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Stripe Rust Responses of Australian Wheat and Triticale Varieties, 2010

Colin Wellings

The University of Sydney, Plant Breeding Institute
[Email: colinw@camden.usyd.edu.au](mailto:colinw@camden.usyd.edu.au), Phone: 02-9351 8826
(on secondment from Industry & Investment NSW)

A revision of expected stripe rust responses for Australian wheat and triticale varieties recommended for sowing in 2010 is included with this report. The annual revision is based on data collected in the 2009 season, assessment of this data against previous responses and the inclusion of newly released varieties. The responses of certain varieties have been adjusted, but a majority of varieties remain unchanged. Although the 'Jackie Yr27' pathotype was not recovered in 2009, varieties carrying this resistance were tested in isolated field plots and the expected responses are noted in this report.

Despite varying climatic conditions exerting a strong influence on crop growth and yield in 2009, there was significant wheat stripe rust development across most of eastern Australia and this provided opportunities to gather comparative disease data from trial sites and experimental fields. Data was sent for collation to NVT prior to calling a teleconference of state cereal plant pathologists. The meeting was attended by Peter Wilkinson (Queensland), Andrew Milgate and Steven Simpfendorfer (NSW), Grant Hollaway (Victoria), Hugh Wallwork (South Australia), Manisha Shankar (Western Australia) and Harbans Bariana and Colin Wellings (Plant Breeding Institute). The varietal response classifications, and the data used for these decisions, were circulated to breeding companies for comment; disputed results were then resolved through a process of revision and consultation.

Response descriptions for stripe rust are detailed in **Table 1**. The expected responses of bread wheat, durum wheat and triticale varieties to the two major stripe rust pathotypes is presented in **Table 2**, together with the stripe rust resistance genes where known. Among the 129 wheats reviewed 21 were adjusted by a margin of one rank to a more susceptible response, two were adjusted by one rank to a more resistant response and cultivar Mace was moved from MS-S to S-VS to the 'WA Yr17' pathotype. Triticales were generally more affected by change in response with 16 of the 21 varieties moving up to a more susceptible response. Susceptible responses to head infection in Tobruk and Crackerjack were noted.

Although the 'Jackie Yr27' pathotype was not recorded in 2009, isolated fields at PBI Cobbitty were inoculated with this pathotype and the responses of

wheats carrying Yr27 were observed. The responses of these wheats are presented in **Table 3**.

The outcomes of this process represents a concerted effort to reach national agreement on expected responses of Australian wheat and triticale varieties to significant stripe rust pathotypes. However, there may be response variations at the local level which can be difficult to reconcile with an agreed rating. In cases where data is limited, the rating is noted as preliminary. In other situations, further evidence of pathogen change will need to be gathered and documented to support unexpected differences in variety response. In addition, the influence of micro-climate, crop management and time of disease onset may all play a role in variable disease responses.

Notes on stripe rust resistance genes:

- Yr4: this gene provides good protection to the current WA group of pathotypes, but is vulnerable to the older pathotypes that are now rarely isolated.
- YrA, Yr6, Yr7, Yr9: these genes do not provide protection to the 'WA' group of pathotypes. However, they will have varying effectiveness to older pathotypes.
- Yr17: present in a great range of varieties, and initially released because of good resistance to the 'WA' pathotype. The gene is overcome by the 'WA

Yr17' pathotype leaving varying levels of resistance in Yr17 varieties when challenged with this pathotype.

- Yr18: this gene operates at the adult plant stage and on its own may not be effective in providing resistance. However it combines well with other genes and should assist in providing protection.
- Yr27: present in a limited number of wheats and providing good protection to current pathotypes. Several isolates of the 'Jackie Yr27' pathotype were detected in 2008 and some Yr27 varieties can be expected to be vulnerable to this pathotype (see **Table 3**).
- Yr30: is an adult plant gene that provides minor protection but expected to be useful when combined with other resistances.

Acknowledgements: Grant Hollaway assumed responsibilities in 2009 to collect and distribute sets of Australian wheat cultivars for assessment under the NVT testing agreement, and then arranged data collation and the teleconference meeting. Neale Sutton provided support and communications for the NVT pathology website.

