

Cereal Rust Report

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First detection of wheat leaf rust pathotype 76-1,3,5,7,9,10,12 +Lr37 in Western Australia

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A pathotype of the wheat leaf rust pathogen, *Puccinia triticina*, first detected in eastern Australia in 2011, has been detected in samples of leaf rust infected wheat collected in late Sept/ Oct 2013 from 4 widely separated locations in Western Australia (Borden, Esperance, Gibson, Northampton). While not new to Australia, this is the first detection of this pathotype in WA and it represents the first occurrence of virulence for the resistance genes *Lr13*, *Lr17a*, *Lr17b*, and *Lr26* in WA. The movement of cereal rust inoculum from WA to eastern Australia has been documented many times over the past 90+ years, and is presumed to occur on prevailing winds. Movement from east to west is much less frequent. While 6 such examples of west-to-east movement of cereal rusts have been documented since 1990, the current detection is only the second example of east to west movement during that time.

To date, a total of 21 samples of leaf rusted wheat have been received by the Rust Biology Laboratory at the University of Sydney's Plant Breeding Institute during the 2013-14 annual pathogenicity survey (Table 1). Of these, 6 samples failed to yield a viable isolate, and 6 are yet to be processed.

Of significance is the detection of pathotype 76-1,3,5,7,9,10,12 +Lr37 in 5 samples collected from Borden, Esperance, Gibson and Northampton. This is the first detection of this pathotype in WA, and it is the first time virulences for the resistance genes *Lr13*, *Lr17a*, *Lr17b* and *Lr26* have been detected in that state (Table 2).

Pathotype 76-1,3,5,7,9,10,12 +Lr37 was first detected in eastern Australia in early October 2011 in samples collected from Victoria and South Australia, and it was detected again in samples collected from southern NSW in 2012. This pathotype is considered to have originated via two independent single- step mutational events: firstly the acquisition of virulence for the resistance gene *Lr20* in an existing pathotype in 2008 and secondly, acquisition of virulence for *Lr17b* in 2011. The founding ("parent") pathotype in this lineage, pt. 76-3,5,7,9,10 +Lr37, is regarded as an

exotic introduction, being first detected in Australia at Inverleigh (Vic) in late July 2006. The "parent" and 2 mutant pathotypes have become common in eastern Australia over the past 7 years, and quite recently, a third mutational derivative, virulent for *Lr24*, was detected in northern NSW (pathotype 76-1,3,5,7,9,10,12,13 +Lr24; see Cereal Rust Update Volume 11 #4 revised).

Conclusion

It is likely that the leaf rust response of several wheat cultivars in WA will shift towards higher susceptibility due to this pathotype. Predicted changes in the responses of a selection of cultivars are provided in Table 3, based on tests at the Plant Breeding Institute with pathotypes within the "76" lineage. It is likely that we will not know the full impact of this new pathotype until we have undertaken more exhaustive greenhouse seedling tests, and adult plant field tests. It is important to establish a more accurate picture of the distribution of this pathotype in WA, and so growers in WA are urged to monitor all wheat crops closely for the presence of leaf rust, and to forward samples of any leaf rust detected to the Plant Breeding Institute for pathotype analysis.

Table 1. Samples of wheat leaf rust received from Western Australia by the University of Sydney Plant Breeding Institute, from 1st April through October 22nd 2013

Accession #	Sender	Date	Location	Longitude	Latitude	Variety	Pathotype 1	Pathotype 2
130021	Shankar, M.	21/08/2013	CARNARVON WA 6701	113.6570204	-24.8826946	Trident	104-1,(2),3,(6),(7),11 +Lr37	
130022	Shankar, M.	21/08/2013	CARNARVON WA 6701	113.6570204	-24.8826946	Ajana	104-1,(2),3,(6),(7),11 +Lr37	
130032	Thomas, G.	04/09/2013	KONDININ WA 6367	118.2665213	-32.4942958	Stiletto	Failed	
130033	Thomas, G.	04/09/2013	KALGARIN WA	118.7150767	-32.4953289	Stiletto	Failed	
130034	Thomas, G.	04/09/2013	HYDEN WA 6359	118.865654	-32.4490543	Yitpi	Failed	
130045	Bradley, J.	18/09/2013	MERREDIN WA 6415	118.2812988	-31.4823417	Arrino	Failed	
130046	Bradley, J.	18/09/2013	MERREDIN WA 6415	118.2812988	-31.4823417	Wheat	Failed	
130056	Jayasena, K.	19/09/2013	ALBANY WA 6330	117.8780275	-34.9754734	Mace	Not yet processed	
130066	Bradley, J.	30/09/2013	ESPERANCE WA 6450	121.8932484	-33.8594128	Corack	76-1,3,5,7,9,10,12 +Lr37	104-1,(2),3,(6),(7),11 +
130069	Smyth, P.	02/10/2013	CASCADE WA 6450	121.0755041	-33.4695297	Corack	Not yet processed	
130070	Beard, C.	03/10/2013	NORTHAMPTON WA 6535	114.6314871	-28.3497733	Wyalkatchem	76-1,3,5,7,9,10,12 +Lr37	
130071	Beard, C.	03/10/2013	NORTHAMPTON WA 6535	114.6314871	-28.3497733	Cobra	104-1,(2),3,(6),(7),11	
130072	Beard, C.	03/10/2013	NORTHAMPTON WA 6535	114.6314871	-28.3497733	Wyalkatchem	76-1,3,5,7,9,10,12 +Lr37	
130078	Jayasena, K.	08/10/2013	EAST BORDEN WA 6535	114.7500153	-28.3325363	Calingiri	76-1,3,5,7,9,10,12 +Lr37	
130086	Bartlett, P.	14/10/2013	GIBSON WA 6448	121.8127168	-33.6506426	Westonia	Not yet processed	
130087	Bartlett, P.	14/10/2013	GIBSON WA 6448	121.8127168	-33.6506426	Cobra	104-1,(2),3,(6),(7),11 +Lr37	
130088	Bartlett, P.	14/10/2013	GIBSON WA 6448	121.8127168	-33.6506426	Wyalkatchem	Failed	
130089	Bartlett, P.	14/10/2013	GIBSON WA 6448	121.8127168	-33.6506426	Wheat	76-1,3,5,7,9,10,12 +Lr37	
130093	Thomas, G.	17/10/2013	MOORINE ROCK WA 6425	119.1276906	-31.3118564	Cobra	Not yet processed	
130094	Thomas, G.	17/10/2013	MERREDIN WA 6415	118.2812988	-31.4823417	Stiletto	Not yet processed	
130096	Mudie, N.	18/10/2013	RAVENSTHORPE WA 6346	120.0481056	-33.581611	Mace	Not yet processed	

