



# Cereal Rust Report

Season 2010

VOLUME 8 ISSUE 8  
30 November 2010

---

## Cereal Rust Situation Update, Late Spring 2010

ROBERT PARK and COLIN WELLINGS

The University of Sydney, Plant Breeding Institute,

Email: robert.park@sydney.edu.au, Phone: 02-9351 8806

colin.wellings@sydney.edu.au, Phone: 02-9351 8826 (on secondment from Industry & Investment NSW)

The unusually mild and wet season in eastern Australia has resulted in an increased incidence of all cereal rust diseases in 2010. This has meant that many samples have been received by the Cereal Rust Laboratory for pathotype analyses and we thank all collaborators for sending in specimens. As the wet weather pattern is likely to continue, it will be important to monitor rust pathogens over the summer period so that the industry is well placed to respond to any potential early rust developments in 2011.

Pathotyping of the samples received is continuing. No new pathotypes of the pathogens causing wheat stem rust, wheat leaf rust, barley leaf rust, or oat stem rust have been detected to date and hence cultivar responses are not expected to change. A new pathotype of the wheat stripe rust pathogen and one of the oat crown rust pathogen detected in 2010 will have an impact on some cultivars (see below).

A major concern at present is the common occurrence of wheat stem rust in South Australia and Victoria, with the immediate concern being long season wheats in the Western Districts, and looking towards 2011, the potential for significant over-seasoning should the coming summer be wet.

### Wheat Stem Rust

Twenty nine of the 54 samples received from eastern Australia to date have been processed and were found to comprise a single pathotype, 34-1,2,7 +Sr38, the "VPM" pathotype. Derived from pathotype 34-1,2,7 via acquisition of virulence for Sr38, this pathotype was first detected in WA in 2001, and presumably spread to eastern Australia, where it was first detected at Arno Bay (SA) in November 2003. It has now been detected in all Australian states.

Of particular note is a stem rust sample received from South Australia from a crop suspected to be Kite, which carries the resistance gene Sr26. The pathotype present was shown clearly to be avirulent for Sr26.

### *Notes on Cultivars Carrying Genes for Stem Rust Resistance*

The following information is included from our last pathogenicity survey report (available for downloading at [http://sydney.edu.au/agriculture/plant\\_breeding\\_institute/cereal\\_rust/reports\\_forms.shtml](http://sydney.edu.au/agriculture/plant_breeding_institute/cereal_rust/reports_forms.shtml)).

The stem rust responses of wheat cultivars are not expected to change from those of 2009. Cultivars carrying the following resistance genes are resistant to all pathotypes detected to date:

Sr24 Annuello, Babbler, Carinya, Catalina, Clearfield JNZ, Cunningham, Dakota, Datatine, EGA Bullaring, EGA Burke, EGA Eagle Rock, EGA Jaegar, EGA Jitarning, EGA Wentworth, EGA Wills, GBA Combat, GBA Sapphire, Giles, Gladius, Guardian, Janz, Krichauff, Lang, Mira, Mitre, Naparoo, Pardalote, Petrie, QAL2000, QALBis, Sunco, Sunsoft 98, Yenda and Worrakatta

- Sr26* Blade, Chough, Currawong, Darter, Petrel, Snipe, Sunlin, and Wylah
- Sr30* 1. Close monitoring required, significant rust may develop even with *Sr30*-avirulent isolates: Ajana, Arrino (heterogeneous), Kalgarin, Yitpi
2. Batavia, Brookton, Calingiri, Chara, Cunderdin, EGA Bonnie Rock, EGA Hume, EGA Wedgetail, Frame, H45, Kalannie, Katunga, Lark, Lorikeet, Osprey, Rosella, Silverstar, Sunfield, Sunmist.
- Sr31* GBA Hunter, Grebe, Tennant, Warbler and Zebu
- Sr33* Lorikeet
- Sr45* Thornbill