Table 1. Response descriptors for stripe rust of wheat

	Description
VR	highly resistant: no visible symptoms
R	highly resistant: occasional symptoms of infection including necrotic flecks and small stripes without sporulation
R-MR	resistant: symptoms evident and may include stripes with necrosis and chlorosis, limited sporulation, and affected leaf area up to 15%
MR	moderately resistant: sporulating areas arranged in stripes, some chlorosis and necrosis, and affected leaf area up to 30%
MR-MS	intermediate: sporulating areas arranged in stripes with some chlorosis, and affected leaf area up to 50%
MS	moderately susceptible: sporulating stripes and affected leaf area up to 70%
MS-S	moderately susceptible to susceptible: sporulating stripes merging into broader leaf areas supporting symptoms; chlorosis and necrosis evident; leaf area affected up to 90%
S	susceptible: sporulation across the whole leaf surface with no stripes but with evidence of chlorotic and necrotic areas
S-VS	Susceptible to very susceptible: abundant sporulation across the leaf surface with some chlorosis
VS	highly susceptible: abundant sporulation across the whole leaf area with no evidence of chlorosis or stripes

Table 2. Response of bread wheat, durum wheat and triticale varieties to pathotypes of wheat stripe rust in Australia

Variety	'Jackie' Pathotype (134 E16 A+ J+)	'WA Yr17' Pathotype (134 E16 A+ 17+)	Resistance Genes
Bread Wheats			
AGT Scythe	MS-S	MS-S	YrA
Amarok	R	MR-MS	Yr17
Annuello	MS-S	MS-S	Yr7, Yr18
Arrino	S	S	
Axe	R-MR	R-MR	
Babbler	MS-S	MS-S	Yr18
Barham	R	MS-S	Yr17, Yr18
Baxter	MS	MS	Yr18, Yr30
Beaufort	R	R-MR	
Binnu	R	MS	Yr17
Bolac	R-MR	R-MR	Yr4
Bowerbird	S	S	Yr7, Yr30
Bowie	R	S	Yr17
Bullaring	MR-MS	MR-MS	
Bullet	MS-S	MS-S	Yr7, Yr18
Bumper	MS	MS	
Calingiri	S	S	
Camm	R	MS-S	Yr17
Carinya	R	MR-MS	Yr17, Yr18
Carnamah	S	S	Yr30
Cascades	VS	VS	
Catalina	MS	MS	Yr18
Chara	MS-S	MS-S	Yr18
Clearfield Jnz	MS-S	MS-S	Yr18
Clearfield Stl	MS-S	MS-S	
Correll	MR-MS	MR-MS	
Crusader	R	MR-MS	Yr17, Yr18, Yr30
Cunningham	MS	MS	Yr18
Currawong	MR-MS	MR-MS	Yr18, Yr30
Dakota	MR-MS	MR-MS	Yr18
Datatine	MS-S	MS-S	Yr30
Derrimut	R	MS	Yr17, Yr18, Yr30
Diamondbird	MS	MS	Yr7, Yr30
Drysdale	MS	MS	Yr7, Yr30
EGA 2248	MS-S	MS-S	
EGA Bonnie Rock	VS	VS	
EGA Bounty	MR	MR	Yr30
EGA Burke	MS	MS	Yr7, Yr18, Yr30
EGA Eagle Rock	MS	MS	
EGA Eaglehawk	R	MR-MS	Yr17, Yr30
EGA Gregory	MR	MR	Yr18, Yr33
EGA Hume	MR-MS	MR-MS	Yr18
EGA Jitarning	MS-S	MS-S	
EGA Kidman	MR-MS	MR-MS	Yr18, Yr30
EGA Stampede	MR	MR	Yr18, Yr30
EGA Wedgetail	MR-MS	MR-MS	Yr7, Yr18
EGA Wentworth	MS	MS	Yr18, Yr30
EGA Wills	MR-MS	MR-MS	Yr18, Yr30
EGA Wylie	MR-MS	MR-MS	Yr18, Yr30
Ellison	R	MR-MS	Yr17, Yr30
Endure	R-MR	S	Yr17
Eradu	S ^a	S ^a	
Espada	R	MR-MS	Yr17
Excalibur	S-VS	S-VS	
Fang	R	MS-S	Yr17
Fortune	MS	MS	
Frame	MR-MS	MR-MS	
Frelon	R	R	
Gascoigne	R-MR	R-MR	