Table 2. Comparison of pathogenicity of the 3 pathotypes of *Puccinia triticina* detected in Western Australia since 1990 on leaf rust resistance genes common in current Australian wheat cultivars

		Standard race/ pathotype			
		104-	104-	104-	76-
Lr gene	Gene action	1,(2),3,(6),(7),11 ^a	1,2,3,(6),(7),11 ^b	1,(2),3,(6),(7),11+Lr37 ^c	1,3,5,7,9,10,12+Lr37
<i>Lr1</i>	All stage	Virulent	Virulent	Virulent	Avirulent
<i>Lr3a</i>	All stage	Virulent	Virulent	Virulent	Virulent
<i>Lr13</i>	All stage	Avirulent	Avirulent	Avirulent	Virulent
<i>Lr17a</i>	All stage	Avirulent	Avirulent	Avirulent	Virulent
<i>Lr17b</i>	All stage	Avirulent	Avirulent	Avirulent	Virulent
<i>Lr20</i>	All stage	Virulent	Virulent	Virulent	Virulent
<i>Lr23</i>	All stage	Avirulent	Virulent	Avirulent	Avirulent
<i>Lr24</i>	All stage	Avirulent	Avirulent	Avirulent	Avirulent
<i>Lr26</i>	All stage	Avirulent	Avirulent	Avirulent	Virulent
<i>Lr27+Lr31</i>	All stage	Avirulent	Avirulent	Avirulent	Avirulent? ^d
<i>Lr34</i>	APR ^e	Avirulent	Avirulent	Avirulent	Avirulent
<i>Lr37</i>	All stage	Avirulent	Avirulent	Virulent	Virulent
<i>Lr46</i>	APR	Avirulent	Avirulent	Avirulent	Avirulent

^a formerly 104-1,2,3,(6),(7),11

^b formerly 104-1,2,3,(6),(7),11 +Gaza High

^c formerly 104-1,2,3,(6),(7),11 +Lr37

^d further tests are needed to establish whether or not this pathotype is virulent on the complementary genes *Lr27+Lr31*

^e Adult Plant Resistance

Table 3. Expected response of selected wheat cultivars to pathotype 76-1,3,5,7,9,10,12 +Lr37, along with previous ratings for Western Australia (adapted from Cereal Rust Update 10 #1 revised)

Cultivar ^a	Leaf rust response in WA		Postulated leaf rust resistance genes
	2012	Revised	
Chara	R	MS	<i>Lr13, Lr34</i>
Corack	RMR	MS	<i>Lr3a, Lr13</i>
Emu Rock	R	MSS	<i>Lr13</i>
Fortune	MR	MRMS	<i>Lr17a</i>
King Rock	R	MRMS	<i>Lr13, Lr37</i>
Mackellar	R	S	<i>Lr13, Lr17b</i>
Mansfield	RMR	MS	?
Peake	R	MR	<i>Lr13, Lr34, Lr37</i>
Tennant	R	MSS	<i>Lr26</i>
Wallup	R	MRMS	<i>Lr13, Lr20, Lr27+Lr31?</i>
Wyalkatchem	RMR	MS	<i>Lr13, Lr20, Lr46mix</i>
Zippy	MR	MRMS	<i>Lr3a, Lr13, Lr27+Lr31</i>

^a Cultivars Carnamah (*Lr27+Lr31*) and Cobra (*Lr3a, Lr27+Lr31*) may be more vulnerable to pathotype 76-1,3,5,7,9,10,12 +Lr37. Further tests are needed to establish their responses more accurately.

GENERAL ENQUIRIES

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Narellan NSW 2567

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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.



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