

Update on mapping blackleg resistance genes in canola

Canola Molecular Marker Program (2008-2013)



Our major aims are

- Understand the genetic basis of blackleg resistance in Australian canola germplasm
- Tag the genes for resistance to blackleg disease on the canola genome
- Identify and validate molecular markers for an effective MAS in the canola breeding companies

Progress: Screening for blackleg resistance

- Two DH populations from
 - Skipton/Ag-Spectrum (188 lines)
 - BLN3347/Carousel-10 (82 lines)
- Phenotyping
 - Cotyledon resistance (Marcroft Grain Pathology labs)
 - Adult plant resistance (Marcroft Grain Pathology labs)
 - Field resistance in blackleg nursery (NSW DPI Wagga)
 - Resistance was evaluated according to National protocols.

Experiment

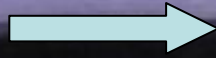
Eight genotypes of *B. napus*

- BLN3347 (Polygenic?)
- Carousel (*Rlm1*, *Rlm2*, *poly*)
- Carousel-10 (*Rlm1*, *Rlm2*, *poly*)
- Skipton (Polygenic?)
- Ag-Spectrum (Polygenic?)
- Beacon (*Rlm3*, *Rlm4*, *Rlm9*)
- Surpass400 (*LepR3*, *Rlm1*)
- Q2 (Susceptible, *Rlm3*?)

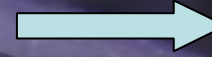
11 isolate of *L. maculans*

- 04MGPP016
- 04MGPP031
- 04MGPP041
- 04MGPS010
- 04MGPS014
- 04MGPS015
- 04MGPS021
- 05MGPP028
- 06MGPP019
- 06MGPP041

Inoculated with 10 μ l
of pycnidiospores
(1x10⁶)



Approx 2 wks



Lesion Scale:

0-3.5: R

3.6-3.9: I

4-9: S

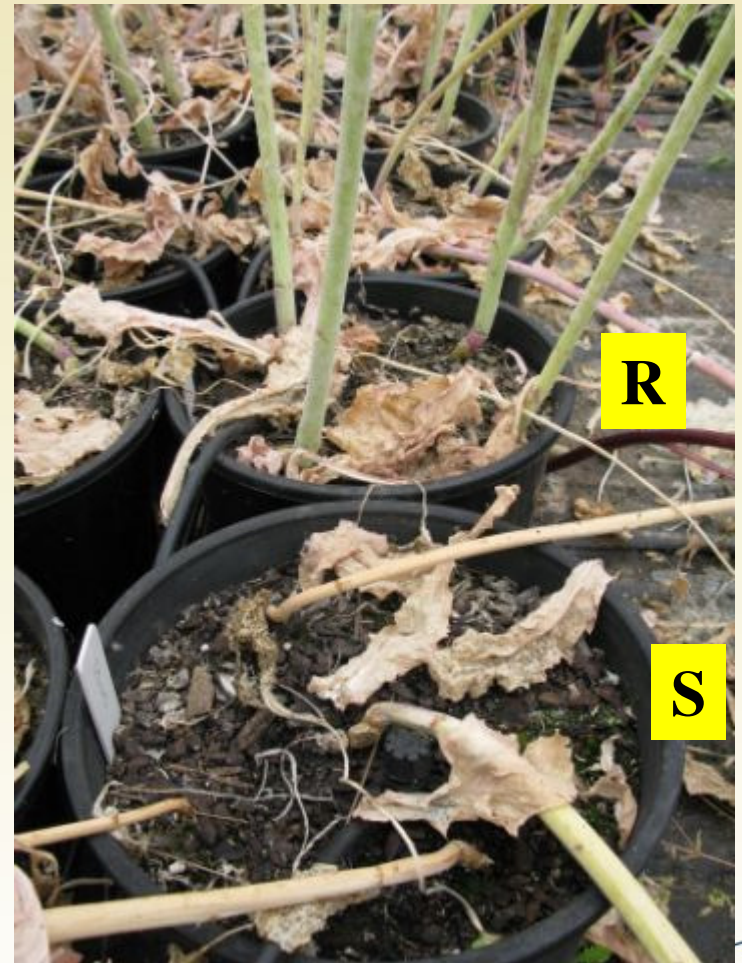
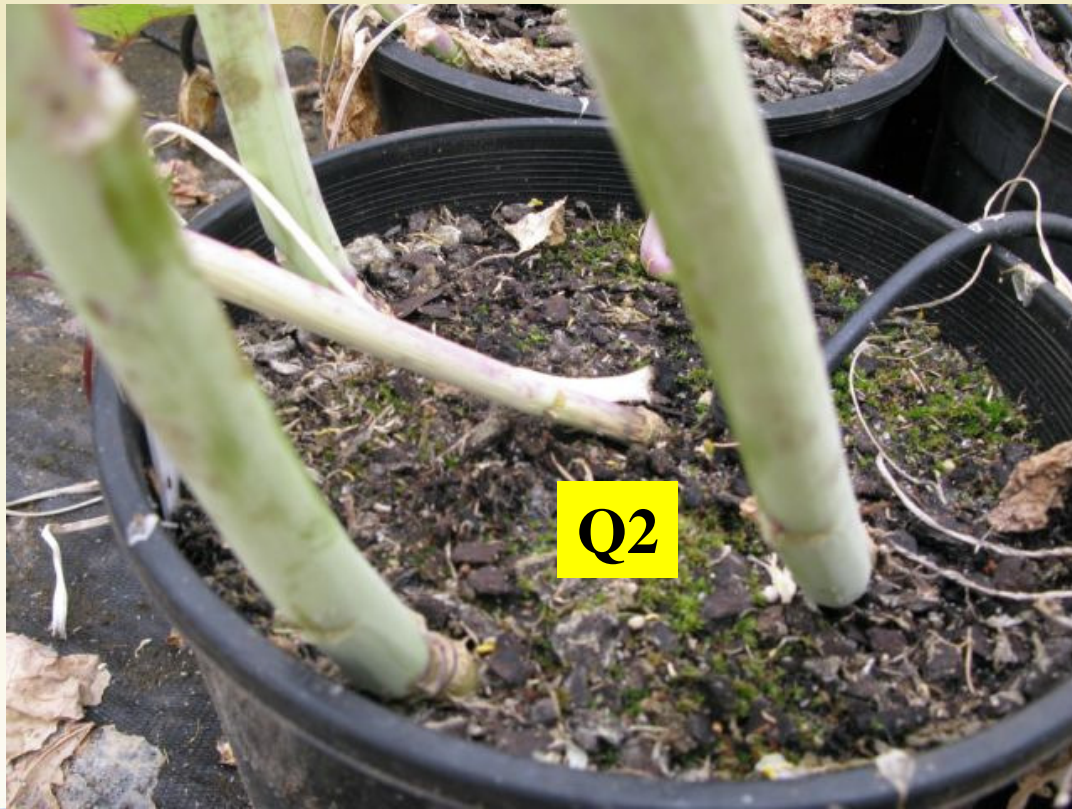
(Koch et al 1991)



