

# Resistance To *Pyrenophora teres* In Barley

Sanjiv Gupta<sup>A</sup>, Robert Loughman<sup>B</sup>, Reg Lance<sup>B</sup> and Mike Jones<sup>A</sup>

<sup>A</sup>WA State Agricultural Biotechnology Centre, Murdoch University, Murdoch, WA 6150

<sup>B</sup>Plant Research & Development Services, Agriculture Western Australia, South Perth, WA 6151

## Introduction

Net-type net blotch of barley caused by *Pyrenophora teres* f. sp. *teres* occurs widely throughout the barley cropping regions of Australia. It reduces grain yield by up to 33% mainly through reduced grain size. Development of stable forms of resistance depends upon using barley lines resistant to the most prevalent isolates around Australia.

## Materials and Methods

We have screened 69 barley lines from different barley breeding groups around Australia and elsewhere to identify sources of resistance for breeding. Most of these lines have some resistance to net blotch and some represent elite resistances. These lines were screened as seedlings in duplicate sets using net-type net blotch isolates prevalent in Western Australia (five isolates), Queensland (three isolates) and South Australia (one isolate) (Table 1). Inoculations of these lines were undertaken at the two leaf stage with a suspension of  $\sim 2 \times 10^4$  spores /ml. Plants were incubated at 19-20°C with complete leaf wetness for the first 24 hr and symptom severity assessed on ninth day.

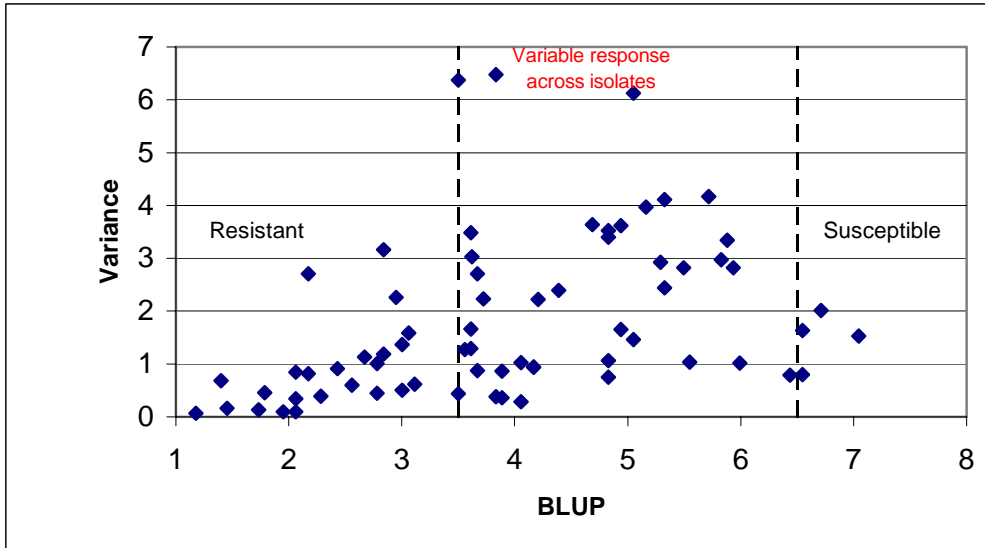
**Table 1.** Net-type net blotch isolates used to screen 69 barley lines.

No.	Designation	Origin	Virulence Spectrum	Supplied by
1.	95NB87	WA (Kulin)	Dampier	S. Gupta and R. Loughman
2.	95NB100	WA (Wongan Hills)	Dampier, Beecher, Prato	S. Gupta and R. Loughman
3.	97NBMDSN	WA (South Perth)	Dampier	S. Gupta and R. Loughman
4.	QNB 61	WA (South Perth)	Dampier	G. Platz
5.	QNB 29	WA (Brookton)	Abyssinian, Beecher	G. Platz
6.	QNB 73	QLD (Tansey)	Perun, Shannon, Grimmett, Pompadour	G. Platz
7.	QNB 280	QLD (Irvingdale)	Reinette, Perun, Grimmett	G. Platz
8.	QNB 78	QLD (Biloela)	Rika, Perun, Grimmett, Skiff	G. Platz
9.	QNB 52	SA (Rendelsham)	Rika, Perun, Grimmett, Skiff	G. Platz

The responses of 69 lines to nine isolates were subject to analysis of variance components using the program ASREML. In this analysis responses were estimated as Best Linear Unbiased Predictors (BLUPS). These estimates take into account experimental error and are better predictors of future performance than raw means.

