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Expected responses of Australian wheat, triticale and barley varieties to the cereal rust diseases and genotypic data for oat varieties

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The rust responses for Australian wheat, barley and triticale varieties provide growers and technical advisors with updated information to make informed decisions. The 2016 edition includes the leaf rust, stem rust and barley grass stripe rust responses of barley varieties and an update on the currently known disease resistance genotypes in Australian oat varieties for the first time. The varietal responses for wheat and triticale presented in this report are the consensus opinion of the pathologists from the state agricultural departments and are based on the most recent field trial reports as well as previous data sets. They are developed in the context of the prevailing rust pathotypes recorded in 2015. The varietal responses for barley presented in this report are the opinion of the members of the Cereal Rust Laboratory at the University of Sydney for barley leaf rust and barley grass stripe rust. The varietal responses to wheat stem rust on barley varieties were provided by Greg Platz from the Queensland Department of Agriculture and Fisheries. Gene postulations based on multi-pathotype tests and pathogen survey results help in explaining regional rust response variation. In this issue we have separated the postulated all stage effective resistance (ASR; seedling resistance) and adult plant resistance (APR) genes into different columns. As our knowledge of APR genes in Australian cereal varieties improves, it will be possible to provide more detailed information regarding the genetic basis of APR in varieties and the level of protection the genes confer.

The disease response categories are summarised in Table 1. The colour coding in this table has been used in all tables to assist in highlighting strengths and potential weaknesses in varieties with respect to rust reaction.

The rust responses of current Australian common wheat, durum wheat, triticale and barley varieties are presented in Tables 2, 3, 4 and 5, respectively. For

wheat and triticale, leaf rust and stripe rust responses are split into two columns to accommodate the differences in pathotypes present in Western Australia relative to the rest of the country. The 'WA' pathotype of wheat stripe rust predominates in Western Australia, but has been displaced in the east by a range of pathotypes that are all clonal mutants descended from the 'WA' pathotype. The most virulent of these pathotypes in the east is the 'Yr17+27+' pathotype,

which is increasing in frequency in the pathotype survey. The combination of the original 'WA' and 'Yr17+27+' pathotypes for disease response rating has replaced the use of the 'Tobruk' pathotype of wheat stripe rust for the triticales in Table 4. Although the 'Tobruk' pathotype is the most virulent on triticales, its frequency is low.

The currently known disease resistance genotypes for Australian bread wheat, barley and oat varieties are presented in Tables 2, 5 and 6 respectively. For the first time the genotypes have been split into all stage resistance (ASR) and adult plant resistance (APR). Any genes that are effective against all Australian pathotypes of a disease are indicated in bold type face.

The presence of adult plant resistances *Sr2*, *Sr57/Lr34/Yr18* and *Sr58/Lr46/Yr29* was determined using the molecular markers *csSr2*, *csLV34* and *Lr46_SNP1G22*, respectively. *Yr31* and *Yr75* were predicted based on adult plant tests in the greenhouse.

The varietal responses for wheat and triticale presented in this report are the consensus opinion of the pathologists from the state agricultural departments and are based on the most recent field trial reports as well as previous data sets. They are developed in the context of the prevailing rust pathotypes recorded in 2015. The rust responses of barley varieties presented in Table 5 are from disease scoring at the Plant Breeding Institute, Cobbitty (barley leaf rust); the Gatton Research Station, Queensland (wheat stem rust) and combined responses from the 2013 consensus opinion of the pathologists from the state agricultural departments and disease scoring at the Plant Breeding Institute, Cobbitty (barley grass stripe rust).

The oat varieties shown in Table 6 are those that have had their rust resistance genotype for oat crown and stem rust diseases characterised using multi-pathotype tests. In addition to the varieties shown in Table 6, rust resistance genes have not yet been shown to be present in any of the following 35 oat varieties: Bannister, Bass, Bond, Boss, Brusher, Cooe, Dawson, Dunnart, Empire, Forester, Galileo, Graza 51, Graza 53, Graza 80, Graza 85, Kangaroo, Kojonup, Lordship, Mammoth, Mannus, Mitika, Mulgara, Outback, Possum, Savannah, SF Colossus, SF Tucana, Tammar, Tungoo, Wandering, Williams, Wintaroo, Wizard, Wombat, Yiddah.