Summary on screening for blackleg resistance at cotyledon stage. Lesion score: 0-3.5=R; 3.6-3.9=I; 4-9=S

Isolates	Cotyledon lesion data (S, R and I)							Virulence genotypes	
	Q2	Beacon	Surpass400	BLN3347	Carousel10	Skipton	Spectrum	AvrLm1	AvrLm6
04MGPP016	S	S	R	S	R	I	S	Avr	Vir
04MGPP031	S	S	R	S	S	S	S	Avr	Vir
04MGPP041	S	S	R	S	S	S	S	Avr	Vir
04MGPS010	S	S	S	S	S	S	S	Vir	Vir
04MGPS014	S	S	S	I	S	I	S	Vir	Vir
04MGPS015	S	S	S	S	S	I	S	Vir	Vir
04MGPS021	S	S	S	S	S	R	S	Vir	Avr
05MGPP028	S	-	S	S	-	R	-	ND	ND
06MGPP005	S	S	S	S	S	S	S	Vir	Vir
06MGPP019	S	S	R	R	R	I	S	Avr	Avr
06MGPP041	S	I	S	S	R	S	R	Vir	Vir

Screening for APR to *L. maculans*



Screening for APR to isolates of *L maculans*

Isolates	Internal Infection (S, R and I)						
	Q2	Beacon	Surpass400	BLN3347	Carousel	Skipton	Spectrum
04MGPP016	S	S	R	S	R	I	S
04MGPP031	S	S	R	S	I	S	S
04MGPP041	S	S	R	S	R	I	I
04MGPS010	S	R	S	I	S	I	I
04MGPS014	S	I	I	I	R	I	I
04MGPS015	S	S	S	I	I	I	I
04MGPS021	S	I	R	I	S	S	I
05MGPP028	S	R	S	I	R	R	R
06MGPP005	S	R	R	R	I	R	R
06MGPP019	S	S	R	S	R	I	I
06MGPP041	S	S	S	S	R	S	I

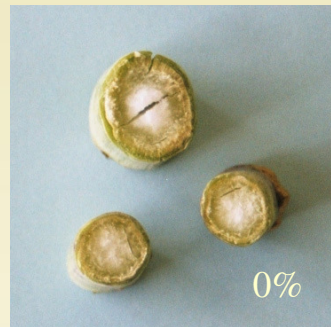
Internal infection: 0-30=R; 31-69=I; 70-100=S