The gene *Sr2* confers adequate adult plant resistance and is present in the cultivars Baxter, Bowerbird, Braewood, Brennan, Carnamah, Crusader, Derrimut, Diamondbird, Drysdale, EGA Bounty, EGA Bullaring, EGA Burke, EGA Eaglehawk, EGA Kidman, EGA Wentworth, EGA Wylie, Ellison, Eradu, Hartog, Kennedy, Kukri, Leichardt, Livingston, Machete, Mackellar, Merinda, Peake, Rees, Sunbrook, Sunstate, Sunzell and Ventura. Cultivars with *Sr13* (AGT Scythe, Axe (?), Clearfield STL, Gascoine (?), Machete, Stiletto, Sunmist and Wialki) are moderately susceptible to resistant, depending upon the presence of additional resistance genes. Given that virulence for *Sr36* has not been detected since 1997, and since 1986 has only been detected on seven occasions, cultivars carrying this gene (Baxter (heterogeneous) and EGA Wylie) can be considered resistant but with some caution. Cultivars carrying the combination of *Sr36* with *Sr38* (Braewood, Ellison, Sunbri and Sunvale), *Sr24* (Lang, Sunco, Sunvale), or with *Sr30* (Young) are resistant to all known stem rust pathotypes.

## Wheat Leaf Rust

Five pathotypes of leaf rust have been identified from the 65 samples from eastern Australia processed to date. A further 32 samples are yet to be processed. The two dominant pathotypes identified are both virulent for the VPM resistance *Lr37* (*viz.* pt 104-1,2,3,(6),(7),11 +*Lr37* [35 isolates] and 76-3,5,7,9,10,12 +*Lr37* [34 isolates]). The three remaining pathotypes identified are 104-1,2,3,(6),(7),11 [13 isolates], 10-1,3,9,10,11,12 [5 isolates], and 76-1,3,5,9,10,12 [1 isolate]. Of particular note is the large increase in the frequency of pt 76-3,5,7,9,10 +*Lr37*. This pathotype was first isolated from Inverleigh (Vic) in late July 2006, and is regarded as having an exotic origin. Prior to 2010, it had remained at a low level but had been isolated from throughout Victoria, southern and northern NSW, South Australia and Tasmania. It is significant in that it combines virulence for several

common resistance genes, *Lr3a*, *Lr13*, *Lr14a*, *Lr17a*, *Lr26* and *Lr37*.

### Notes on Cultivars Carrying Genes for Leaf Rust Resistance

Cultivars with *Lr17a* (Baxter, heterogeneous; Perenjori; Teesdale) are considered resistant to all prevailing pathotypes, however, there is evidence from seedling tests that pt 76-3,5,7,9,10,12 +*Lr37* may be fully virulent for this gene.

Cultivars with *Lr13* in combination with *Lr1* (Batavia, Bowerbird, Cunderdin, Diamondbird, Glover, Hartog, Kukri, Leichardt, Lincoln, Sunbrook, Sunfield and Tailorbird) or *Lr2a* (Sunmist) could be vulnerable to pt 10-1,3,9,10,11,12. Cultivars with *Lr13* in combination with *Lr23* (EGA Hume, EGA Kidman, Kennedy, Strzelecki) or *Lr24* (GBA Combat, Giles, Gladius, Merinda, Naparoo, Petrie and Sunsoft 98) are resistant to all pathotypes isolated to date. Cultivars carrying *Lr13* and *Lr37* (Braewood, Derrimut, Ellison, H46, Rudd, Sunstate and Young) may be vulnerable to pt 76-3,5,7,9,10,12 +*Lr37*. The combination of *Lr13* and *Lr17b*, found in several winter wheats (Gordon, Mackellar, Paterson), and of *Lr14a*, *Lr13* and *Lr17b* (Declic) is ineffective in protecting against pts 10-1,3,9,10,11,12 and 76-3,5,7,9,10,12 +*Lr37*.

Cultivars with *Lr26* (GBA Hunter, Grebe, Tennant and Warbler) are at least seedling susceptible to pts 10-1,3,9,10,11,12 and 76-3,5,7,9,10,12 +*Lr37*. Field data from 2005 suggest that Tennant is rated "S" (susceptible) to pt 10-1,3,9,10,11,12. Mawson is seedling susceptible to pt 76-3,5,7,9,10,12 +*Lr37* but carries an unidentified seedling resistance gene that is effective against pt 10-1,3,9,10,11,12.

Carinya, EGA Jaegar QAL2000 and QAL Bis (*Lr24* + *Lr37*) are resistant to all pathotypes isolated from Australasia to date.

Cultivars with *Lr21* (Thornbill), *Lr28* (Sunland) and the complementary seedling resistance genes *Lr27*+*Lr31* (Carnamah and Kalgarin) are resistant to all pathotypes isolated in 2009-10. Genetic studies at PBIC have indicated that Carnamah and Kalgarin should also carry the adult plant resistance gene *Lr12*, which is completely linked to *Lr31*, and in fact may be the same gene.

