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Cereal Rust Report
Season 2008

Stripe Rust Situation at mid Spring 2008

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Wheat stripe rust continues to cause problems through the mid spring period in 2008, and especially in central and northern NSW, and southern Queensland. Chemical control has been extensive; industry sources across the nation indicate that approximately $50million has been expended on fungicide purchases alone, with additional expenditure for application costs. Fungicides are still being considered in late crops that are in some instances showing evidence of recent infection.

Seasonal Conditions

An above average warm to hot and dry period in mid September checked stripe rust development in most of south eastern Australia. Daily maximum temperatures in this period ranged from 24 to 30°C, although overnight minimum temperatures were generally 10°C or lower. In these conditions, the stripe rust pathogen is capable of surviving in infected tissue and then continues to progress as daily temperatures cool and overnight dew periods return.

Perhaps a more important feature of the early spring weather patterns has been the impact on crop development and yield potential. In eastern Australian zones encompassing the Riverina, Mallee and Wimmera where subsoil moisture reserves were already depleted, this period witnessed the demise of many crops. Rain events in September (see Figure 1) and early October restored confidence in some areas, with the region north of central NSW experiencing above average conditions and renewed optimism for harvest.

Pathotype Distribution

The data in Table 1 provides an update on the samples received to date, and places this season in the context of recent years. Clearly we are experiencing an unusually severe epidemic of stripe rust, although this is largely confined to eastern Australia, and specifically to NSW and Queensland. History suggests that September and October are the busy period for stripe rust sample receivals; at the date of writing in mid October, sample numbers had already reached 685 which have exceeded the previous record total of 657 in 1983.

The number of samples examined and determined for pathotype description has progressively advanced since the September report. The majority of July and August samples have now been tested and results reported to individual co-operators. Attention is now being given to current September and October samples; the remaining isolates from July and August will be followed up at the end of the season.

The essential nature of pathotype distribution as described in previous reports for this season has remained largely unchanged. The updated information in Table 2 indicates that the 'Jackie' pathotype continues to be dominant. The 'WA' pathotype has also been common, and from this preliminary data, it seems to have surged to become more frequent in late winter in northern NSW. This feature suggests that the 'WA' pathotype may have survived in this region, in contrast to the 'Jackie' pathotype that clearly arose on early sown crops in the south of NSW.

The 'WA Yr17' pathotype has increased in frequency in late winter and perhaps more notably in early spring, but still remains at relatively low frequency. Current data suggests that this pathotype represents approximately 10% of the population, and this is consistent with its frequency at the end of the 2007 season. Given the wide deployment of *Yr17* carrying wheats in NSW in 2008 and the relative vulnerability of many of these varieties to the 'WA Yr17' pathotype, it is surprising that this pathotype has not become more widespread. This may reflect the chance events of survival in the summer of 2007-08, or perhaps suggest that features of low fitness may limit its ability to adapt and spread.

Stripe rust isolates recovered from *Yr17* carrying wheats have not always yielded the 'WA Yr17' pathotype. Data presented in Table 3 indicates that the 'Jackie' pathotype has been the most frequent type recovered from these wheats. There are still many samples to process, and so these conclusions are preliminary. However, it is clear that crops of these varieties can support pathotypes that are considered avirulent for *Yr17*. This is likely due in part to the inoculum pressure experienced in this severe epidemic season; thus symptoms can and will develop but are not expected to cause serious losses on *Yr17* wheats where the pathotype is avirulent for *Yr17*.

Variety Responses

The comments on variety response to stripe rust in the previous report remain essentially unchanged. An update is provided below:

GBA Ruby
Ten samples have been received from GBA Ruby and six have been shown to be affected by the 'Jackie' pathotype; the remaining samples are still being processed. All samples, including those from GBA Ruby, are tested on the resistance gene *Yr27* that is present in Ruby, and also GBA Hunter, Merinda and Livingstone (plus *Yr17*). To date, all samples have been clearly avirulent and hence this gene is expected to continue to provide protection.

