1.0L (Bromoxynil + Diflufenican)	Z12–Z13	√ (1)	–	–	–	–	–	–
Metribuzin 750 WG 100g (Metribuzin) *	Z12–Z13	–	–	√ (2)	√ (1)	√ (1)	√ (1)	–
Velocity <sup>®</sup> 0.670 L (Bromoxynil + Pyrosulfotole)	Z12–Z15	–	–	–	–	√ (1)	–	–
Affinity <sup>®</sup> 60 g + MCPA 0.5L (Carfentrazone-ethyl + MCPA amine)	Z13–Z14	N (1/1)	N (1/2)	√ (2)	–	–	–	–
Ally <sup>®</sup> 7g (Metsulfuron)	Z13–Z14	N (1/2)	–	–	–	–	–	–
Diuron 0.350L + MCPA 0.4L (Diuron + MCPA)	Z13–Z14	N (1/1)	N (1/1)	N (1/2)	–	–	–	N (1/1)
Legacy <sup>®</sup> MA 1.0L (Diflufenican + MCPA)	–	–	–	√ (1)	√ (1)	√ (1)	√ (1)	–
Tigrex <sup>®</sup> 1.0L (Diflufenican + MCPA)	Z13–Z14	–	–	–	–	–	–	–
Triathlon <sup>®</sup> 1L * (Diflufenican + Bromoxynil + MCPA)	–	–	–	√ (4)	√ (3)	√ (1)	√ (2)	–
2,4-D LV Ester 680 0.8L (2,4-D)	Z15+	√ (1)	√ (1)	–	–	–	–	17 (1/1)
Jaguar <sup>®</sup> 1.0L * (Bromoxynil + Diflufenican)	Z16–Z17	–	–	20 (1/2)	7 (1/1)	√ (1)	–	–
Velocity <sup>®</sup> 1.0L * (Bromoxynil + Pyrosulfotole)	Z16–Z17	–	–	√ (2)	√ (1)	√ (1)	–	–

PS= Pre-seeding. The trials were conducted at Great Southern Agricultural Research Institute (GSARI) Katanning on Sandy loam to Loamy sand soils with pH range of 4.3–5.1. The names in the parenthesis are the chemical names. Hoegrass<sup>®</sup> 375 200 mL = Hoegrass<sup>®</sup> 500 150 mL, Affinity<sup>®</sup> 400 DF 60 g = Affinity<sup>®</sup> Force 100 mL and Diuron 500 350 mL = Diuron 900 194.5 g. The total rainfall from May to November at Katanning was 211, 419, 299, 355 and 395 mm during 2010, 2011, 2012, 2013 and 2014, respectively. \* indicates that all or some of the varieties were tested at Mullewa on sandy loam soil (pH CaCl<sub>2</sub> : 5.8 and OC (%): 0.75) during 2014.

# Market requirements

(Source: Wheat Quality Australia)

## Australian Hard (AH)

Australian Hard is made up of specific hard grained white wheat varieties selected for superior milling performance and excellent dough quality. It is segregated at a guaranteed minimum protein level of 11.5 percent. The flour derived from Australian Hard is ideally suited to the production of a wide range of baked products including European style pan and hearth breads, Middle Eastern flat breads, Chinese steamed products as well as Chinese style yellow alkaline noodles.

## Australian Premium White (APW)

Australian Premium White is hard grained white wheat varieties with high milling performance and flour quality, delivered with a minimum protein level of 10.5 percent. Australian Premium White is multi-purpose wheat ideal for the production of a variety of noodle types, including Hokkien, instant and fresh noodles. It is also suitable for Middle Eastern and Indian style flat breads and Chinese steamed bread. The segregation APW2 has a minimum protein level of 10 percent.

## Australian Premium White Noodle (APWN)

APWN is a hard grained specialty class that has strict quality requirements. APWN varieties are specific hard grained wheats with excellent visual specifications, segregated within a protein window of 10 to 11.5 percent. This Class is currently only segregated in Western Australia where it is used for blending for specific markets in Asia. The blended grade produces flours for a range of white salted and instant noodle types. The only varieties suitable for this classification are Bonnie Rock, Cascades, Gutha, Halberd, King Rock, Westonia, Wyalkatchem, Envoy, Scout and Nyabing.