Since 2012, 48 new varieties of common wheat, durum wheat and triticale have been added to the lists. These include 37 of the common wheats: Adagio, B53, Beckom, Bremer, Buchanan, Cobalt, Condo, Cosmick, Cutlass, Dart, Flanker, Gazelle, Grenade CL Plus, Harper, Hatchet CL Plus, Hydra,

Impress CL Plus, Jade, Kiora, Lancer, Manning, Merlin, Mitch, Phantom, Scenario, Scepter, Shield, Steel, Sunlamb, Sunmate, Suntime, Suntop, Supreme, Tenfour, Trojan, Viking and Zen; the durum wheats: DBA Aurora, Penne, Rotini, WID802 and Yawa and the triticales: Astute, Bison, Cartwheel, Fusion and KM10. Resistance genotype data has not been finalised for the common wheat variety Einstein so no data has been presented for this variety.

There have been slight changes in the resistance ratings of some existing wheat varieties since 2012. The more significant changes to disease response ratings are discussed in more detail below.

There have been significant changes to wheat stripe rust response ratings for EGA Wedgetail, Justica CL Plus and Cobra. EGA Wedgetail was downgraded from MRMS in 2012 to MS and Justica CL Plus was downgraded from an MRMS disease response to the 'WA' pathotype with combined virulence to *Yr17* and *Yr27* to MS. Cobra was upgraded from an S rust response in 2012 to an MSS.

For wheat stem rust, the disease response ratings of Axe and Correll were downgraded from 2012 to MS. Impose CL Plus and Wallup were downgraded from their 2012 rating to MRMS while Envoy was upgraded from an MRMS disease response in 2012 to an MR.

The most significant changes in rust response ratings have been due to a series of changes in the pathotypes of wheat leaf rust in Australia including the movement of pathotypes from the eastern grains belt to Western Australia. Changes to the varietal ratings in the eastern States have been from the occurrence of two new wheat leaf rust pathotypes: 76-3,5,7,9,10,12,13+Lr37 in 2013 and 104-1,3,4,6,7,8,9,10,12+Lr37 in 2014. These pathotypes have introduced virulence combinations that have altered the resistance rating of many varieties. The introduction of two wheat leaf rust pathotypes to Western Australia from the eastern states in 2013 (pathotype 76-1,3,5,7,9,10,12+Lr37) and 2015 (pathotype 104-1,3,4,6,7,8,10,12+Lr37) has radically shifted the leaf rust response of many varieties in Western Australia towards increased susceptibility in the 2016 ratings. The primary change in the consensus ratings has been through the introduction of *Lr13* virulence to Western Australia. Varieties affected include: Chara, Corack, Emu Rock, Mace, Wallup and Wyalkatchem. It is not clear what the consequences of the second pathotype (104-1,3,4,6,7,8,10,12+Lr37) will be on Western Australian varieties, since it was only detected in Western Australia in October 2015. Growers of the varieties Emu Rock, Envoy, Estoc, Grenade CL Plus and Mace should exercise caution in the interpretation of the consensus ratings for leaf rust resistance shown in this report.

Acknowledgements

The national wheat rust disease assessments were conducted by cereal plant pathologists across Australia (Greg Platz, Andrew Milgate, Steven Simpfendorfer, Grant Hollaway, Hugh Wallwork, Manisha Shankar). Data were compiled by staff at ACAS Ltd and the National Variety Trials (Tatjana Karov, Neale Sutton).