It is apparent that many cultivars protected previously by *Lr24*, and at least some cultivars protected previously by *Lr37* have some adult plant resistance to pathotypes virulent for these genes. This includes the resistance gene *Lr34*, present along with *Lr24* in Annuello, Babbler, Carinya (also with *Lr37*), Catalina, Clearfield Janz, Cunningham, EGA Jaeger, EGA Wentworth, EGA Wills, GBA Combat, Giles, Janz,

Lang, Merinda (also with *Lr13*), Mira, Mitre, Pardalote, Petrie, Sunco, Sunsoft 98.

The combination of *Lr1*, *Lr13* and *Lr37* (Crusader, EGA Eaglehawk, Livingston, Sunlin, Sunstate and Sunzell) remains effective.

## Wheat Stripe Rust

The most recent summary of results for stripe rust pathotype analysis for the 2010 season is presented in Table 1. The large sample volume has meant that results have not always been quickly turned around for reporting, although as each sample has been finalized the result has been forwarded by email to individual co-operators. Over 70% of samples have been completed at the end of November, and several points serve to highlight the stripe rust survey for the 2010 season:

- after several seasons of steadily increasing importance, the 'WA-Yr17' pathotype has dominated in 2010 from early in the epidemic.
- the 'WA' and 'Jackie' pathotypes remain significant components of the pathogen population.
- the 'Tobruk' pathotype has been frequent in southern NSW where it was originally detected late last year. It was less common in northern NSW.
- the pathotype associated with Lincoln (64 E0 A-) has been recovered at low frequency, but does not appear to have had an adverse effect on Lincoln and Bolac during the season.
- the 'Yr17-27' pathotype was first reported in October (Cereal Rust Report Volume 8, Issue 7). It has now been recovered from 12 samples of cultivar Livingston collected from a relatively wide region in central west NSW encompassing Gilgandra (north) -Wallendbeen (south) - Cudal (east) - Tabbita (west). This pathotype was clearly a derivative of the 'WA-Yr17' pathotype and typically arose late in the season when the parent pathotype was dominant in wheat growing regions.

## Barley leaf rust

This disease has been particularly severe during 2010 in northern NSW and Queensland. A total of 121 samples have been received to date from eastern Australia, 96 of which have been processed. Six pathotypes have been identified from these samples, two of which were by far the most dominant. Pt 5453 P+ [66 isolates] is the most common pathotype throughout eastern Australia, and pt 5457 P+ [41 isolates] was very common in northern NSW and Queensland. The latter pathotype was first detected in March 2009 in northern NSW. It is the first pathotype

detected in Australia that carries virulence for the resistance gene *Rph3*, present in cultivars Fitzroy, Starmalt and Yarra. This pathotype has increased rapidly in frequency during 2010, and has been found as far south as Wagga Wagga and Brocklesby in southern NSW. Other pathotypes isolated so far in 2010 are: 5453 P- [11 isolates], 5473 P+ [1 isolate], 5652 P+ [5 isolates], and 220 P+ [2 isolates].

### Notes on Cultivars Carrying Genes for Leaf Rust Resistance

Many Australian barley cultivars carry seedling genes for resistance to *P. hordei*, however, other than *Rph7* (cv Galaxy), all of these genes are now ineffective against pathotypes that currently prevail and therefore all cultivars must be regarded as having at least some susceptibility to leaf rust. Before 1999–2000, cultivars carrying *Rph12* (Tallon and Lindwall) were resistant to pathotypes occurring in Region 1, however, virulence for *Rph12* now exists in this region and in all others. In fact, avirulence for this gene has been rare since 2002. Cultivars Fitzroy, Yarra and Starmalt carry *Rph3* and are now seedling susceptible to the new pathotype 5473P+. The adult plant responses of these cultivars to this pathotype were assessed at two field sites at PBI in 2009: Fitzroy was rated as 80S and 70S; Starmalt at 10MR and 5R, indicating residual resistance; and Yarra at 90S and 80S.

## Oat Crown Rust

After several years of low incidence, crown rust of oats has increased in frequency throughout eastern Australia and the diversity of pathotypes isolated this year has been high, with 23 pathotypes identified from the 73 samples processed to date (a further 83 samples are yet to be processed). Eighteen pathotypes were isolated only once or twice (Table 2). Of note was the isolation of a new pathotype, 0307-1,4,5,6,10,12 +Nugene +Gwydir +Genie, which is virulent on the cultivar Genie. It is not fully clear yet just how susceptible Genie is to this pathotype, however, growers of this cultivar are urged to monitor it closely. Two isolates of the Volta pathotype 0307-3,4,5,6,10 +Warrego +Volta (virulent on *Pc50*) were isolated.