## Australian Standard White Noodle (ASWN)

ASWN is white grained wheat with relatively soft kernel hardness. The key quality requirements for Australian Noodle wheat varieties are excellent physical grain and milling quality with high flour pasting attributes, and specific flour colour and end product performance. The soft grain hardness levels of ASWN varieties produce the medium to low levels of water absorption that are required for the production of Udon type noodles. Flour colour for Australian Noodle varieties is also fundamental, and they must generate bright and creamy flour and paste.

## Australian Soft Wheat (ASFT)

Australian Soft Wheat is a unique blend of white, soft-grained wheat varieties, segregated at a guaranteed maximum protein level of 9.5 percent. Traditionally Australian Soft Wheat has featured only club wheat varieties however these varieties tend to produce higher screenings. New varieties do not need to be club types however they do need to have the associated quality attributes. ASFT wheats are used in confectionery and baked products including sweet biscuits, cookies, pastries, and cakes. The market for this grade of wheat is small in WA.

## Australian Standard White (ASW)

There are no specific quality guidelines for Australian Standard White – varieties are classified as Australian Standard White when they fail to meet one or more of the minimum quality standards required to meet premium milling grade specifications. This multi-purpose wheat is used for the production of Middle Eastern, Indian and Iranian style flat breads, European style breads and rolls, and Chinese steamed bread.



# Area sown

**Table 8. Percentage of area sown to wheat varieties for the 2008/2009 to 2014/2015**

Data from CBH Group. Varieties with less than 0.06% of total crop area in 2014/2015 season are not included.

Variety	09/10	10/11	11/12	12/13	13/14	14/15
	%	%	%	%	%	%
Arrino	3.4	1.9	2.4	1.4	0.8	0.6
Baxter	0.2	0.3	0.1	0.2	0.1	0.1
Binnu <sup>(b)</sup>	0.7	0.4	0.3	0.2	0.2	0.1
Bonnie Rock <sup>(b)</sup>	6.5	4.6	3.3	2.6	1.6	0.9
Calingiri	9.8	5.6	8.5	8.6	9.5	10.8
Camm	0.3	0.2	0.2	0.1	0.0	0.1
Carnamah	6.9	5.0	3.6	1.9	1.3	0.8
Clearfield Stl <sup>(b)</sup>	1.1	2.0	1.4	0.9	0.4	0.3
Cobra <sup>(b)</sup>	–	–	–	0.2	1.7	2.2
Corack <sup>(b)</sup>	–	–	–	0.1	1.6	3.2
Eagle Rock <sup>(b)</sup>	1.9	1.9	1.3	0.9	0.5	0.4
Emu Rock <sup>(b)</sup>	–	–	–	0.0	0.3	0.4
Eradu <sup>(b)</sup>	0.1	0.1	0.1	0.1	0.1	0.1
Espada <sup>(b)</sup>	0.3	0.7	0.7	0.4	0.2	0.1
Fortune <sup>(b)</sup>	0.0	1.0	1.1	0.6	0.4	0.3
Frame	0.4	0.4	0.3	0.2	0.2	0.2
Halberd	1.0	0.6	0.6	0.4	0.5	0.4
Harper <sup>(b)</sup>	–	–	–	–	–	0.1
Justica CL Plus <sup>(b)</sup>	–	–	0.0	0.5	1.0	1.1
King Rock <sup>(b)</sup>		0.0	0.2	0.4	0.2	0.2
Mace <sup>(b)</sup>	0.0	4.6	18.0	41.4	53.4	59.1
Machete	0.4	0.3	0.2	0.1	0.2	0.3
Magenta <sup>(b)</sup>	0.2	9.1	9.5	6.5	4.7	3.8
Sapphire <sup>(b)</sup>	3.0	2.7	1.3	0.9	0.4	0.3
Scout <sup>(b)</sup>	–	–	0.2	0.4	0.5	0.2
Spear	1.7	1.1	1.0	0.7	0.5	0.6
Stiletto <sup>(b)</sup>	5.2	5.1	4.4	2.9	2.2	1.7
Tammarin Rock <sup>(b)</sup>	1.0	0.7	0.8	0.6	0.5	0.2
Westonia	4.2	3.8	3.2	2.6	1.5	0.9
Wyalkatchem <sup>(b)</sup>	32.7	29.7	22.7	14.5	7.7	5.0
Yitpi <sup>(b)</sup>	11.0	10.7	9.8	7.0	6.3	4.9