Gregory
As noted in Cereal Rust Report Volume 6, Issue 5 (September 2008), Gregory has generally performed well although many have taken the decision to spray in the earlier stages when concern was expressed that disease levels were higher than anticipated. On flag leaves, symptom development has been observed but usually no more than 10-15% leaf damage under high inoculum load.

However, in some situations under severe pressure such as hotspot infections, there has been evidence that individual plants have shown considerable stripe rust symptoms with leaves showing up to 60% damage. The field depicted in Figure 2 is a Gregory crop near Goolgowie (south west NSW) in early September. Here single plants were identified with heavy rust development in the hotspots. The preliminary conclusion was that these plants were not typical of Gregory's rust resistance, although they appeared to be true-to-type for the variety – *ie*, they were not 'off-types' or contaminant plants. Seed collected from individual plants will be sought to test this hypothesis. If readers are aware of similar observations, we would greatly value seed samples from single plants of Gregory to add to our material for testing.

***Yr17* Varieties**
As noted above, the current data suggests that 'WA Yr17' pathotype is not widespread at this stage, but there have been an increasing number of samples received from Ventura, Ellison, Sunvale, Sunstate, Derrimut, Gladius, QAL 2000, QAL Bis, Bowie from mid September. The majority of these samples are still being processed. Reports indicate that concerning levels of stripe rust in Ellison, Ventura and others have prompted fungicide applications. Given the vulnerability of these varieties to the 'WA Yr17' pathotype, the decision to spray needs to be taken early and certainly before confirmation of the pathotype involved.

Triticales
The responses of triticale varieties to the 'Jackie' pathotype were published in Cereal Rust Report Volume 5 Issue 5 (December 2007); copies are available from the website. These response ratings will be revised shortly as recent information is gathered from this first year of exposure of triticales to this damaging pathotype. The long season triticale Tobruk experienced severe rusting in the early phases of crop development, and many crops were sprayed

to contain the disease. In most situations, Tobruk has performed well in later growth stages, although there have been reports of unexpected stripe rust development on upper leaves in high yield, high disease pressure situations.

Disease Control in Late Infection Situations

As mentioned previously, Ventura and other *Yr17* wheats have generally performed well this year due largely to the predominance of avirulent pathotypes. However, there were certainly instances where the 'WA Yr17' pathotype showed signs of causing problems and these crops were sprayed.

A more difficult scenario is emerging in mid spring where there is evidence that crops such as Ventura that have performed well to date, but are now showing evidence of infection in the upper canopy only and even on just flag leaves. Samples from these situations are yet to be processed for pathotype determination. However, it is likely that the late emergence of the 'WA Yr17' pathotype in September may be causing infection from heading to post flowering.

In these situations where fungicides are under consideration, the following factors are relevant to the decision making process:

1. data from the 1980s suggests that yield loss resulting from late infection at heading in moderately susceptible crops would be less than 5%.
2. mechanical crop damage from ground application machinery could exceed expected yield gains.
3. wheat prices are now lower than expected and so care needs to be taken in estimating the economic benefits of late fungicide sprays.

Barley Grass Stripe Rust

Heavily infected barley grass has been observed from the southern highlands in NSW through to southern Queensland. Although stripe rust on barley grass has been common in previous years, it has been rare since the arrival of the 'WA' pathotype and its two derivatives from 2003. Previous research has established that barley grass, comprising *Hordeum leporinum, H. glaucum* and several minor species, may be affected by either of two forms of the stripe rust pathogen:

1. wheat stripe rust. Isolates of wheat stripe rust have been shown to be virulent on barley grass clones. This was particularly noted in the original wheat stripe rust pathotype that arrived from Europe in 1979. By the mid 1980s, certain isolates of this original pathotype were able to cause severe stripe rust infection on particular wild barley grasses.
2. barley grass stripe rust. This form of the pathogen was first observed in 1998. It was unable to infect most wheat varieties, but was able to cause disease on barley grass and on some commercial barleys, notably Skiff and its derivatives. The current barley variety Maritime is moderately susceptible to barley grass stripe rust.

Recent isolates from barley grass collected in the current season have been barley grass stripe rust. One isolate was the 'WA' pathotype, and the possibility that this has acquired virulence for barley grass will need to be established.

