

# SOUTHERN AUSTRALIA

## FOCUS

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### THE RESEARCH VIEW

## How did wheat and triticale varieties handle stripe rust last season?

By Colin Wellings<sup>1</sup>

The Plant Breeding Institute Cereal Rust Laboratory has coordinated a comprehensive review of responses in Australian wheat and triticale varieties to significant stripe rust pathogens during season 2009. The review included input from all states in the broadacre cropping zone and is a concerted effort to reach national agreement on resistance ratings.

In total, 129 wheats were reviewed and the resistance rankings of 24 varieties were adjusted and 21 triticale varieties were reviewed, with 16 varieties changing to a more susceptible response.

#### ANNUAL REVIEW

The annual revision of expected stripe rust responses for Australian wheat and triticale varieties 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 some varieties have been adjusted, but a majority of varieties remain unchanged.

Although the 'Jackie Yr27' pathotype was not recorded<sup>1</sup> 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. The varietal response classifications, and the data used for these decisions, were made in conjunction with pathologists from around Australia and were also circulated to breeding companies for comment.

Any results which were disputed were resolved through a process of revision and consultation.

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**WHAT'S CHANGED?**

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.

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.

Triticales were generally more affected by change in response with 16 of the 21 varieties moving to a more susceptible response. Susceptible responses to head

**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 per cent
MR	Moderately resistant – sporulating areas arranged in stripes, some chlorosis and necrosis, and affected leaf area up to 30 per cent
MR-MS	Intermediate – sporulating areas arranged in stripes with some chlorosis, and affected leaf area up to 50 per cent
MS	Moderately susceptible – sporulating stripes and affected leaf area up to 70 per cent
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 per cent
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

infection in Tobruk and Crackerjack were noted.

While the aim has been to develop a national consensus on stripe rust resistance, there may be response variations at the

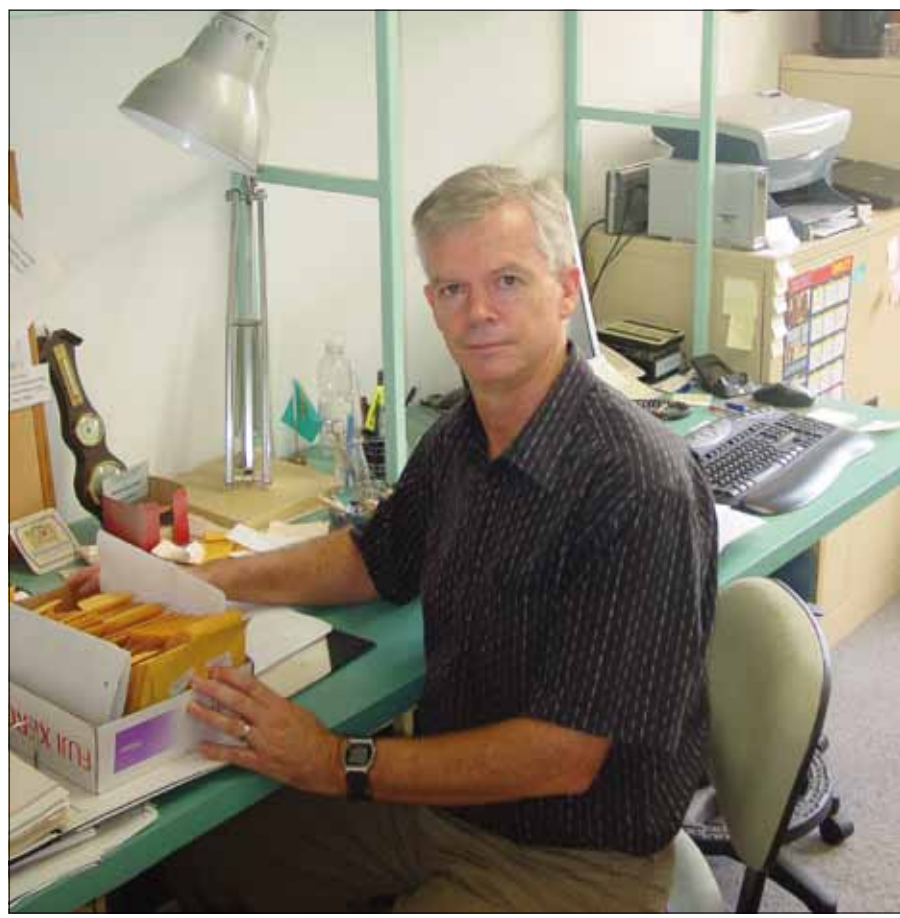
local level which can be difficult to reconcile with an agreed rating. In cases where data is limited, the rating is noted as preliminary.