# Seed marketers and seed distribution information

## Marketers

AGT,  
+61 (0)8 9622 8935  
[ausgraintech.com](http://ausgraintech.com)

COGGO Seeds,  
+61 (0)8 9310 2636  
[coggo.net.au](http://coggo.net.au)

InterGrain,  
+61 (0)8 9419 8000  
[intergrain.com](http://intergrain.com)

Pacific Seeds,  
+61 (0)7 4690 2666  
[pacificseeds.com.au](http://pacificseeds.com.au)

Seednet (formerly AWB Seeds),  
+61 (0)8 8752 1777  
[seednet.com.au](http://seednet.com.au)

## Seed distributors

**Australian Seed and Grain**  
Moora, +61 (0)8 9651 1069  
[austseedgrain.com.au](http://austseedgrain.com.au)

- AGT seed affiliate
- InterGrain seed group member
- Pacific Seed associate
- Seednet partner

**Coorow Seeds**  
Coorow, +61 (0)8 9952 1088  
[coorowseeds.com.au](http://coorowseeds.com.au)

- AGT seed affiliate
- Pacific Seed associate

### **Eastern Districts Seed Cleaning Co**

Kellerberrin,  
+61 (0)8 9045 4036

- AGT seed affiliate
- InterGrain seed group member
- Pacific Seed associate
- Seednet partner

## **Melchiorre Seeds**

Narrogin, +61 (0)8 9881 1155

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- InterGrain seed group member
- Pacific Seed associate

## **MultiSEED Production**

Esperance, +61 (0)8 9071 1053

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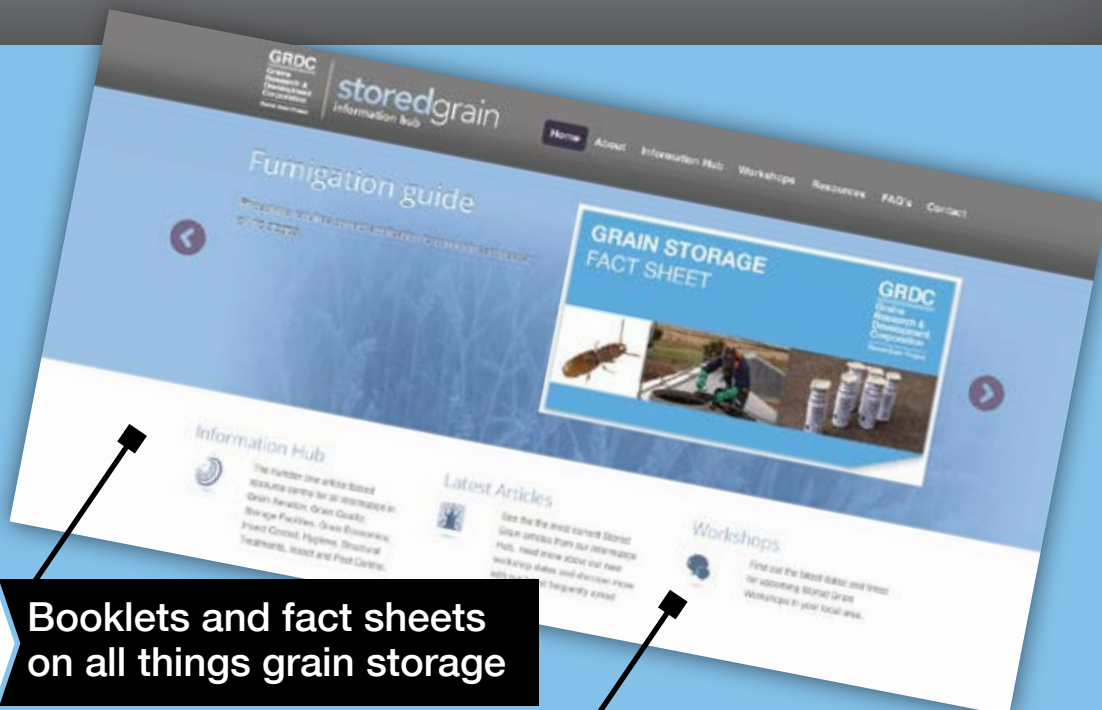
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