

National Brassica Germplasm Improvement Program Trait Development:

Blackleg resistance in *Brassica napus*

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Victoria
The Grains & Legumes
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Aims

- (i) Identify advanced *Brassica napus* germplasm and other Brassicaceae lines with high levels of blackleg resistance
- (ii) Provide germplasm to breeders as appropriate

- Source germplasm from different gene banks and the ACIAR program
- Germplasm sourced includes winter *Brassica napus*, cultivated and wild diploid progenitors and wild Brassicaceae species
- Screen and identify high levels of blackleg resistance in disease nurseries
- Identify novel major genes by phenotyping with the differential set of 10 – 12 single spore isolates of *Leptosphaeria maculans*

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Alternative Sources of Blackleg Resistance

Germplasm sourced:

- 500 winter *B. napus* lines
- 100 ACIAR lines including *B. carinata* introgression lines and Chinese introductions
- 620 *B. rapa*
- 50 cultivated *B. oleracea*
- 63 wild Brassicaceae (*B. fruticulosa*, *B. nigra*, *B. montana*, *B. incana*, *Hirshfeldia incana*, *Sinapis alba*, *B. rapa* landraces)

Disease nursery trials:

- 500 winter *B. napus* and 30 ACIAR accessions screened between 2009 - 2012
 - 95 winter *B. napus* and 5 ACIAR accessions were found to have adult plant survival greater than 75%
 - 7 winter *B. napus* and 1 ACIAR were found to have outstanding % survival of similar or higher than Hyola50 (95 – 100%)
- 220 *B. rapa* lines were screened in 2012
 - 8 accessions showed outstanding survival and low blackleg internal infection

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Selected Accessions with Outstanding Adult Plant Survival

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Alternative Sources of Blackleg Resistance

Selected *B. rapa* accessions with outstanding field blackleg resistance

Performance of Selected *B. rapa* accessions in blackleg disease nursery

4 accessions showed outstanding survival and low internal infection

4 accessions showed good survival

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Alternative Sources of Blackleg Resistance

Gene identification using the differential set of *L. maculans* isolates

- winter *B. napus*
 - prior to 2011 no novel blackleg resistance genes have been identified in the field-selected germplasm
 - 2011 – 2012 two accessions have been confirmed to have a phenotypic profile indicative of a novel gene/gene combination

Line	Isolates									
	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
Westar	S	S	S	S	S	S	S	S	S	S
Bn1	R	R	I	R	R	S	R	R	R	R
Bn2	R	R	R	R	R	R	R	R	R	R

- Bn1 is not *B. napus*
- Bn2 is a synthetic *B. napus*

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Alternative Sources of Blackleg Resistance

Gene identification using the differential set of *L. maculans* isolates

- Cultivated *B. oleracea*
 - 37 accessions were screened in controlled environment conditions
 - 7 accessions had a resistance profile consistent with the existence of a new gene

Cultivar (Test)	Isolates									
	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
Westar	nd	S	S	S	S	S	S	S	S	S
Bo1	nd	S	R	S	S	S	R	R	S	R
Bo2	nd	S	R	I	S	S	R	R	S	R
Bo3	R	R	R	R	S	S	R	R	S	R
Bo4	nd	S	S	I	S	S	R	S	R	R
Bo5	nd	S	S	S	S	S	I	I	S	R
Bo6	nd	S	I	R	R	S	R	R	R	R
Bo7	nd	S	S	I	I	S	I	S	S	R

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Alternative Sources of Blackleg Resistance

Gene identification using a differential set of *L. maculans* isolates

- wild *Brassicaceae*
 - 15/20 *B. nigra*, 9/12 *B. tournefortii*, 9/9 *H. incana*, 1/4 *B. montana*, 0/4 *B. incana* and 0/4 *B. rapa* land races showed strong resistance against all differential isolates

Line	Isolates									
	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
Westar	S	S	S	S	S	S	S	S	S	S
Bt1	R	R	R	R	R	R	R	R	R	R
Bt2	R	R	R	R	R	R	R	R	R	R
Ht1	R	R	R	R	R	R	R	R	R	R
Bm1	R	R	R	R	R	R	R	R	R	R

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Conclusions

- Excellent field blackleg resistance has been identified in winter *B. napus* and *B. rapa* germplasm
- Several *B. oleracea* accessions have been identified as resistant to several *L. maculans* isolates in the differential testing
- One *B. napus* accession with excellent blackleg resistance has been identified for further development.
- High levels of blackleg resistance to field isolates were identified in several wild *Brassicaceae* species
- Single spore isolate phenotyping of promising field-tested winter *B. napus* and *B. rapa* accessions will be continued in 2013 -2014.

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	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	
-	-	-	-	+	+	+	-	-	-	-	AvrLm1
+	-	-	-	+	-	-	-	-	-	-	AvrLm2
-	-	-	-	-	-	-	+	-	-	-	AvrLm3
-	-	-	+	+	-	-	-	-	-	-	AvrLm4
+	+	+	+	-	+	+	+	+	+	+	AvrLm5
+	+	-	+	-	+	+	+	+	+	+	AvrLm6
-	-	-	+	+	-	-	-	-	-	-	AvrLm7
-	+	-	+	-	+	+	+	nd	nd	+	AvrLm8
+	-	-	-	-	-	-	-	-	-	+	AvrLm9
+	+	nd	+	+	+	+	-	-	-	+	AvrLmS

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