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.

**Stripe rust resistance genes include:**

- Yr4 – 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 and Yr9 – do not provide protection to the WA group of pathotypes. But they will have varying effectiveness to older pathotypes.
- Yr17 – present in a wide 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 – operates at the adult plant stage and on its own may not be effective in providing resistance. But it combines well with other genes and should assist in providing protection.
- Yr27 – present in a limited number of wheats and providing good protection

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Col Wellings from the University of Sydney PBI Cereal Rust Laboratory.

**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
<b>BREAD WHEATS</b>			
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	
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

Variety	'Jackie' Pathotype (134 E16 A+ J+)	'WA Yr17' Pathotype (134 E16 A+ 17+)	Resistance Genes
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	
<b>DURUM WHEATS</b>			
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	
<b>TRITICALE</b>			
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

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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.

**The University of Sydney, Plant Breeding Institute Cereal Rust Laboratory, Phone: 02 9351 8826 E: colinw@camden.usyd.edu.au**

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**General enquiries:** Plant Breeding Institute, Private Bag 4011, Narellan NSW 2567. Phone: 02 9351 8800 (Reception) Fax: 02 9351 8875.

**Rusted plant samples can be mailed in paper envelopes, do not use plastic wrapping or plastic lined packages. Samples can be sent to Australian Cereal Rust Survey, Plant Breeding Institute, Private Bag 4011, Narellan NSW. ■**

**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



**Stripe rust in wheat.**

## THE CONSULTANT'S VIEW

### EARLY MONITORING CROPS FOR STRIPE RUST VITAL IN 2010

Industry & Investment NSW cereals specialist Frank McRae says changes in stripe rust resistance ratings for triticale will require stringent management practices during season 2010 to limit spread of the disease. With 16 of 21 triticale varieties now recognised to be more susceptible to stripe rust, he says most triticales – even grazing varieties – will need close monitoring during the growing season.

Frank says the implications of increased susceptibility could mean an increase in the spread of rust from triticale to wheat, particularly popular early sown wheats, since few have seedling stripe rust resistance.

While stripe rust is the easiest of rusts to manage, new triticale varieties like Berkshire and Canobolas are likely to cause problems because they were previously thought to be resistant. The dual purpose variety Tobruk is also likely to cause problems.

#### Management package

Frank says to ensure stripe rust remains in check during 2010, a comprehensive management package will need to be adopted by growers including:

- Use of fungicidal seed and fertiliser treatments where possible to limit likelihood of stripe rust infestation. But the effectiveness of seed and fertiliser treatments will be reduced if stripe rust appears later in the season.
- Application of early foliar sprays where necessary or when early or post-emergent herbicides are being applied. With the reduced costs of foliar fungicides, this option may be more appealing than in previous seasons.

- Be proactive from the start of the season. Growers need to be more aware of the likely responses of varieties as they are sowing. Monitoring and observation of crops is vital if seed and fertiliser treatments have not been used, and they are relying totally on foliar fungicide applications.
- Growers must be prepared to spray early rather than later if they have susceptible varieties.

Frank says with variety trials across Australia, it is possible to spot rust infestations early and the Plant Breeding Institute is able to give good early warning signals that growers may need to watch various varieties.

Because of high summer rainfall across the southern cropping region growers should concentrate on controlling the 'green bridge'. The green bridge allows pathotypes to survive over summer, increasing chances of early season infections.

"If we continue to get more summer rain, we will continue to have problems because some leftover grain from harvest is germinating in stubbles," Frank says. "There will be increased capacity for the green bridge to keep disease inoculum going over summer."

"Growers need to be managing their fallows and stubbles not only for weed control, moisture and nitrogen conservation but also controlling self sown cereal that can carry the disease forward."

"It would be good to have favourable seasonal conditions this coming year so growers can go out and effectively manage rust and see the results in increased yields."