Several suspect samples from Drover, which carries the resistance gene *Pc91*, were shown to be avirulent for this gene and hence this cultivar remains resistant to crown rust.

### Notes on Cultivars Carrying Genes for Crown Rust Resistance

With the exception of cultivar Drover, all current Australian oat cultivars are susceptible to crown rust. Cultivar Taipan, released in 2001, has the Nugene resistance. Some of the cultivars released in Region 1

and regarded at the time of release as resistant to *P. coronata* f. sp. *avenae*, are now susceptible to a range of pathotypes. These cultivars were believed to carry new genes for resistance to *Pca*, but it now seems that the resistance in practically all can be explained on the basis of known resistance genes.

### Oat Stem Rust

During this favourable season, oat stem rust isolates have also increased in frequency. The dominant pathotypes have been variants of Race 94, with

virulence for *Pg9*, *Pg13*, *Pg Saia*, and *Pga*. Virulence for *Pga* has been relatively low for several years, and was originally detected in Region 1 (Queensland, northern NSW). However, virulence for *Pga* is more widespread in the current season with isolates recovered to date from Queensland to Victoria. Variety Mitika has been unexpectedly infected with oat stem rust in certain locations, and samples recovered have suggested that *Pga* virulence may be the underlying cause. Further research is required to confirm these observations.

**Table 1.** Stripe rust pathotypes identified across Australian wheat growing regions. Current to late November 2010.

Pathotype	Region						Total
	QLD	n NSW	s NSW	VIC	SA	WA	
<b>'WA' pt</b> 134 E16 A+	12	17	28	8	-	2	67 (14%)
<b>'WA Yr17' pt</b> 134 E16 A+ Yr17+	13	50	137	15	4	-	219 (46%)
<b>'Jackie' pt</b> 134 E16 A+ J+	6	12	51	21	11	-	101 (21%)
<b>'Tobruk' pt</b> 134 E16 A+J+T+	-	8	21	2	3	-	34 (7%)
<b>'Jackie Yr27' pt</b> 134 E16 A+J+Yr27+	-	-	-	1	-	-	1 (<1%)
<b>'Yr17-27' pt</b> 134 E16 A+Yr17+Yr27+	-	4	8	-	-	-	12 (3%)
64 E0 A-	-	-	7	1	-	-	8 (2%)
<b>BGYR</b>	-	7	13	5	1	-	26 (6%)
Total identifications	31	98	265	53	19	2	468
Total samples	47	119	354	80	35	2	637

**Table 2.** Oat crown rust pathotypes identified in eastern Australia, 1 April – 24 November 2010

Pathotype	No. isolates
0000-2	1
0001-0	35
0003-4,6,10	1
0004-2 +Saia	1
0007-4,6,10	1
0007-4,6,10 +Nugene	1
0007-4,6,8,10	1
0107-1,4,6,10,12 +Nugene	2
0107-1,4,6,10,12 +Warrego +Nugene	4
0107-1,4,6,7,10,12 +Warrego +Nugene +Gwydir	8
0107-4,6,10 +Nugene	1
0307-1,4,5,6,10,12	1
0307-1,4,5,6,10,12 +Nugene	1
0307-1,4,5,6,10,12 +Nugene +Gwydir +Genie	4
0307-1,4,5,6,10,12 +Warrego +Nugene	1
0307-1,4,5,6,7,10,12 +Gwydir	1
0307-3,4,5,6,10 +Warrego +Volta	2
0307-4,5,6,10 +Nugene	1
2207-4,5,6,10 +Nugene	1
0071-0	8
0071-0 +Pc92	1
0071-1,4,7,10,12 +Gwydir	1
4473-4,6,10 +Bettong +Barcoo	2
<b>TOTAL</b>	<b>80</b>

**GENERAL ENQUIRIES**

Plant Breeding Institute  
Private Bag 4011,  
Narellan NSW 2567  
  
107 Cobbitty Road  
Cobbitty NSW 2570  
T 02-9351 8800 (Reception)  
F 02-9351 8875

**RUSTED PLANT SAMPLES**

can be mailed in paper envelopes;  
do not use plastic wrapping or plastic  
lined packages.

Direct samples to:

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

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



Industry & Investment