Table 1 Response descriptors for the rust diseases

Response	Description
R	highly resistant: occasional symptoms of infection including necrotic flecks; no sporulation
RMR	resistant: symptoms evident and usually with necrosis and chlorosis, limited sporulation, and affected leaf area up to 15%
MR	moderately resistant: evidence of sporulating areas on the leaf surface with some chlorosis and necrosis, and affected leaf area up to 30%
MRMS	intermediate: restricted sporulating areas with some chlorosis, and affected leaf area up to 50%
MS	moderately susceptible: freely sporulating lesions and affected leaf area up to 70%
MSS	moderately susceptible to susceptible: freely sporulating lesions with leaf area affected up to 90%
S	susceptible: abundant sporulation across the whole leaf surface; leaf area affected up to 100%; some chlorosis and necrosis evident
SVS	susceptible to very susceptible: abundant sporulation across the leaf surface ; leaf area affected up to 100%; limited chlorosis
VS	highly susceptible: abundant sporulation across the whole leaf area with no evidence of chlorosis or necrosis; 100% leaf area affected

Table 2 Disease response and disease resistance genotypes of Australian bread wheat varieties to leaf, stem and stripe rust diseases. Genotypes in bold face are still effective against all current pathotypes in Australia.

	Rust Response					Rust Resistance Genotypes					
	Leaf Rust		Stem Rust	Stripe Rust		Leaf rust		Stem Rust		Stripe Rust	
	Eastern States	WA ^A		WA	Yr17+27+	ASR	APR	ASR	APR	ASR	APR
Adagio	MSS	MSS	SVS	RMR	RMR	Lr37		Sr38			Yr17
Axe	SVS	MR	MS	RMR	RMR	Lr1, Lr3a or Lr73, Lr13		Sr13			Yr75
B53	S	MRMS	MS	MR	MR	Lr?		Sr8a, Sr30			
Baxter	S	MR	MRMS	MSS	MSS	Lr17a	Lr34	Sr30, Sr36*	Sr2, Sr57		Yr18
Beaufort	MSS	R	SVS	RMR	RMR	Lr13, Lr37		Sr38			Yr17+
Beckom	S	MR	MR	MR	MRMS	Lr3a, Lr37	Lr34	Sr9b, Sr38			Yr17 Yr18
Bolac	S	MRMS	MRMS	RMR	RMR		Lr34	Sr30	Sr57	Yr4	Yr18
Bremer	MR	MR	RMR	MR	S	Lr24, Lr37	Lr34	Sr24, Sr38	Sr2, Sr57	Yr17	Yr18
Buchanan	MR	MR	S	RMR	RMR	Lr?		Sr17, Sr30	Sr2		
Calingiri	S	MS	S	S	S	Lr3a		Sr30			
Chara	S	MS	MRMS	MSS	MSS	Lr13	Lr34	Sr30	Sr57		Yr18
Cobalt	S	MSS	VS	RMR	RMR			Sr17			
Cobra	MR	MR	RMR	MSS	MSS	Lr3a, Lr23		Sr8a, Sr30	Sr2		
Condo	S	R	RMR	MR	MSS	Lr?	Lr34	Sr17, Sr30	Sr57	Yr27	Yr18
Corack	SVS	S	MR	MS	MS	Lr3a, Lr13		Sr30	Sr2		
Correll	MSS	MSS	MS	MSS	MSS			Sr30			
Cosmick	SVS	MSS	MS	MSS	MSS	Lr13		Sr8a, Sr30	Sr2		
Cutlass	RMR	RMR	R	RMR	MS ^P	Lr1, Lr24, Lr37		Sr24, Sr38			Yr17
Dart	SVS	R	MR	MR	MR	Lr1, Lr13	Lr34	Sr9g, Sr30+	Sr57	Yr7	Yr18
Derrimut	MSS	R	MR	RMR	MSS	Lr13, Lr37	Lr34	Sr30, Sr38	Sr2, Sr57	Yr17	Yr18
EGA Burke	MS	MR	MR	MS	MSS	Lr1, Lr13	Lr34	Sr30	Sr2, Sr57		Yr18
EGA Gregory	MR	RMR	MR	MR	MR	Lr3a, Lr23	Lr34	Sr30	Sr57	Yr33	Yr18
EGA Wedgetail	MS	MS	MRMS	MS	MS		Lr34	Sr30	Sr57		Yr18