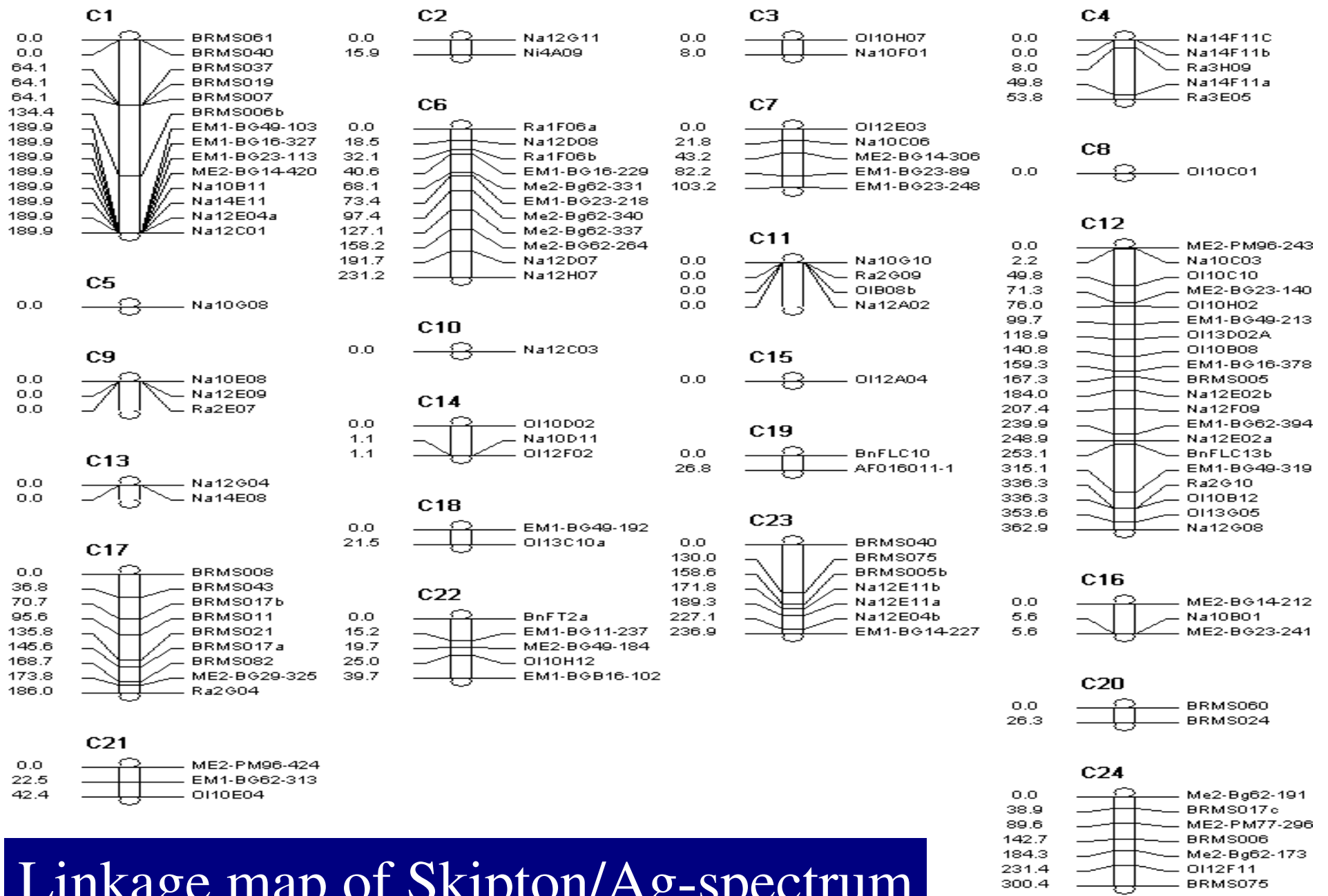
Phenotyping for field resistance at Wagga

Contd-

- **Skipton/Ag-Spectrum population was evaluated for blackleg resistance in blackleg nursery**
 - July 18, 2008
 - 177 DH lines, 2 parents and a susceptible check (Karoo)
 - 2 Replication
- **10 plants/DH line were uprooted and internal infection was assessed**
- **DH lines showed segregation for internal infection**
 - but infection was **NOT** uniform

Symptoms of blackleg was scored





Linkage map of Skipton/Ag-spectrum

QTL analysis for blackleg resistance

Very preliminary data

Ch 1

LRS=9.9, $R^2=10\%$



Ch 2

LRS=20.0, $R^2=12\%$



Ch 3

LRS=12, $R^2=14\%$



Future Plans: Screening of DH populations for blackleg resistance

- Skipton/Ag-Spectrum and BLN3347/Carousel-10
 - Two single spore isolates/DH population
 - 20% of DHs will be replicated
 - Q2 control (Susceptible check)
 - Experimental design by Neil Coombes
 - Split plot design
 - DH will be evaluated at seedling and adult plant stages
 - Planned for sowing in 2nd Wk of March 09
- Multiply mapping/validation populations

Acknowledgements

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- Angela Van De Wouw
- Neil Coombes