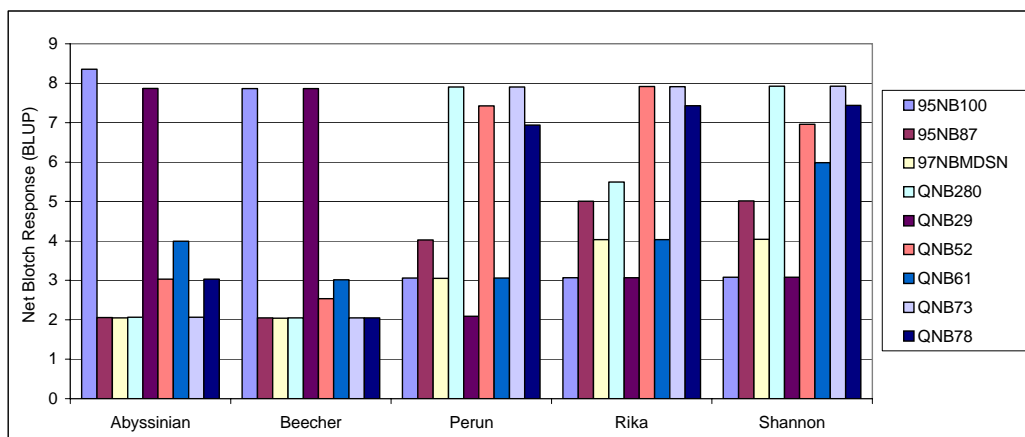
## Results and Discussion

For each line an overall rating (BLUP) and a variance across isolates were calculated (Figure 1). The most desirable resistances have low overall rating (BLUP) and low variance indicating resistance to the majority or all tested isolates.



**Figure 1.** Barley lines categorised into resistant, intermediate and susceptible using best linear unbiased predictors and variance.

Twenty four lines were resistant with variances up to 3.16 (Table 2). Forty one lines were intermediate with variance ranging 0.28 - 6.48. Four lines were susceptible with variances of up to 2.01. Barley lines Abyssinian, Beecher, Perun, Rika and Shannon had very higher variance (>4). The basis of high variance for these lines is shown as contrasting responses to the different isolates (Figure 2).



**Figure 2.** Barley lines with contrasting responses to net blotch isolates.

Barley lines that served to differentiate isolates included in this study were Abyssinian, Beecher, Dampier, Grimmett, Perun, Pompadour, Prato, Requette, Rika, Shannon and Skiff (Table 1).

**Table 2.** Resistant barley lines ranked on overall net blotch response. Among these lines, those with the lowest variance were resistant to all isolates tested.

Line	Overall net blotch response (BLUP)	Variance
WA5149	1.2	0.1
WA4794	1.4	0.7
WA4791	1.5	0.2
CI 9819	1.7	0.1
CI 5791	1.8	0.5
CI 7584	2.0	0.1
WPG-8412-9-2-1	2.1	0.1
CI 9214	2.1	0.3
WA5769	2.1	0.8
Heartland	2.2	0.8
WA4833	2.2	2.7
Rajo	2.3	0.4
WA5182	2.4	0.9
CI 9776	2.6	0.6
Psaknon	2.7	1.1
Tifang	2.8	0.4
W94% 175	2.8	1.0
Steptoe	2.8	1.2
Pompadour	2.8	3.2
Prato	2.9	2.3
Den-4D	3.0	0.5
Coast	3.0	1.4
CM72	3.1	1.6
Bonanza	3.1	0.6

Resistant lines with low variance are the most useful sources to identify resistance genes for future breeding strategies for net-type net blotch. Four diverse lines WA 4794, Pompadour, CI 9214 and WPG8412-9-2-1 were selected to study inheritance of resistance and genetically map those resistances under the National Barley Molecular Marker Program. Doubled haploid lines from crosses with these parents have been generated and screening is in progress.

### Acknowledgments

This research was supported by GRDC and the Western Region Malting Barley Improvement Programme. We thank G. Platz for providing net-type net blotch isolates.