Acknowledgements
The support of colleagues at the PBI Rust Laboratory has been excellent, and especially the technical staff who have assisted in keeping the pathotype analysis at full pace while managing the pressures of the traditionally busy spring program. Conversations and communication with many field advisors, research colleagues, agronomists and farmers have been invaluable in maintaining current awareness of the stripe rust situation in various corners of the wheat growing regions of Australia.

Table 1. Stripe samples received from commercial fields in eastern Australia, 2003 – 2008 (end of September, 2008)

Year	Stripe Rust Samples Received at PBI Rust Lab				
	June	July	August	September	Season Total
2003	-	-	30	94	484
2004	-	-	67	306	590
2005	3	25	51	133	407
2006	-	-	51	71	167
2007	-	2	18	138	349
2008	14	60	206	297	(685) [1]
% samples pathotyped[1]	100%	82%	73%	27%	

[1]As at 14th October 2008

Table 2. Pathotype determinations across regions and time periods in 2008. Note that this is preliminary data as at 14.10.2008 with more samples to be examined.

Region	'Jackie' Pathotype				'WA' Pathotype				'WA Yr17' Pathotype			
	May-June	July	August	Sep	May-June	July	August	Sep	May-June	July	August	Sep
Qld		1	3	10			5	7			1	7
nNSW	1	3	20	14	1	3	27	12			3	1
sNSW	12	25	53	16	1	5	14	2	2	1	4	1
VIC		7	6	4			1	1				1
SA			2	3			3					
WA								2				
Totals	13	36	84	47	2	8	50	24	2	1	8	10
	180				84				21			

Table 3. Pathotypes recovered from *Yr17* carrying wheat varieties (at 14.10.2008).

Variety	'Jackie' pathotype	'WA' pathotype	'WA Yr17' pathotype
Bowie	1	1	
Carinya		1	
Derrimut		1	1
Ellison	9	2	2
Gladius	1		
H46	1		1
Marombi	2	1	5
Sunstate	6	2	2
Sunvale	5	5	2
Sunzell		2	2
Ventura	7	2	2
Total	32	17	17

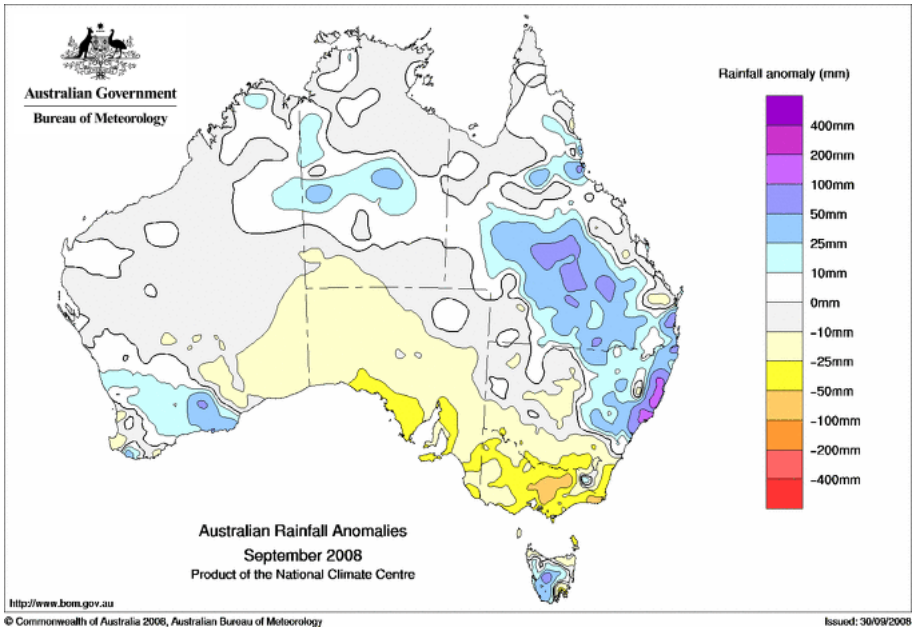

Figure 1. Rainfall anomalies for September 2008, indicating regions of above and below average rainfall for this period. Map courtesy of the Australian Bureau of Meteorology.