	Rust Response					Rust Resistance Genotypes					
	Leaf Rust		Stem Rust	Stripe Rust		Leaf rust		Stem Rust		Stripe Rust	
	Eastern States	WA ^A		WA	Yr17+27+	ASR	APR	ASR	APR	ASR	APR
EGA Wylie	MS	R	R	MS	MS	Lr3a, Lr17a	Lr34	Sr30, Sr36*	Sr2, Sr57		Yr18
Elmore CL Plus	RMR	RMR	MR	MRMS	MRMS	Lr24	Lr34	Sr24	Sr57		Yr18
Emu Rock	S	S	MRMS	MRMS	MRMS	Lr13		Sr8a, Sr30	Sr2		
Envoy	S	R	MR	RMR	VS	Lr1, Lr37		Sr38			Yr17
Estoc	MSS	MRMS	MR	MR	MRMS	Lr1, Lr37		Sr8a, Sr38			Yr17
Flanker	MRMS	MR	RMR	RMR	RMR		Lr34	Sr8a, Sr30	Sr57		Yr18
Forrest	MS	MR	RMR	RMR	RMR	Lr1, Lr13	Lr34	Sr8a, Sr12, Sr30	Sr57		Yr18
Gauntlet	MS	MRMS	RMR	RMR	MRMS	Lr3a, Lr37	Lr34	Sr8a, Sr38	Sr57	Yr17	Yr18
Gazelle	MR	MR	MR	RMR	RMR	Lr24, Lr37		Sr24, Sr38			Yr17
Gladius	MS	MS	MR	RMR	MRMS	Lr1, Lr37		Sr38			Yr17
Grenade CL Plus	S	MS	MR	RMR	MRMS	Lr1, Lr37		Sr8a, Sr38			Yr17
Harper	S	MRMS	MRMS	RMR	MS	Lr1, Lr37		Sr9b, Sr38			Yr17
Hatchet CL Plus	SVS	RMR	MS	MR	MRMS	Lr1, Lr37		Sr9b, Sr38			Yr17
Hydra	SVS	MRMS	MR#	MS	MS	Lr13		Sr8a, Sr30	Sr2		
Impala	SVS	S	RMR	MR	MR	Lr37	Lr34	Sr12, Sr38	Sr57	Yr17	Yr18
Impose CL Plus	S	MS	MRMS	RMR	VS	Lr3a, Lr13, Lr20, Lr37		Sr8a, Sr15, Sr38			Yr17
Impress CL Plus	R	R	MR	MSS	MSS	Lr24		Sr24	Sr2		
Jade	MSS	R	MS	RMR	RMR	Lr13		Sr8a, Sr30	Sr2		
Janz	MRMS	MRMS	RMR	MS	MS	Lr24	Lr34	Sr24	Sr57		Yr18
Justica CL Plus	S	MS	MR	RMR	MS	Lr1, Lr37		Sr8a, Sr38			Yr17
Kennedy	MR	MR	MR	MS	MS	Lr23, Lr46		Sr30	Sr2, Sr58	Yr7	Yr29
Kiora	MRMS	RMR	RMR	RMR	RMR		Lr34, Lr46	Sr30	Sr57, Sr58	Yr4	Yr18, Yr29
Kord CL Plus	MS	MRMS	MR	MR	MRMS	Lr1, Lr37		Sr8a, Sr38			Yr17
Lancer	RMR	RMR	R	MR	MR	Lr24	Lr34	Sr24, Sr36	Sr57		Yr18
Lang	MS	R	R	MS	MS	Lr24	Lr34	Sr24, Sr36	Sr57		Yr18
Lincoln	S	RMR	MR	RMR	RMR	Lr1, Lr13	Lr34	Sr30	Sr57	Yr4	Yr18
Livingston	MSS	R	MRMS	R	MRMS	Lr1, Lr13, Lr37	Lr34	Sr38	Sr2, Sr57	Yr17, Yr27	Yr18
Mace	MSS	MS	MR	RMR	SVS	Lr3a, Lr13, Lr20*, Lr37		Sr15, Sr38	Sr2		Yr17
Magenta	MRMS	R	RMR	MS	MS	Lr1, Lr24		Sr24			
Manning	MRMS	R	MR	RMR	RMR	Lr23, Lr26, Lr37		Sr31, Sr38			Yr9, Yr17+
Mansfield	MS	RMR	SVS	RMR	RMR				Sr2		
Merlin	MS	MS	MR	MR	MR	Lr1		Sr9g, Sr30			Yr7
Mitch	SVS	RMR	MRMS	RMR	RMR	Lr13, Lr27+Lr31		Sr8a, Sr30	Sr2		
Naparoo	S	R	RMR	R	R	Lr13, Lr24		Sr24			
Orion	R	R	MR	RMR	MSS	Lr20, Lr37		Sr15, Sr38			Yr17
Phantom	S	MR	MS	MR	MR			Sr8a, Sr30			
Preston	SVS	MRMS	SVS	RMR	RMR	Lr37		Sr38			Yr17
Scenario	MSS	R	MSS	RMR	RMR	Lr37		Sr38			Yr17
Scepter	MSS	MR	MR	MR	MSS	Lr13, Lr20, Lr37, Lr46		Sr38	Sr2, Sr58	Yr17	Yr29
Scout	MS	R	MR	RMR	MS	Lr37		Sr38			Yr17
Sentinel	R	R	RMR	RMR	RMR	Lr26	Lr34	Sr31	Sr2, Sr57		Yr18
SF Hekto	MSS	MRMS	MR#	RMR	RMR	Lr3a, Lr37+		Sr38	Sr2		Yr17
SF Ovalo	MSS	MSS	S	R	RMR	Lr13		Sr17			
Shield	R	R	RMR	RMR	MR	Lr24, Lr37	Lr34	Sr24, Sr38	Sr57	Yr17	Yr18
Spitfire	S	MS	MR	MR	MR	Lr1	Lr46	Sr30	Sr2, Sr58		Yr29
SQP Revenue	SVS	R	RMR	R	R	Lr13, Lr37+		Sr38+			Yr17
Steel	MRMS	MR	MSS	RMR	RMR	Lr37	Lr34	Sr38	Sr57	Yr17	Yr18
Sunguard	MR	R	R	MR	MR	Lr24+	Lr34	Sr24+	Sr57		Yr18
Sunlamb	MRMS	R	R	MR	MRMS	Lr37, Lr27+Lr31		Sr38+	Sr2		Yr17

