Wyalkatchem reselections differentiate the adult plant resistance gene *Yr29* in an Australian wheat back-ground

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BACKGROUND

Stripe rust, caused by *Puccinia striiformis* f.sp. *tritici*, is an important disease of wheat in Australia (McIntosh *et. al.* 1995). The disease has been present in Australia since 1979 but was not detected in Western Australia until 2002 (Wellings *et. al.* 2003). Consequently there had been comparatively little prior selection of Western Australian wheat breeding germplasm for resistance to stripe rust and limited knowledge of the extent and type of resistance present in locally adapted germplasm.

The commercial variety Wyalkatchem (Machete/ Gutha..2*Jacup.11ISEPTON135) is the major wheat variety in Western Australia, estimated to represent 30% of wheat area sown in 2007/08. Wyalkatchem possesses partial resistance and understanding its genetic control will assist breeding to improve stripe rust resistance and adaptation.

WYALKATCHEM RESPONSE TO STRIPE RUST

Under natural infection with pathotype 134 E16 A+ in the field, the wheat variety Wyalkatchem was observed to be mixed for response to stripe rust. A low frequency of individual Wyalkatchem plants lack partial resistance and reach very high terminal rust severity. The majority of individual Wyalkatchem plants express partial resistance. Among 60 single plants re-selected at random and evaluated for adult plant resistance to stripe rust in the field at two sites in 2005, 2 were highly susceptible (80-100S) and were presumed to lack the partial resistance factor(s). Remaining lines expressed partial resistance (30-70MS).

ASSOCIATION OF PARTIAL RESISTANCE WITH *Yr29*

Yr29 has been mapped to chromosome 1B (William *et. al.* 2003, 2006). Preliminary mapping of stripe rust resistance in a Wyalkatchem derived doubled haploid population identified a stripe rust resistance QTL linked to *Xwmc44* on chromosome 1BL, most likely *Yr29* (M. Hayden pers. comm.).

A sample of unselected Wyalkatchem, two highly susceptible single plant selections and 4 partially resistant single plant selections were tested with a novel single nucleotide polymorphism CAPS marker, *csLV46*. The marker is located at the 1BL locus co-segregating with *Lr46/Yr29/Pm39*. The marker assay clearly distinguished Wyalkatchem re-selections that differed in the stripe rust APR response (Table 1).

Table 1. Terminal rust severity and *csLV46* genotype of Wyalkatchem and 6 single plant selections of Wyalkatchem representing variants with and without adult plant resistance.

	% Stripe Rust Severity			*csLV46*
	Manjimup (2 observers)		South Perth*	genotype**
	Obs. 1	Obs. 2		
Wyalkatchem	30	70	-	B
Wyalkatchem-003	30	50	0	B
Wyalkatchem-016	30	60	0	B
Wyalkatchem-018	100	100	80	A
Wyalkatchem-045	30	60	0	B
Wyalkatchem-048	30	60	0	B
Wyalkatchem-049	100	100	80	A

* as active sporulation
**Yr29 absent (A) or present (B)

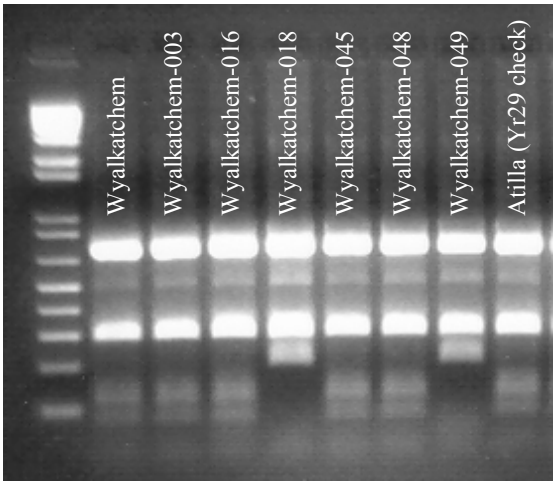

Figure 1. PCR products of *csLV46* of Wyalkatchem and 6 single plant selections of Wyalkatchem representing variants with and without adult plant resistance, with reference to the control variety Atilla possessing *Yr29*.

DISCUSSION

The single plant reselected Wyalkatchem individuals provide potential 'near-isogenic' genetic stocks with and without *Yr29*. These stocks are likely to be useful in developing improved understanding of the expression of partial resistance to stripe rust in an Australian wheat background, which can be influenced by environmental factors. The use of Wyalkatchem as a donor of stripe

rust resistance is enhanced by the knowledge that it possesses *Yr29*, though care should be taken in breeding to avoid a small proportion of individual plants lacking this resistance. Enhancing stripe rust resistance through breeding for resistance gene combinations should be improved with this knowledge.

ACKNOWLEDGEMENTS

Preliminary mapping of *Yr29* in Wyalkatchem was undertaken through the Australian Winter Cereal Molecular Marker Program, supported by the Grains Research and Development Corporation.

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