Variety	'Jackie' Pathotype (134 E16 A+ J+)	'WA Yr17' Pathotype (134 E16 A+ 17+)	Resistance Genes
Bread Wheats			
GBA Ruby	R-MR	R-MR	Yr27
Giles	MS	MS	Yr18
Gladius	R	MR-MS	Yr17
Guardian	MS	MS	
H45	VS	VS	Yr7
H46	MS	VS	Yr17
Hartog	MS	MS	Yr6, Yr7, Yr30
Hornet	R	MS	Yr17, Yr18
Janz	MS	MS	Yr18
Kellalac	MR-MS	MR-MS	YrA
Kennedy	MS	MS	Yr7, Yr30
Krichauff	S-VS	S-VS	
Kukri	MR-MS	MR-MS	Yr7, Yr30
Lang	MS	MS	Yr18
Leichhardt	MS	MS	Yr30
Lincoln	R-MR	R-MR	Yr4, Yr18
Livingston	R	R-MR	Yr17, Yr18, Yr27, Yr30
Mace	R	S-VS	Yr17
Machete	MS-S	MS-S	Yr30
Magenta	MS	MS	
Marombi	R-MR	MS	Yr17
Merinda	R-MR	R-MR	Yr18, Yr27, Yr30
Mitre	MS-S	MS-S	Yr18
Naparoo	R	R	
Peake	MR-MS	MR-MS	Yr6, Yr18, Yr30
Petrie	MS	MS	Yr18
Preston	R-MR	R-MR	
Pugsley	R	S	Yr17, Yr30
QAL2000	R	VS	Yr17
Rees	MS-S	MS-S	Yr7, Yr30
Rosella	MR-MS	MR-MS	Yr18
Sentinel	R-MR	R-MR	Yr9, Yr30
Snipe	MS	MS	Yr18
Strzelecki	MR	MR	Yr33, Yr18
Sunbri	R	MR	Yr17, Yr18
Sunbrook	MR-MS	MR-MS	Yr30
Sunco	MR-MS	MR-MS	Yr18
Sunlin	R	MR	
Sunsoft 98	MS-S	MS-S	Yr18, Yr30
Sunstate	R	MS	Yr17, Yr30
Sunvale	R	MR	Yr17, Yr18
Sunvex	R	MR	Yr17
Sunzell	R-MR	MR-MS	Yr17, Yr30
Thornbill	MS-S	MS-S	Yr18
Ventura	R	MS	Yr17, Yr30
Waagan	MR	MR	Yr27
Westonia	VS	VS	
Whistler	MS-S	MS-S	Yr18
Wyalkatchem	S	S	Yr30
Wylah	MS	MS	Yr18
Yandanooka	S	S	
Yenda	R	S	Yr17
Yitpi	MR-MS	MR-MS	
Young	MR	MS	Yr17, Yr18
Zebu	R-MR	R-MR	Yr9, Yr27
Zippy	MS-S	MS-S	

Variety	'Jackie' Pathotype (134 E16 A+ J+)	'WA Yr17' Pathotype (134 E16 A+ 17+)	Resistance Genes
Durum Wheats			
Arrivato	R-MR	R-MR	
Caparoi	R-MR	R-MR	
EGA Bellaroi	MR	MR	
Hyperno	MR	MR	
Jandaroi	MR	MR	
Kalka	MR	MR	
Saintly	MR	MR	
Tamaroi	MR	MR	Yr6
Wollaroi	MR	MR	Yr6
Yallaroi	MR	MR	Yr6
Zulu	MR	MR	
Triticale			
Abacus	MS	MR	Yr9, YrJ
Bogong	MR-MS	MR	
Breakwell	S-VS	MR	Yr9, YrJ
Canobolas	MS-S	MR	
Crackerjack	R-MR ^b	MR	Yr9, YrJ
Credit	S-VS	MR	Yr9, YrJ
Endeavour	R	MR	
Hawkeye	MR (MS) ^c	MR	Yr9, YrJ
Jackie	VS	MR	Yr9, YrJ
Jaywick	MR (MS) ^c	MR	Yr9, YrJ
Kosciuszko	S-VS	MR	Yr9, YrJ
Rufus	MR-MS	MR	Yr9
Speedee	S-VS	MR	Yr9, YrJ
Tahara	MS	MR	Yr9
Tickit	MS	MR	Yr9
Tobruk	MR-MS ^b	MR	Yr9, YrJ
Tuckerbox	MR	MR	
Yukuri	R-MR	MR	Yr9, YrJ

Footnotes:

^a based on a small data set^b susceptible to head infection^c some plants have a higher response noted in brackets**Table 3.** Responses of wheats carrying Yr27 to the 'Jackie Yr27' pathotype.

Variety	'Jackie' Pathotype (134 E16 A+ J+)	'Jackie Yr27' Pathotype (134 E16 A+ J+ 27+)
GBA Hunter	R-MR	MR-MS
GBA Ruby	R-MR	S
Livingston	R	R
Merinda	R-MR	MR-MS
Mira	MR	MS-S
Waagan	MR	MS-S

General enquiries:

Plant Breeding Institute
Private Bag 4011
Narellan NSW 2567

107 Cobbitty Road
Cobbitty NSW 2570
Ph: 02-9351 8800 (Reception)
Fax: 02-9351 8875

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Australian Cereal Rust Survey
Plant Breeding Institute
Private Bag 4011, Narellan NSW 2567

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