	Rust Response					Rust Resistance Genotypes					
	Leaf Rust		Stem Rust	Stripe Rust		Leaf rust		Stem Rust		Stripe Rust	
	Eastern States	WA ^A		WA	Yr17+27+	ASR	APR	ASR	APR	ASR	APR
Sunmate	MS	R	MRMS	R	MRMS	Lr1, Lr37, Lr27+Lr31		Sr30, Sr38	Sr2	Yr17, Yr27	
Suntime	MS	RMR	R	RMR	RMR	Lr1, Lr37, Lr27+Lr31?		Sr8a, Sr30, Sr38	Sr2	Yr17	
Suntop	MRMS	R	MR	MR	MRMS	Lr1, Lr27+Lr31, Lr37		Sr30, Sr38	Sr2	Yr17, Yr27	Yr31
Sunvale	S	MRMS	RMR	MR	MR	Lr37	Lr34	Sr36, Sr38	Sr57	Yr17	Yr18
Sunzell	MS	R	MR	RMR	MS	Lr1, Lr13, Lr37	Lr46	Sr30, Sr38	Sr2, Sr58	Yr17	Yr29
Supreme	RMR	RMR	RMR	MR	SVS	Lr24, Lr37		Sr24, Sr38	Sr2	Yr17	
Tenfour	MSS	MS	S	MRMS	SVS	Lr37		Sr30, Sr38	Sr2	Yr17	
Trojan	MRMS	MR	MRMS	MR	MR	Lr3a or Lr23, Lr27+Lr31		Sr30	Sr2		
Ventura	MSS	R	RMR	R	MSS	Lr13, Lr37		Sr38	Sr2	Yr17	
Viking	MSS	MSS	MRMS	RMR	RMR	Lr13	Lr34	Sr17, Sr30	Sr57	Yr4	Yr18
Waagan	S	MRMS	MSS	RMR	S	Lr3a	Lr34	Sr30	Sr57	Yr27	Yr18
Wallup	SVS	MSS	MRMS	MRMS	MRMS	Lr13, Lr20, Lr27+ Lr31?		Sr8a, Sr15, Sr30	Sr2		
Wyalkatchem	SVS	MSS	MS	S	S	Lr3a, Lr13, Lr20	Lr46*	Sr8a*, Sr15	Sr2, Sr58*		Yr29*
Yitpi	S	MSS	S	MRMS	MRMS			Sr30?			
Zen	S	RMR	S	MRMS	MRMS	Lr13, Lr20		Sr8a, Sr15	Sr2		