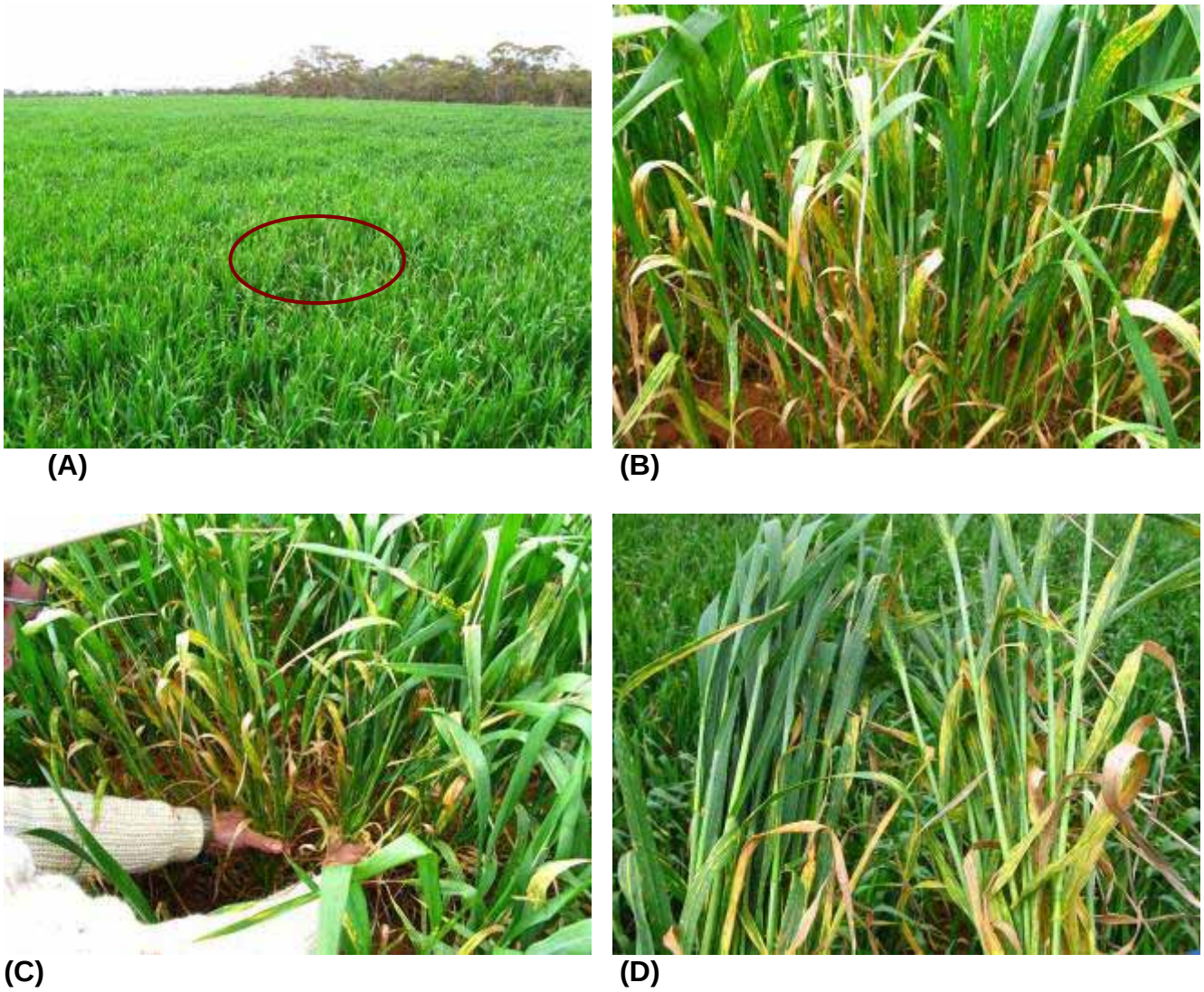

Figure 2. Gregory crop, Goolgowie NSW, at/near GS 39. The hot spots in this field (A) included plants that were heavily infected (B). Individual plants were identified (C) and two groups were established that showed contrasting rust reaction (D).

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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
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