- # indicates the variety may be more susceptible to alternate pathotypes, e.g. when the reaction to a new or rare pathotype is unknown
- ^ indicates the presence of a low proportion of susceptible off types
- + indicates the presence of an uncharacterised resistance gene as well as the known genotype
- * indicates a mixed (heterogeneous) response to the disease or for the presence of a resistance gene
- ^A It is not clear how the introduction of pathotype 104-1,3,4,6,7,8,10,12+Lr37 to Western Australia in 2015 will affect the consensus ratings for leaf rust responses in Western Australia. Readers are advised to treat these ratings with caution
- ^P indicates a provisional rating that requires further testing to validate

Table 3 Disease response of Australian durum varieties to the three rust diseases

	Rust Response				
	Leaf Rust		Stem Rust	Stripe Rust	
	Eastern States	WA		WA	Yr17+27+
Caparoi	RMR	R	R	MR	MR
DBA Aurora	R	RMR	R#	RMR	RMR
EGA Bellaroi	RMR	RMR	MR	MR	MR
Hyperno	R	RMR	RMR	MR	MR
Jandaroi	RMR	MR	MR	MR	MR
Penne	R	RMR	MR	MR	MR
Rotini	R	RMR	RMR	MR	MR
Tjilkuri	R	RMR	MR	MR	MR
WID802	R	RMR	RMR	MR	MR
Yawa	R	MR	RMR	MR	MR

- # indicates the variety may be more susceptible to alternate pathotypes, e.g. when the reaction to a new or rare pathotype is unknown

Table 4 Disease response of Australian triticale varieties to the three rust diseases

	Rust Response				
	Leaf Rust		Stem Rust	Stripe Rust	
	Eastern States	WA		WA	Yr17+27+
Astute	RMR	RMR	RMR	RMR	RMR
Berkshire	R	RMR	R	MRMS	MRMS
Bison	RMR	RMR	RMR	R	R
Canobolas	R	RMR	R	MRMS	MRMS
Cartwheel	R	R	R	R	R
Chopper	R	R	MR	MRMS	MRMS
Endeavour	R	R	R	RMR	RMR
Fusion	R	R	R	RMR	RMR
Goanna	R	R	R	RMR	RMR
KM10	MRMS	MRMS	R	R	R
Rufus	R	R	R	MRMS	MRMS
Tahara	R	R	R	MRMS	MRMS
Tobruk	R	R	R	MR	MR
Tuckerbox	R	R	MR	MR	MR
Yowie	R	R	R	MR	MR

Table 5 Disease response and disease resistance genotypes of Australian barley varieties to leaf and stem rust diseases

	Rust Response			Rust Resistance Genotypes			
	Leaf Rust	Stem Rust	Barley Grass Stripe Rust	Leaf rust		Stem Rust	
				ASR	APR ^A	ASR ^B	APR
Alestar	RMR	S	RMR ^P	<i>Rph3+</i>	<i>Rph20</i>		
Barque	MSS	S	RMR	<i>Rph19?</i>	<i>Rph20</i>	-	
Bass	VS	SVS	RMR	<i>Rph3</i>		-	
Baudin	VS	S	MR	<i>Rph12</i>	-	-	
Binalong	SVS	SVS	RMR	<i>Rph2+</i>	-		
Buloke	S	SVS	MR	Nil	-	-	
Capstan	S	SVS	MRMS	<i>Rph19</i>	<i>Rph20</i>	-	
Charger	RMR	VS	RMR	<i>Rph3</i>	<i>Rph20</i>		
Commander	S	S	RMR	<i>Rph19+</i>	-	-	
Compass	S	S	RMR	<i>Rph3</i>	-		
Dash	RMR	MSS	RMR	<i>Rph12+</i>	<i>Rph20</i>		
Fairview	S/MR	SVS	RMR	<i>Rph3</i>	-	-	
Fathom	MS	SVS	MR	<i>Rph?</i>	<i>Rph20</i>	-	
Finniss	MS	S	MR/VS	<i>Rph3</i>	<i>Rph20</i>	-	
Fitzroy	SVS/MR	MS	MRMS	<i>Rph3</i>	-	-	
Flagship	MSS	SVS	MR	Nil	<i>Rph20</i>	-	
Fleet	MRMS	S	MR		<i>Rph20</i>	-	
Flinders	MRMS	S	MR	<i>Rph12+</i>	<i>Rph20</i>	-	
Gairdner	S	S	MR	<i>Rph12</i>	<i>Rph23</i>	-	
GrangeR	MR	MSS	MR	<i>Rph3+</i>	<i>Rph20</i>	-	
Grimmett	S	MSS	MR	<i>Rph4</i>	-	-	
Grout	VS	S	MR	<i>Rph2</i>	-	-	
Hamelin	SVS	MRMS	MR	<i>Rph9.am</i>	-	-	
Hannan	SVS	S	MR	<i>Rph9.am?</i>	-	-	
Henley	MR	MSS	MR	<i>Rph3</i>	<i>Rph20</i>	-	
Hindmarsh	MSS	MSS	MRMS	<i>Rph9.am+</i>	-	-	
Keel	VS	MS	MRMS	<i>Rph19?</i>	-	-	
La Trobe	MRMS	MSS	MR	<i>Rph9.am</i>	-		
Litmus	S	MSS	RMR ^P	Nil	-		

	Rust Response			Rust Resistance Genotypes			
	Leaf Rust	Stem Rust	Barley Grass Stripe Rust	Leaf rust		Stem Rust	
				ASR	APR ^A	ASR ^B	APR
Lockyer	S	SVS	MRMS	<i>RphFT</i>	-	-	
Mackay	MRMS	S	MR	Nil	<i>Rph20</i>	-	
Macquarie	S	MSS	MR	<i>Rph2</i>	<i>Rph23</i>	-	
Maltstar	RMR	MSS	RMR ^P	<i>Rph3</i>	<i>Rph20</i>		
Maritime	S	SVS	MSS	<i>Rph12</i>	-	-	
Mundah	SVS	MSS	MR	<i>Rph2</i>	-	-	
Navigator	VS	SVS	MR	Nil	-	-	
Oxford	MR	S	R/S*	<i>Rph3</i>	<i>Rph20</i>	-	
Roe	SVS	MSS	MR	<i>Rph?</i>	-	-	
Schooner	SVS	S	MR	<i>Rph19</i>	-	-	
Scope	SVS	S	MR	Nil	-		
Shepherd	MR	S	MR	Nil	<i>Rph20</i>		
Skipper	SVS	MSS	RMR	Nil	-		
Sloop SA	SVS	S	RMR	<i>Rph19</i>			
Stirling	SVS	MSS	MRMS	<i>Rph9.am</i>	-		
SY Rattler	RMR	SVS	MR	<i>Rph?</i>	<i>Rph20</i>		
Tilga	S	S	MR	<i>Rph9.am</i>	-	-	
Tulla	S	SVS	MR	<i>Rph19</i>	-	-	
Urambie	S	S	R	Nil	-		
Vlamingh	SVS	MR	R	Nil	-	<i>Rpg1</i>	
Westminster	RMR	SVS	R	<i>Rph2</i>	<i>Rph20</i>		
Wimmera	MRMS/S	S	RMR	<i>Rph3</i>	<i>Rph23</i>		
Yagan	SVS	MSS	MRMS	<i>RphFT</i>	-	-	
Yambla	S	MSS	RMR	<i>Rph19</i>	-	-	
Yarra	MR/S	SVS	MRMS	<i>Rph3</i>	-	-	

^A Adult plant resistance to leaf rust as determined by marker screens with *bPb-0837* (*Rph20*) and *Ebmac0603* (*Rph23*)

^B Seedling resistance to stem rust determined by marker screens for *Rpg1* and *Rpg5*

^P indicates a provisional rating that requires further testing to validate

* indicates a mixed (heterogeneous) response to the disease or for the presence of a resistance gene

+ indicates the presence of an uncharacterised resistance gene as well as the known genotype

- indicates a negative result for a marker. Please note this does not preclude the possibility of uncharacterised ASR or APR in a given variety. A blank cell indicates the variety was not marker assayed.

Table 6 Disease resistance genotypes of Australian oat varieties to crown and stem rust diseases

	Rust Resistance Genotypes			
	Crown rust		Stem Rust	
	ASR	APR	ASR	APR
Aladdin	<i>Pc50, Pc91</i>			
Barcoo	<i>Pc39, Pc61, PcBett</i>		<i>Pga</i>	
Bimbil	<i>Pc58+</i>		Nil	
Blackbutt	<i>Pc1</i>		<i>Pg2+</i>	
Carrolup	<i>PcMortlock+</i>			
Comet	<i>Pc+</i>			
Cooba	<i>Pc45?</i>		<i>Pg2+</i>	
Coolabah	<i>Pc?</i>		Nil	
Culgoa II	<i>PcMortlock+ PcCulgoa</i>		<i>Pga</i>	
Drover	<i>Pc91</i>			
Echidna	<i>Pc?</i>		<i>Pg2+</i>	
Enterprise	<i>Pc39 or Pc55</i>			
Eurabbie	<i>PcDalyup</i>			
Genie	<i>Pc61</i>			
Glider	<i>Pc58 or Pc59?</i>		<i>Pg1, Pg2</i>	
Graza 50	<i>Pc38+PcCulgoa?</i>			
Graza 68	<i>Pc68</i>			
Graza 70	<i>Pc38, Pc39</i>			
Gwydir	<i>Pc56</i>			
Moola	<i>Pc68</i>		<i>Pg1, Pg2</i>	
Mortlock	<i>PcMortlock</i>		<i>Pg1, Pg2</i>	
Nile	<i>Pc1</i>		<i>Pg2</i>	
Numbat	<i>PcDolphin</i>		<i>Pg2+</i>	
Potoroo	<i>PcDolphin</i>		<i>Pg2+</i>	
Quamby	<i>PcDolphin</i>			
Quoll	<i>Pc61</i>		<i>Pga</i>	
Saia	<i>Pc15, Pc16, Pc17</i>		<i>PgSa</i>	
Taipan	<i>PcNugene+</i>		<i>Pga?</i>	
Volta	<i>Pc50, Pc68</i>			
Wallaroo	<i>Pc1</i>			
Warrego	<i>Pc61+</i>			
Yallara	<i>Pc38+</i>			
Yarran	<i>PcDolphin</i>		<i>Pg2</i>	

+ indicates the presence of an uncharacterised resistance gene as well as the known genotype

GENERAL ENQUIRIES

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RUSTED PLANT SAMPLES

can be mailed in paper envelopes;
do not use plastic wrapping or plastic
lined packages. If possible, include
the latitude and longitude of the
sample location.

Direct samples to:
University of Sydney
Australian Rust Survey
Reply Paid 88076
Narellan NSW 2567

The Australian Cereal Rust Control Program is supported by growers through the Grains Research & Development Corporation.

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